Enhancing the Coping Skills of Submariners: An Evaluation of the Effectiveness of Skills Based Stress Management Training

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This thesis is presented for the degree of Doctor of Psychology (Clinical), Murdoch University, 2007.

Declaration

I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary educational institution.

Cindy McDougall

2007

CHAPTER 8

STUDY 4

8.0 Intervention Study

8.1 Introduction

This chapter investigates the effectiveness of skills training for stress management in submariners. The intervention was a multimodal cognitive behavioural program based on 'best-practice' from the research literature. The intervention was conducted whilst subjects were alongside.

8.2 Preliminary Analyses

Before hypothesis testing, paired samples t-tests were conducted on the control data for the five 'wait-list' control subjects, who later participated in the intervention, to determine whether there were any significant differences between their pre and post-test control measures. The results revealed no significant differences on the dependent variables during this interval. The post-test to follow-up period (before the intervention was administered in these five subjects) was also compared and a significant difference was obtained for the Social Support scale of the PRQ from post-test (M = 35.6, *SD* = 5.68) to follow-up (M = 31.6, *SD* = 5.59). This indicated that there was a reduction in the use of social support from post-test to follow-up. This could be expected given that personnel were separated from their 'usual' supports (i.e. family and/or friends) during the follow-up period when they were at sea. Therefore this is not seen as a difference specific to this group of subjects but rather a reflection of the limitations of the environment. No other significant differences were detected between post-test and follow-up. A more detailed

examination of the data from these five ‘wait-list’ control subjects can be found in Appendix O.

A repeated measures analysis was also conducted to compare changes after the intervention in the same five subjects with changes in the other 11 intervention subjects. The means for each of the dependent measures were found to be moving in the same direction, thus indicating no significant differences between the groups. As such, the intervention data from all 16 subjects were combined in subsequent analyses.

The demographic data of the intervention and control subjects were compared to determine whether the treatment group was representative of the entire sample. Means, independent samples t-tests, frequencies and chi square analyses were computed, and are presented in Table 24.

Table 24

Comparing Demographic Data of the Treatment Group versus the No Treatment Group

Demographic Variable	**Treatment Mean (*SD*) (*n*=16)**	**No Treatment Mean (*SD*) (*n*= 59)**	**T-Test Findings**
Age	30.31 (5.24)	30.07 (5.32)	-0.16
Years in Navy	9.46 (4.30)	9.11 (5.11)	-0.25
Years in Submarine Service	6.64 (5.40)	5.25 (4.83)	-0.99
Months in current posting	9.56 (7.39)	14.44 (11.78)	1.57
No. of children	1.12 (1.20)	0.84 (1.20)	-0.82
Nonparametric categories	**Treatment Frequency**	**No Treatment Frequency**	**Chi Square Findings**
Marital status Relationship No Relationship	 8 8	 33 26	0.02
Level of education Tertiary Non Tertiary	 1 15	 14 45	1.43
Rank Sailors Officers	 15 1	 51 8	0.13
Category Technical Non Technical	 10 6	 19 40	3.68*
Submariner Status Qualified Trainee	 14 2	 52 7	0.25

*Significant effect $p<.05$

The only significant difference between the two groups on any of the demographic variables was for Job Category. A greater proportion of technical submariners made up the treatment group, whereas the controls had a greater proportion of non technical submariners. In all other respects the treatment group was representative of the entire sample.

Further comparisons of technical and non technical categories were conducted using nonparametric tests (Mann-Whitney U). Work conditions, attitudes, work outcomes, symptoms and coping were examined to determine any significant differences between these two groups that may have influenced self-selection for treatment.

Bonferroni corrections were calculated to adjust for multiple comparisons within categories. Findings are presented in Appendix P (Tables P1 & P2).

Only one significant difference was detected, with technical submariners reporting higher anxiety symptoms than non technical submariners ($z = -3.42$, $p=0.001$) (see Table P2). This finding may be attributed to ongoing demands for technical submariners whilst alongside and the pressures involved in getting the submarine ready to sail again. However, it should be noted that their mean anxiety rating ($M=4.76$, $SD=6.44$) is still very low and well within the normal range. Therefore, there is no compelling clinical reason for why technical submariners were more greatly represented in the treatment group. Perhaps this was their opportunity to 'break' from work.

Other weak associations were that technical submariners felt less well prepared for lifestyle changes, had greater difficulties relaxing due to separation from family and friends, reported higher physical environment and physical strain (without Bonferroni correction) (see Tables P1 & P2). Technical submariners tend to work in the smaller and more confined spaces of the submarine, which may contribute to greater physical strain and tension. However, these trends account for only a small proportion of the total variance, and may possibly be chance findings. There were no other statistically significant differences between technical and non technical submariners.

8.3 Intervention Data

8.3.1 Hypothesis

It was hypothesised that participants in the intervention group would report improvement between pre and post-test, as compared to the control group, on the dependent variables. The mean values and standard deviations are reported in Table 25. The DASS and the PSQ formed part of the Baseline Alongside measures which were completed separately to the remaining dependent variables, which were included in the Pre-Test phase. Three control subjects did not complete their ratings for the DASS and the PSQ but provided data for the remaining variables.

Table 25

Descriptive Findings for Each of the Measures at Pre and Post-Test for Intervention and Control Subjects

