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Charles H. Van Wijk

Institute for Maritime Medicine, chvanwijk@gmail.com

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Cover Page Footnote

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Charles H. Van Wijk

Institute for Maritime Medicine

Abstract

Specialists working in isolated, confined, and extreme environments may need to negotiate unique combinations of potentially stressful circumstances. This paper reports on three studies using the Brief COPE to examine some of the dispositional and situational coping strategies reported by navy divers and submariners.

The first study investigated whether individual members of these specialist groups would favor similar coping response styles, and found that divers ($N = 174$) and submariners ($N = 195$) generally report similar coping styles, with some context appropriate nuances in their reports. Further, they share much of their profiles with other high-demand occupational settings, making their coping style profiles unique only in degree, rather than direction.

The second study examined whether these navy specialists' coping response styles would be stable across time, and through repeat administration of the Brief COPE ($N = 237$), found that they were remarkably stable over a period of almost 2 years.

The third study investigated whether the same dispositional profile will be visible during specific submarine missions, or whether different, e.g., situational, coping strategies would be reported on board. Submariners appear to rely on similar coping strategies whether ashore or at sea, while also drawing on additional—and contextually appropriate—situational strategies while at sea. Thus while they rely on dispositional coping styles, they also seem responsive to changing environments during deployments.

Practically, these findings could be used to assist divers and submariners to develop optimal coping strategies suited to their environments.

Keywords: dispositional coping, navy divers, submariners, extreme environments, Brief COPE, coping styles

Introduction

Specialists working in isolated, confined, and extreme (ICE) environments, for example navy divers and submariners, operate in high-demand contexts, and at times have to negotiate a fairly unique combination of potentially stressful circumstances. This paper examines some of the dispositional and situational coping strategies reported by these specialists.

Stress and Coping

The Transactional Model of stress and coping considers stressors as demands made by the internal or external environment that may affect the physical and psychological well-being of an individual. Psychological stress is the outcome of three processes when faced with a stressor (Lazarus & Folkman, 1984): *Primary appraisal* is the process of perceiving an event as challenging, threatening, and/or harmful. *Secondary appraisal* is the process of considering available resources to respond to the event. *Coping* is the process of executing such responses to environmental stressors. These processes do not occur in a linear sequence only, but may cycle repeatedly during stressful transactions.

Descriptions of coping broadly distinguishes between two approaches to coping: *Problem-focused coping* is aimed at problem solving or acting to alter the source of the stress, while *emotion-focused coping* is aimed at reducing or managing the emotional distress that is associated with the situation. Although most stressors elicit both types of coping, problem-focused coping tends to predominate when people perceive themselves to have some control over a particular situation, and that something constructive can be done, whereas emotion-focused coping tends to predominate when people perceive themselves to have little control and that the stressor is something that must be endured (Folkman & Lazarus, 1980). However, in practice coping responses are much more diverse (Carver, Scheier, & Weintraub, 1989). For example, some emotion-focused responses involve avoidance or denial, others involve positive reinterpretation of events, and still others involve the seeking out of social support. These responses are very different from each other, and they may have very different implications for a person's success in coping. Similarly, problem-focused coping can potentially involve several

All correspondence concerning this article should be directed to Charles H. Van Wijk at chvanwijk@gmail.com.

distinct activities, like planning, taking direct action, seeking assistance, and sometimes even forcing oneself to wait before acting (Carver et al., 1989, p. 268). As people develop through life and are exposed to its demands, they tend to develop individual coping patterns intended to reduce the impact of stressors (Skinner & Zimmer-Gembeck, 2007).

Environmental Demands in Navy Diving and Submarine Contexts

Navy divers, in the execution of their duties, are confronted with a hostile environment (i.e., the sea), requiring the use of specialized equipment. This is associated with potential life-threatening stressors that include equipment failure, gas toxicities, very low ambient temperatures (causing hypothermia), impairment of senses under water (e.g., through low visibility or protective clothing), poor communication, isolation when working underwater, dangers of inadequate decompression, and working in enclosed spaces (Beckman, Johnson, & Lall, 1996; Van Wijk & Waters, 2001). Navy submariners are also exposed to a wide range of potential stressors (Kimhi, 2011; Suedfeld & Steel, 2000), including the sea, where adverse weather conditions may overwhelm a boat's capability to sail safely, or where structural or mechanical failure may compromise a boat's ability to reach the surface safely. Physical stressors include cramped working and living space, confinement to the pressure hull, and lack of physical exercise. Mental fatigue refers to the stress of stimulus invariance, the disruption of circadian cycles, and the constant vigilance when operational. Social stressors include the lack of privacy, very close interaction with crew members with no escape from the close interpersonal environment, constant pressure to maintain good interpersonal relations, and extended separation from families and home. These environmental demands are not unique to these naval specialists, and may also apply to people who live and work in other isolated, confined, and often artificially engineered environments, such as spacecraft, weather stations, and polar outposts (Sandal, 2000). These environmental demands, particularly in their unique combinations, may act as significant antecedents for stress, which in turn would require meaningful coping responses, appropriate to the context, to facilitate good adjustment.

Coping in the Context of Extreme Environments

Stress research generally has found that the ability to cope with prolonged stress situations depends on both personality characteristics and coping strategies (Carver & Connor-Smith, 2010; Kimhi, 2011). In the field of military psychology, more specifically, there have been sustained empirical efforts to explore "those characteristics that assist people in coping" (Borders & Kennedy, 2006, p. 333), and how coping strategies underpin operational resilience. This led to an increased emphasis on active duty personnel's

coping strategies throughout their screening, surveillance, and fitness-for-duty evaluations (Jones, Kennedy, & Hourani, 2006).