	Intervention (*n*=16)		**Control (*n*=22)**	
	Pre-Test	**Post-Test**	**Pre-Test**	**Post-Test**
Measure	**Mean (*SD*)**	**Mean (*SD*)**	**Mean (*SD*)**	**Mean (*SD*)**
DASS				
Depression	5.19 (5.23)	2.37 (2.47)	5.04 (5.44)	6.23 (9.31)
Anxiety	4.56 (7.44)	2.62 (3.76)	2.41 (3.09)	3.63 (7.98)
Stress	9.87 (6.41)	5.31 (3.87)	7.82 (6.60)	8.18 (9.35)
PSQ				
Vocational Strain	20.06 (4.20)	17.44 (3.12)	20.45 (4.93)	21.73 (6.83)
Psychological Strain	21.50 (7.20)	17.62 (3.79)	22.63 (7.54)	21.50 (7.84)
Interpersonal Strain	21.56 (5.92)	18.56 (3.76)	21.95 (5.21)	23.27 (6.80)
Physical Strain	22.19 (8.52)	19.25 (4.07)	22.04 (8.66)	23.09 (9.36)
	Intervention (*n*=16)		**Control (*n*=25)**	
ORQ				
Role Overload	29.12 (6.86)	24.31 (5.63)	27.84 (6.93)	27.68 (6.82)
Role Insufficiency	27.87 (5.58)	23.62 (5.52)	28.56 (6.80)	29.92 (7.23)
Role Ambiguity	25.06 (5.64)	26.94 (4.93)	24.24 (6.92)	22.92 (6.26)
Role Boundary	23.12 (3.34)	20.94 (4.30)	22.84 (5.89)	22.84 (6.59)
Responsibility	27.19 (6.97)	26.62 (7.61)	26.04 (7.78)	27.00 (7.92)
Physical Environment	23.81 (7.16)	22.00 (6.67)	25.52 (8.06)	27.36 (9.89)
PRQ				
Recreation	23.69 (6.38)	25.69 (6.57)	22.32 (5.76)	24.36 (7.49)
Self Care	21.37 (5.77)	26.25 (4.65)	19.64 (5.32)	22.34 (6.85)
Social Support	33.62 (8.16)	41.75 (6.19)	35.68 (8.85)	36.88 (7.91)
Rational Coping	31.44 (6.60)	33.94 (6.71)	31.48 (6.37)	33.08 (6.35)
Job Satisfaction	3.44 (0.81)	3.87 (0.62)	3.00 (1.15)	3.32 (0.94)
Job Performance	3.56 (0.63)	4.00 (0.36)	4.04 (0.67)	3.96 (0.79)
General Wellbeing	30.25 (9.85)	25.19 (4.10)	29.32 (7.73)	25.16 (6.41)
Health	2.63 (0.81)	3.00 (0.51)	2.48 (0.87)	2.68 (0.74)
Sickbay Attendance	1.44 (1.41)	0.38 (0.80)	0.84 (1.37)	0.76 (1.33)

To test the hypotheses, a repeated measures analysis of variance was conducted for each dependent variable. The F ratios for the dependent variables and significant effects are presented in Table 26.

Table 26

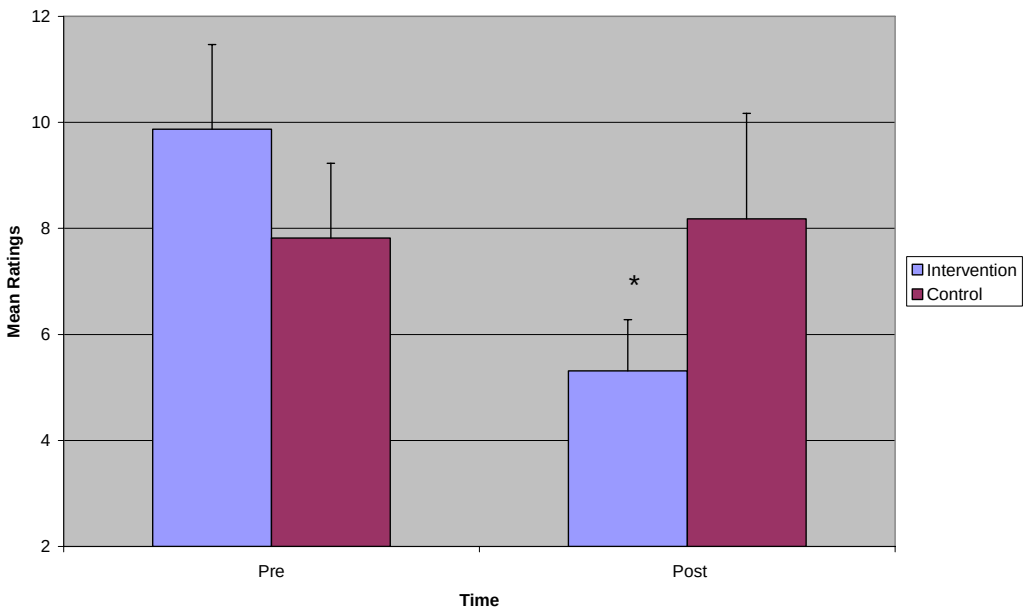
F Ratios for Each of the Outcome Measures Between Pre and Post-Test

	F Ratios		
Measure	**Group**	**Time**	**Group x Time**
DASS			
Depression	1.08	0.54	3.24
Anxiety	0.11	0.13	2.52
Stress	0.04	3.13	4.31*
PSQ			
Vocational Strain	2.50	0.69	5.70*
Psychological Strain	1.50	5.99*	1.79
Interpersonal Strain	2.38	1.03	6.78*
Physical Strain	0.60	0.61	2.72
ORQ			
Role Overload	0.28	8.69*	7.61*
Role Insufficiency	1.00	0.05	1.67
Role Ambiguity	0.21	1.58	0.003
Role Boundary	0.29	1.52	1.52
Responsibility	0.03	0.05	0.76
Physical Environment	2.07	0.00	3.32
PRQ			
Recreation	0.54	3.56	0.00
Self Care	2.80	23.32*	1.97
Social Support	0.53	7.83*	4.32*
Rational Coping	0.05	3.35	0.16
Job Satisfaction	3.79*	5.54*	0.13
Job Performance	1.40	3.08	6.46*
General Wellbeing	0.05	20.87*	0.20
Health	1.12	7.09*	0.65
Sickbay Attendance	0.11	5.13*	3.79*

*Significant effect $p<.05$

A DASS

Participants' scores on the DASS recorded alongside were used as the pre-test scores. Mean scores fell within the normal range for both groups. Results indicated a significant Group x Time interaction for Stress [$F(1, 36) = 4.31$, $p<.04$] (Figure 2). Further investigation of this interaction indicated that the decrease in stress ratings from pre to post-test for the intervention subjects was statistically significant [$t(15) = -2.75$, $p=.015$], whereas ratings did not change in the control group.

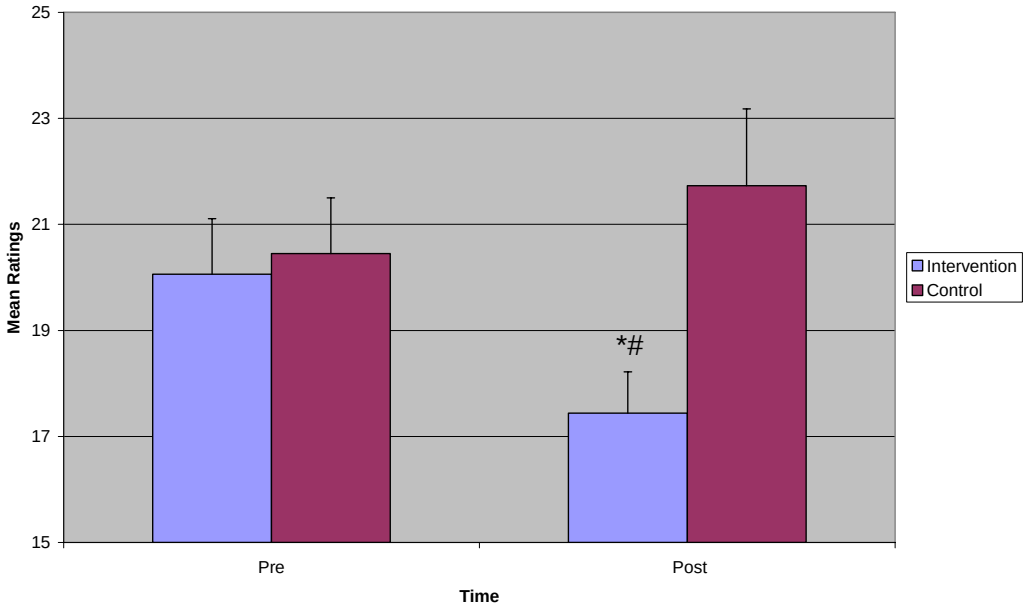


*Significant decrease from pre to post-test for the intervention subjects

Figure 2. Significant changes in Stress symptoms

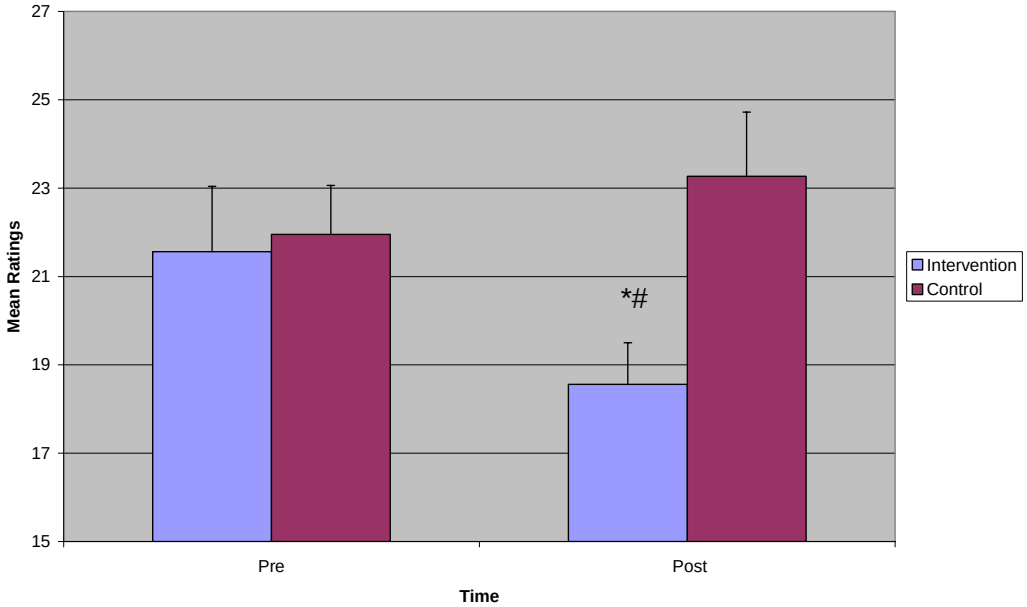
B Strain indicators (PSQ, ORQ)

Both groups at pre and post test had mean ratings within the normal range for each of the PSQ subscales. Mean ratings for the Psychological Strain subscale of the PSQ decreased from pre to post-test in both groups, and a significant main effect for Time was found [F (1, 36) = 5.99, *p*=.02]. A significant Group x Time interaction was identified for Vocational Strain (VS) [F (1, 36) = 5.70, *p*=.02] (Figure 3), and Interpersonal Strain (IS) [F (1, 36) = 6.78, *p*=.01] (Figure 4). The Vocational Strain and Interpersonal Strain subscale scores decreased in the intervention group but not the control group at post-test (VS: t (15) = 2.65, *p*=.018; IS: t (15) = 2.23, *p*=.04). The difference between the mean post-test ratings for intervention and control subjects was also statistically significant for Vocational Strain [t (41) = 2.14, *p*=.038] and for Interpersonal Strain [t (41) = 2.58, *p*=.014], with the intervention subjects reporting less strain.



*Significant decrease from pre to post-test for the intervention subjects
Significantly less in treated than control subjects at post-test

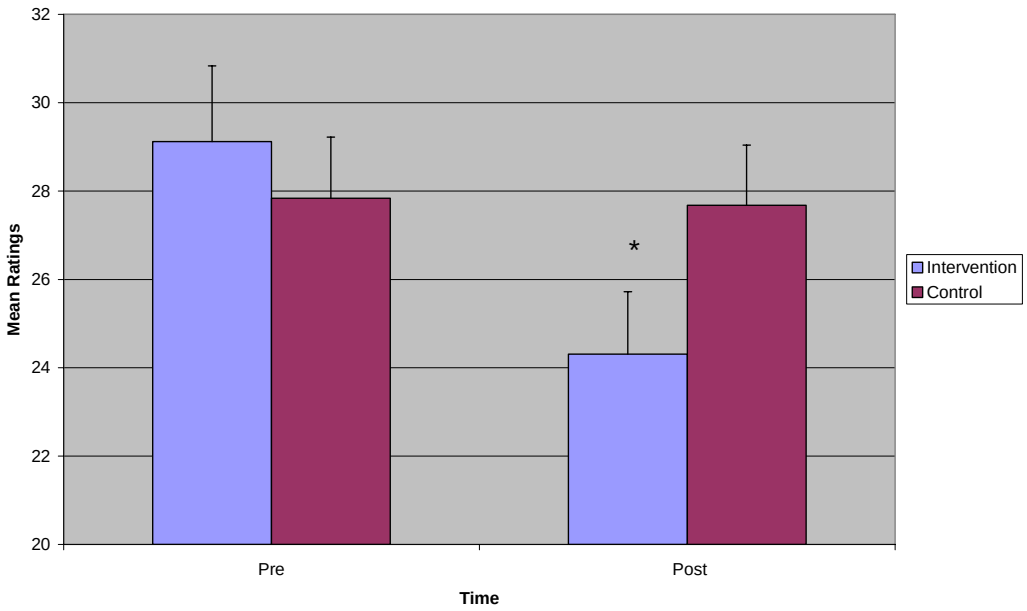
Figure 3. Significant changes in Vocational Strain



*Significant decrease from pre to post-test for the intervention subjects
Significantly less in treated than control subjects at post-test

Figure 4. Significant changes in Interpersonal Strain

Neither group reported maladaptive strain on the ORQ scales at pre or post-test. Mean ratings for the Role Overload subscale decreased across all subjects with a main effect for Time [F (1, 39) = 8.69, *p*=.005]. A repeated measures analysis indicated a significant Group x Time interaction for the Role Overload scale [F (1, 39) = 7.61, *p*=.01] (Figure 5). Role overload decreased in the intervention group [t (15) = 3.44, *p*=.004], indicating that the intervention was effective in reducing strain in this area. This is an important finding given previous research regarding the impact of work overload.



*Significant decrease from pre to post-test for the intervention subjects

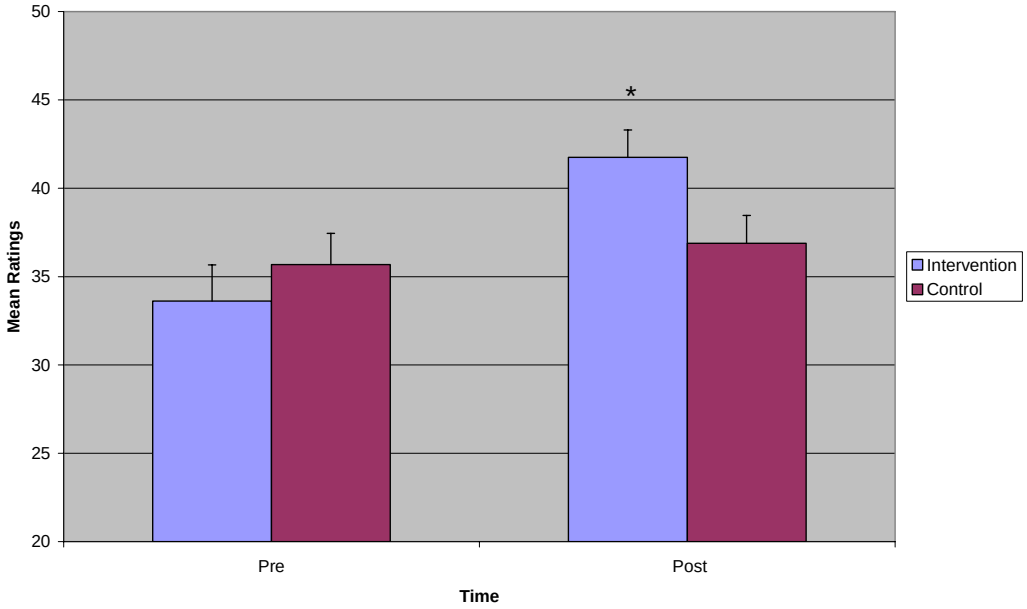
Figure 5. Significant changes in Role Overload strain

C Coping resources (PRQ)

Both groups were in the normal range on the PRQ subscales. Mean ratings for each of the coping resources increased from pre to post-test for both groups. Significant main effects for Time were detected for the Self-Care and Social Support subscales, [F (1, 39) = 23.32, *p*=.000], and [F (1, 39) = 7.83, *p*=.008] respectively. This likely reflects increased access to both resources whilst alongside. Main effects for Time on

the Recreation and Rational/Cognitive Coping subscales approached but did not achieve statistical significance, [F (1, 39) = 3.56, *p*=.067] and [F (1, 39) = 3.35, *p*=.075] respectively.

A significant Group x Time effect was also identified for the Social Support subscale [F (1, 39) = 4.32, *p*<.05] (Figure 6). Social support improved significantly for participants in the intervention group [t (15) = -3.37, *p*=.004].



* Significant increase from pre to post-test for the intervention subjects

Figure 6. Significant changes in Social Support

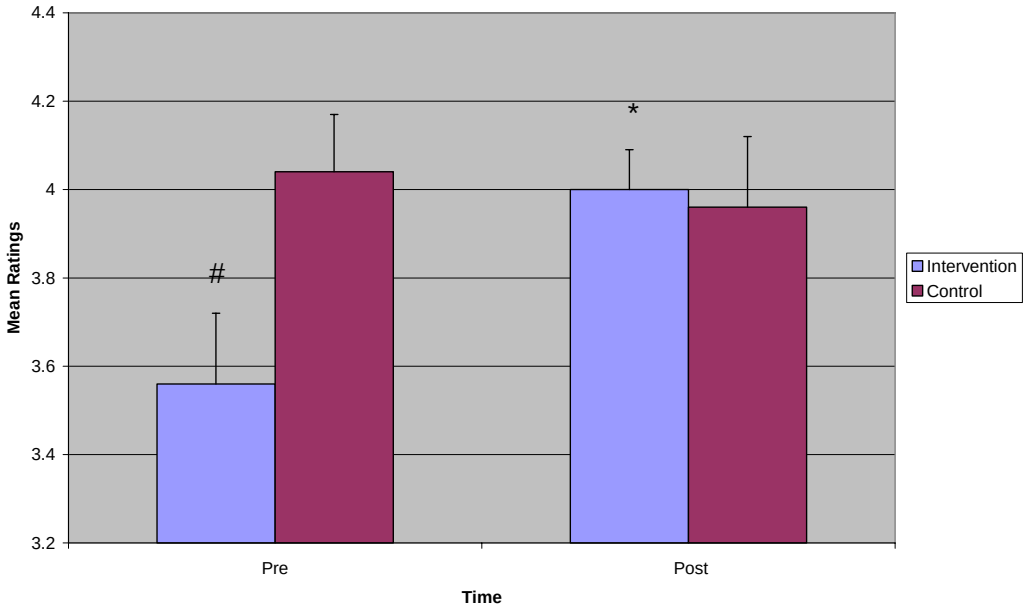
D Job satisfaction

Job satisfaction increased from pre to post-test for all subjects with a main effect for Time [F (1, 39) = 5.54, *p*<.05]. An interesting finding in mean ratings between the groups at pre-test was that the intervention group rated their job satisfaction, on average, more highly than the control group (Table 25). This finding persisted at post-test [main effect for Group, F (1, 39) = 3.79, *p*=.059] (Table 26). Thus, despite

the intervention participants identifying themselves as requiring assistance through skills training, their job satisfaction was not identified as an issue.

E Overall job performance

Job performance ratings increased from pre to post-test in the intervention group but not controls. A significant Group x Time effect was found for job performance [F (1, 39) = 6.46, $p<.05$] (Figure 7). The increase in mean ratings from pre to post-test was statistically significant for the intervention group [t (15) = -3.42, $p=.004$] but not controls. A significant difference in the mean ratings of the intervention and control groups was obtained at pre-test [t (59) = 2.25, $p=.028$] with the intervention subjects rating their job performance lower than control subjects. The difference in ratings at post-test was not significant, with both groups rating their job performance equally.



* Significant increase from pre to post-test for the intervention subjects
# Significantly less in treated than control subjects at pre-test

Figure 7. Significant changes in Job Performance ratings

F General health and wellbeing; sick bay attendance

General wellbeing and health ratings improved significantly from pre to post-test across all subjects, for general wellbeing [F (1, 39) = 20.87, p=.000] and health ratings [F (1, 39) = 7.09, p<.05]. Sickbay attendance decreased from pre to post-test for all subjects also [F (1, 39) = 5.13, p<.05]. On average, intervention subjects were higher on sickbay attendance than controls at pre-test but less at post-test. Changes in sickbay attendance approached but did not achieve statistical significance [Group x Time, F (1, 39) = 3.79, p=.059] (Tables 25 & 26).

8.4 Post-Test versus Follow-Up

Outcome ratings at post-test were compared to follow-up for both the intervention and control subjects. Only seven intervention subjects completed both the post-test and follow-up phases, as two subjects were discharged from the Navy and a further seven subjects were posted ashore and did not return to sea. Follow-up measures were taken on a second return from sea, with responses being retrospective over the past two weeks. It was expected that there would be an increase in symptomatology across all subjects with a return to sea. However, it was predicted that this would be less so for the treatment group. Table 27 shows the mean ratings and standard deviations for each group. F ratios are presented in Table 28.

Table 27

Descriptive Findings on the Outcome Measures at Post-Test and Follow-Up by Group

	Intervention (*n*=7)		**Control (*n*=18)**	
	Post-Test	**Follow-Up**	**Post-Test**	**Follow-Up**
Measure	**Mean (*SD*)**	**Mean (*SD*)**	**Mean (*SD*)**	**Mean (*SD*)**
DASS				
Depression	2.86 (3.18)	4.43 (5.85)	4.22 (5.58)	6.05 (5.11)
Anxiety	5.28 (4.46)	4.14 (4.74)	2.72 (5.30)	2.22 (2.73)
Stress	6.57 (4.65)	11.00 (6.48)	7.05 (5.75)	10.28 (7.26)
	Intervention (*n*=7)		**Control (*n*=18)**	
PSQ				
Vocational Strain	17.43 (3.21)	20.28 (5.68)	19.83 (5.27)	21.05 (5.43)
Psychological Strain	18.43 (3.46)	20.86 (3.97)	20.11 (4.75)	22.66 (5.34)
Interpersonal Strain	19.43 (4.39)	19.71 (3.73)	22.83 (6.14)	22.22 (5.83)
Physical Strain	20.14 (3.18)	20.86 (3.43)	23.05 (8.01)	23.44 (7.21)
ORQ				
Role Overload	23.28 (2.63)	25.28 (4.89)	26.78 (5.28)	27.00 (3.79)
Role Insufficiency	25.71 (4.85)	27.14 (6.94)	28.50 (7.86)	28.11 (6.16)
Role Ambiguity	24.14 (5.61)	22.86 (2.97)	23.00 (5.77)	22.61 (5.12)
Role Boundary	21.57 (3.99)	23.43 (4.24)	21.89 (4.27)	25.00 (5.30)
Responsibility	28.43 (9.11)	29.00 (5.44)	28.39 (5.98)	27.33 (7.45)
Physical Environment	25.43 (7.32)	29.28 (12.23)	26.78 (8.40)	28.55 (8.54)
PRQ				
Recreation	23.14 (3.80)	21.57 (5.74)	22.83 (7.43)	23.78 (7.46)
Self Care	26.71 (4.71)	24.14 (6.33)	21.44 (6.70)	19.94 (6.33)
Social Support	40.14 (6.52)	39.28 (5.68)	37.50 (7.55)	37.33 (8.00)
Rational Coping	33.86 (4.45)	31.43 (5.68)	33.22 (7.48)	29.33 (5.14)
Job Satisfaction	4.00 (0.00)	3.14 (0.90)	3.44 (1.04)	3.44 (0.78)
Job Performance	3.86 (0.38)	3.71 (0.49)	4.00 (0.68)	3.94 (0.64)
General Wellbeing	27.28 (4.75)	26.71 (3.77)	25.61 (5.18)	26.72 (5.10)
Health	2.86 (0.38)	2.57 (0.53)	2.67 (0.77)	2.72 (0.82)
Sickbay Attendance	0.29 (0.49)	0.14 (0.38)	0.89 (1.49)	0.50 (1.04)

Table 28

F Ratios for Each of the Outcome Measures Between Post-Test and Follow-Up

	F Ratios		
Measure	**Group**	**Time**	**Group x Time**
DASS			
Depression	0.59	1.87	0.01
Anxiety	2.32	0.44	0.07
Stress	0.002	8.60*	0.21
PSQ			
Vocation Strain	0.57	4.51*	0.72
Psychological Strain	0.90	5.71*	0.004
Interpersonal Strain	1.66	0.03	0.23
Physical Strain	1.13	0.12	0.01
ORQ			
Role Overload	2.69	0.89	0.57
Role Insufficiency	0.49	0.13	0.40
Role Ambiguity	0.14	0.35	0.10
Role Boundary	0.28	5.78*	0.37
Responsibility	0.10	0.02	0.25
Physical Environment	0.007	2.66	0.36
PRQ			
Recreation	0.16	0.02	0.41
Self Care	3.16	5.45*	0.38
Social Support	0.72	0.07	0.03
Rational Coping	0.47	2.88	0.15
Job Satisfaction	0.17	3.72	3.72
Job Performance	0.60	0.58	0.11
General Wellbeing	0.62	0.03	0.33
Health	0.005	0.73	1.61
Sickbay Attendance	1.01	2.94	0.63

*Significant effect $p<.05$

Between post-test and follow-up, mean ratings increased for Stress, Vocational and Psychological strain, and Role Boundary strain in both groups. Significant main effects for time were obtained for each: Stress [F (1, 23) = 8.60, $p<.05$]; Vocational Strain [F (1, 23) = 4.51, $p<.05$]; Psychological Strain [F (1, 23) = 5.71, $p<.05$]; Role Boundary [F (1, 23) = 5.78, $p<.05$]. Vocational strain ratings for both groups at follow-up approached maladaptive strain levels. A further main effect for Time was found for Self-Care [F (1, 23) = 5.45, $p<.05$] with mean ratings decreasing at follow-up (Tables 27 & 28). This indicates that subjects reduced their use of this coping technique whilst at sea. At follow-up, the average ratings for Self-Care and Rational Coping were nearing 39T for the control group. This indicates that they were close to

recording coping deficits in these two areas in the group as a whole. There were no other significant changes in terms of reduced coping.

Job satisfaction decreased from being 'satisfied' to being 'ambivalent' for the intervention group, to levels that matched those of the control group. Job performance and health ratings were 'average' and remained largely unchanged. Health complaints decreased at follow-up for the intervention subjects to match the control group. Marginal decreases were indicated for sickbay attendance at follow-up (Table 27). Personnel are typically less likely to present to the sickbay whilst at sea. No significant differences were identified for these particular outcomes.

8.5 Discussion

This chapter focussed on the intervention and its impact on the outcome measures in comparison with the control group. Statistical analyses were conducted between pre and post-test measures, and between post-test and follow-up measures.

Methodological issues will be considered and key findings for stress, strain, coping techniques, job satisfaction, job performance and health between pre and post-test are discussed. Key findings between post-test and follow-up are then presented.

8.5.1 Methodological Issues

It was determined that approximately 20 subjects would be required for the intervention. This study had 16 subjects who completed the training and pre and post-test questionnaires. This is just under the approximation and may have reduced the likelihood of detecting significant effects. Another possible limitation was that

subjects were required to volunteer to participate in the intervention, and hence this was not a truly random sample.

At follow-up, the very small sample size may have limited the chance of detecting significant effects. Recruiting a larger sample was difficult due to changes in postings, and absence due to leave, and training requirements. Although organisational support for this study was high in the initial stages, this gradually deteriorated over time. Greater encouragement for continued participation of personnel would be needed to reduce the attrition rate. Scheduling skills training into the boat's programs would be required for the 'true' effects to be realised.

A greater proportion of technical submariners made up the intervention group. It was thought that this may have been due to their more complex roles and generally greater workloads whilst alongside than non technical submariners, thus being more likely to experience higher stress and strain. However, no clinical reasons were identified to account for this difference in representation.

Job performance ratings were lower for intervention subjects at pre-test than controls. Given the importance of perceived status on the boat, and teamwork, it was thought this may have been a factor in self-selection for treatment. Another possible factor in nominating for assistance may have been sickbay attendance, which was on average higher for intervention subjects at pre-test. However, although technical submariners made up a greater proportion of the intervention group, there were no statistically significant differences on these two variables (job performance, and sickbay attendance) between technical and non technical submariners.

Within the treatment and no treatment groups, subjects could not be matched equally for category due to the small sample size. This could be done in any future studies with larger sample sizes. Despite the possibility that less confidence in performance and ill health may have played a role in those subjects who nominated for treatment, this was not found to be statistically significant in this study.

8.5.2 Pre and Post-Test

The intervention was successful in reducing stress, vocational strain, interpersonal strain, and role overload strain from pre to post-test. It also resulted in increased use of social support and improved confidence in job performance. Intervention subjects also reported less vocational and interpersonal stain than controls at post-test. These findings lend further support to earlier research indicating that such stress management interventions can produce positive results in subjects with normal symptom levels (Murphy, 1996), at least in the short-term.

8.5.2a Stress Symptoms

Many intervention programs provide participants with training in coping skills and rehearsal, often in the learning (classroom) environment. More generalised stressors are used for training, such as work conflict and assertiveness training. The stress management program used in this study focussed on specific stressors identified as being personally relevant to the subjects, and enabled them to resolve their problems through application of various skills in the actual work environment. Low job control produces a variety of adverse effects (Bongers et al., 1993; Houtman et al., 1994; Riihimaki, 1991; Sonnentag & Zijlstra, 2006). Thus, in the present program, controllability and predictability were considered when participants selected

problems to address, to increase their sense of personal control. This may have helped reduce stress and strain.

Murphy (1996) noted that it is difficult to detect statistically significant treatment effects for anxiety in subjects with normal levels at pre-test. In this study, a change in anxiety symptoms may have been difficult to detect as mean ratings at baseline were quite low in both groups. During the selection process, submariner applicants are screened for state and trait anxiety. Thus anxiety was not expected to be problematic or vary much over time for subjects as a whole. Unfortunately, the present intervention did not influence depressive symptoms, but these were generally quite low at pre-test with little room to improve.

8.5.2b Strain

Vocational strain, which is an indicator of attitudes to work and problems in work output quality (Osipow, 1998), improved as a result of the intervention. Intervention subjects were generally motivated towards improving their work standards and were taught in skills aimed at specific work problems (for example, time management skills). Interpersonal strain, which measures disruption (withdrawal or aggressiveness) in interpersonal relationships (Osipow, 1998), also improved as a result of the intervention. As part of the problem solving component of the program, participants covered communication skills in the workplace. They were encouraged to participate in more social interaction, seek assistance from work colleagues in resolving problems, and learnt assertiveness techniques and how to manage frustrations. Frustrations were also addressed through use of distraction techniques and compensatory activities. Subjects were also taught how to apply a paced

diaphragmatic breathing technique to manage on-the-spot stress. One subject in particular cited using this technique to avoid an aggressive confrontation with a supervisor. This technique would seem to have utility in the face of stress, and is more likely to be applied than other relaxation techniques which cannot be applied in-situ (McKay & Fanning, 1987).

Psychological strain has been linked to reduced job satisfaction, increased job search activity, and high voluntary turnover (Cavanaugh et al., 2000). Psychological strain decreased from pre to post-test in intervention and control subjects. This suggests that the period alongside was sufficient in itself to reduce the extent of psychological and/or emotional problems being experienced by the submariners. This could also be due to a change in environment, as lack of windows in the workplace (submarines don’t have windows) has been consistently linked to such strain reactions as depression, isolation and tension (Finnegan & Solomon, 1981; Sundstrom, 1986). A decrease in tension, threat and danger, and improved environmental conditions may also have contributed to the decrease in psychological strain. In addition, personnel have access to more personal resources and emotional supports when alongside than when at sea, and opportunities for less disturbed sleep.

Role overload examines the imbalance of demands and resources, and managing workloads. Mean ratings were in the normal range and decreased in intervention and control subjects from pre to post-test. Although submariners are faced with a different set of pressures whilst alongside, as previously stated in more recent times there has been an increase in access to resources alongside (such as contractors, and psychological support) to help meet these demands. In addition to this general

decrease, the intervention further reduced role overload strain. This is a significant finding as this was one of the most prevalent stressors identified in Officers and Senior Sailors in Brown's (1999b) study. In addition, role overload strain is related to poor work outcomes such as work withdrawal, reduced organisational loyalty, intention to quit, increased job search activity (Boswell et al., 2004), and poor psychological health (Cavanaugh et al., 2000).

The problem-solving phase of the skills training not only enabled subjects to directly address their personal issues, but also enabled a broad range of skills to be covered and implemented, with advice and input from work colleagues. Running this type of program in work groups seemed to be effective in gaining input and ideas from people of different ranks, categories and experience to help solve problems. It also meant that alternative perceptions were offered, participants were able to empathise with the person who reported the problem, and they had better insight into the organisational environment of each boat. For example, an Able Seaman (AB) had concerns about his performance and how others perceived him. One of his senior colleagues was able to provide directly relevant feedback, offer his own perception of the AB, and challenge some of the AB's irrational/unhelpful thoughts. The AB specifically identified this opportunity as a beneficial part of the program for him. In addition, research has shown that individuals who engage in task-focussed coping tend to be more resilient (Campbell-Sills, Cohan, & Stein, 2006), further supporting the inclusion of a problem-solving component within a stress management program.

8.5.2c Coping Resources

Self-care techniques are those activities which reduce or alleviate chronic stress (Osipow, 1998). These activities improved in intervention and control subjects. Similarly, social support improved. These improvements are likely when coming alongside, given better access to these resources. However, intervention subjects markedly improved in their use of social support. This may be a side-benefit of working within a supportive group setting.

Mean ratings for recreation and rational coping improved in intervention and control subjects but these increases did not achieve statistical significance. Intervention subjects were encouraged to engage in more pleasant activities. However, post-test ratings did not differ markedly from their pre-test results. Earlier research has shown lower reporting of health complaints by individuals who engaged more regularly in strenuous leisure-time physical activity (Lochbaum, Lutz, Sell, Ready, & Carson, 2004). Engagement in social and physical activities has also been found to be negatively related to need for recovery. Leisure activities stimulate recovery, although the type and duration of activity is important. Activities involving active engagement, rather than low-effort activities, are more effective in helping participants switch off from work and improve recovery and wellbeing (Sonnentag & Zijlstra, 2006). Recreation has been found to be associated with less stress, anxiety, psychological and physical strain, and better health, general wellbeing and job satisfaction in this study. Thus, it would seem worth pursuing this strategy and creating a specific component for encouraging this in stress management training. Opportunities to participate in such activity would also need to be provided.

Rational coping measures one's use of cognitive skills when faced with work-related stressors. This is also a key element of cognitive-behaviour therapy and was expected to improve in intervention subjects. However, some items on this scale may not be relevant to the work environment of submariners. For example, the skills required for certain job roles onboard are not directly transferable to other jobs, and as such, those personnel working in these roles may not 'feel that there are other jobs they could do besides that one', regardless of their use of rational coping techniques. Another item asks about 'being able to put their job out of their mind when going home' – this would be difficult for personnel who stay onboard the boat. Finally, 'being able to set and stick to priorities' is not always possible because submariners are often required to shift priorities at short notice. This requires personnel to be adaptable and is not reflected in the measurement of rational coping.

The more relevant items on the Rational Coping scale assessed problem-solving and decision-making processes. An exploratory analysis of these items indicated a nonsignificant increase in mean scores from pre (M=12.69, *SD*=3.34) to post-test (M=13.43, *SD*=2.99) for intervention subjects, and no real change in scores for the control subjects from pre (M=12.64, *SD*=3.49) to post-test (M=12.72, *SD*=3.05), [Group x Time, $F(1, 39) = 0.27$, $p=.60$]. This suggests that the cognitive skills taught in the intervention may have had some impact on these particular 'rational coping' techniques, although not strong enough to achieve statistical significance.

Despite the lack of significant impact from the intervention on the use of rational coping, subjects were able to use techniques such as diaphragmatic breathing with 'on-the-spot' stress, and distraction techniques for managing work frustrations to

effect positive changes in stress and strain. Noting some of the above-mentioned limitations, and exploratory findings, emphasis on problem-solving techniques and decision-making processes may also be important.

8.5.2d Job Satisfaction

Job satisfaction improved whilst alongside in intervention and control subjects. This is an interesting finding given that submariners' roles are less 'operational' when alongside. As already stated, submariners typically choose this role for its inherent challenges, and these largely arise when at sea. The pre-test was done two weeks after a return from sea, possibly resulting in a decline in job satisfaction due to the change in role requirements. As previously noted, frequent work schedule changes and long working hours contributed to job dissatisfaction. Difficulties planning family and leisure interests were also of concern, and this becomes an issue more so with being alongside. Post-test measures were taken just prior to sailing, and job satisfaction was higher at this point. This could be a reflection of the goal (i.e. getting the submarine ready to sail) being more in sight, an anticipation of changes to the work role and hours, reduced pressure in terms of planning activities (as the focus is on preparation for departure rather than engagement with the family), and perhaps a sense of accomplishment.

The change may also be a result of improved environmental conditions (i.e., opportunities to manoeuvre outside of the boat, to get fresh air and sunlight, and time with family and friends). Earlier research has identified associations between unpleasant working conditions, lack of windows and sunlight penetration, and poor job satisfaction and wellbeing (Carlopio & Gardner, 1992; Duvall-Early & Benedict,

1992; Finnegan & Solomon, 1981; Leather et al., 1998; Sundstrom, 1986; Sundstrom et al., 1994; Wineman, 1986). Interestingly, on average intervention subjects reported greater job satisfaction at pre-test and at post-test than controls. Job satisfaction does not appear to have played a role in determining those who identified themselves as requiring assistance.

8.5.2e Job Performance

The intervention was successful in improving job performance ratings to match those of the controls at post-test. Enabling personally relevant problems to be addressed and receiving support and encouragement from work colleagues may have been beneficial here. In addition, manipulations in the work environment, such as short activity breaks and changes in body posture, have been identified as being effective for maintaining alertness and enhancing arousal in commercial pilots (Caldwell et al., 2004; Neri et al., 2002). The Basic-Rest-Activity-Cycle (BRAC) was included in the Submariner Health and Wellness program. This encouraged participants to engage in activities that promoted a relaxation response for 10-15 minutes after every 90-120 minutes of productive work. The BRAC is aimed at increasing concentration and work efficiency. Most participants were able to take short activity breaks. For those personnel who could not remove themselves from their work station due to the nature of their role, ways to still ‘break’ from the task at hand, such as standing and stretching whilst still in the vicinity of their work station and able to continue their job function, were encouraged.

Brown’s (1999b) study revealed a strong relationship between stress and impaired military performance, which was exacerbated following a two-week period at sea.

Work stress can negatively impact on performance by distracting attention from the task-at-hand (Teichner et al., 1963), restricting attentional capacity (Combs & Taylor, 1952; Easterbrook, 1959), reducing productivity and concentration (Harris et al., 2005), and increasing absenteeism (Cooper, 1986; Cooper & Cartwright, 1994; Farrington, 1995; Rice, 1999). This raises significant safety concerns in the military environment, particularly the submarine environment. The intervention had an impact on stress symptoms and confidence in performance, factors identified as top predictors of turnover in the military (Fuller et al., 1996; Horn et al., 1992; Kopelman et al., 1992; Mitra et al., 1992; Tai et al., 1998; Tett & Meyer, 1993; Vandenberg & Nelson, 1999; Williams & Livingstone, 1994). There was also a trend for sickbay attendance to decrease more in treated than control subjects, but this did not achieve statistical significance.

8.5.2f Health

Health and general wellbeing improved during the period alongside for all subjects. This parallels improvements in self-care and social support. This is consistent with research indicating the positive impact of respite experiences and recovery processes on wellbeing (Etzion, Eden & Lapidot, 1998; Westman & Eden, 1997; Westman & Etzion, 2001), work engagement and proactive work behaviour (Sonnentag, 2003). A possible factor in nominating for assistance may have been sickbay attendance, which was on average higher for intervention subjects at pre-test. Similar to lowered confidence in job performance, frequent sickbay attendance may affect perceived status on the boat and ability to ‘pull one’s own weight’, noting the high social value placed on mental and physical capacity (Sandal et al., 1999). Stress education,

increased self-care and pleasant activities, and relaxation techniques may help to reduce sickbay attendance (Murphy, 1996).

8.5.3 Post-Test and Follow-Up

It was expected that symptoms would worsen from post-test to follow-up. This was true for stress, vocational strain, psychological strain, and role boundary strain, which all increased with a return to sea. Self-care decreased. It was also anticipated that these changes would be smaller in the treatment group. Unfortunately, however, there were no positive outcomes at follow-up as a result of the intervention. Whilst some short-term benefits were gained alongside from the intervention, the gains were not strong enough to persist at sea. This suggests that different strategies need to be employed for submariners at sea.

Submarine Service is identified as having many and unique stressors, and personnel are chosen for their capacity to manage such stressors. Therefore it would be beneficial to aim to maintain coping capacity and resilience for stressors that are inherent in the job, that may be challenge-related (and therefore 'removal' may be detrimental) or that cannot be modified due to external factors.

Another possible reason for the lack of treatment effect at follow-up could be a decline in motivation and application of learned skills. Examination of participants' workbooks at follow-up suggested that many of them did not continue to monitor their problem solving and/or engagement in the strategies taught during the intervention. Time pressure may have made this difficult, but it is unclear why subjects did not follow through with their training. Some of the subjects suggested

that such a program could be conducted at sea. This may help facilitate the immediate application of techniques in the presence of stress. A Naval Reserve Psychologist could be utilised to conduct such training.