Certain dispositional personality traits associated with adaptive coping have been described among military divers, including optimism, adventurousness, confidence, independence, and an internal locus of control (Beckman et al., 1996; Biersner & LaRocco, 1983; Van Wijk, 2008; Van Wijk & Waters, 2001). Likewise, certain dispositional traits associated with adaptive coping have been described among US Navy (USN) submarine crews, including detachment, propriety, and workaholicism (Moes, Johnson, & Lall, 1996), and South African Navy (SAN) submariners, including adventurousness, confidence, group orientation, and precision (Van Wijk & Waters, 2000). Both SAN divers and submariners score high on sense of coherence scales, suggesting a positive dispositional orientation to life (Van Wijk, 2008).

The traits described above are examples of a dispositional understanding of coping. This follows a growing body of research that relates coping to personality, with specific coping styles associated with specific personality traits (cf. Watson, David, & Suls, 1999). For example, context-specific (i.e., situational) coping strategies have been reported for Israeli (Kimhi, 2011) and Norwegian (Sandal, Endresen, Vaernes, & Ursin, 2003) submariners, as well as related analog contexts (e.g., polar expeditions; Leon, McNally, & Ben-Porath, 1989). While problem-directed strategies and positive reappraisal were some of the major coping patterns reported, the relationships between personality and coping strategies within these specialist groups are not always clearly visible or understood (Sandal et al., 2003).

Measuring Coping Responses

There are many instruments in use to measure coping responses or patterns. The Brief COPE (Carver, 1997), a shortened version of the original COPE (Carver et al., 1989), was developed for use in applied settings when participant response burden is a considering factor. The questionnaire taps 14 coping dimensions. Some of these coping responses are thought to be generally adaptive (e.g., focusing efforts on finding practical solutions), while others are thought to be problematic (e.g., turning to drugs to feel better). A useful feature of the Brief COPE, given some evidence that coping is stable over time in a given stress domain (e.g., Gil, Wilson & Edens, 1997; Powers, Gallagher-Thompson, & Kraemer, 2003) and that people have habitual coping tendencies (Moos & Holahan, 2003), is that it can be administered in both situation and dispositional formats (Carver, 1997).

The Present Study

This study followed an approach of positive psychology in extreme environments (cf. Suedfeld, 2001), and administered

the Brief COPE to SAN diver and submariner volunteers during their annual occupational health screening. This allowed for a comprehensive dataset of active duty specialists working in extreme environments, comprising 93% of specialists rotating through their health screening.

This paper reports on three studies investigating coping amongst naval specialists working in high-demand ICE environments. These high-demand contexts are characterized by hostile physical surroundings (e.g., water), necessitating the use of life support systems to survive, and where human error or engineering failures can be fatal. Psychologically, such contexts require individuals to maintain, among others, good cognitive, interpersonal, and emotional adjustment. The first study described the general coping response styles of SAN divers and submariners. The second study investigated the dispositional nature of their reported coping, using a longitudinal approach. The third study explored whether the same dispositional coping profile would be visible during specific submarine missions, or whether different, i.e., situational, coping strategies would be reported on board.

Study 1

Objectives

Relatively homogenous psychological profiles have been reported for these specialists (e.g., divers: Beckman et al., 1996; Van Wijk & Waters, 2001; or submariners: Moes et al., 1996; Van Wijk & Waters, 2000), who are also exposed to the same potential stressors and environmental demands (e.g., Suedfeld & Steel, 2000). The first study thus aimed to investigate whether members of these specialist groups would then also favor similar coping response styles. Study 1 set two objectives: Objective 1 was to describe specific clusters of coping responses associated with specific groups (i.e., divers and submariners); in other words to determine whether specific styles of coping are associated with specific specialist groupings. Objective 2 was to compare reported coping styles to other relevant groups, to determine whether the coping styles might be context specific, or shared across related environments.

Method

Participants

Active duty SAN divers and submariners were invited to complete the Brief COPE during their annual occupational health screening. Volunteers gave written consent for their psychometric data to be used. Participants were included if they had completed at least 2 years of operational service—indicating adaptation in their respective ‘extreme’ environment—and had no psychiatric diagnosis during that time. The study was conducted according to the principles in the Declaration of Helsinki of 2013.

The 369 participants ranged from 21 to 55 years in age, and included both women ($N = 51$) and men ($N = 318$). The men were generally older than the women ($t = 2.978$, $p < .05$; mean difference = 3.3 years). Detailed sample composition is tabulated in the supplementary materials.

For comparison, a random sample of sailors from the general fleet was also invited to complete the Brief COPE during their annual occupational health screening. The 136 volunteers ranged from 21 to 55 years in age, and included women ($N = 39$) and men ($N = 97$). The men tended to be older than the women (mean difference = 2.6 years).

Measure

The Brief COPE scale is a 28 item self-report inventory consisting of 14 domains, designed to assess a broad range of coping responses. Response options on the four-point Likert-type scale range from 0 (*I do not do this at all*) to 3 (*I do this a lot*). Higher scores represent greater endorsement of coping strategies. As the scores are independent measures, there is no aggregate score, but rather they provide a reflection of the relative frequency of responding to each of the different coping strategies.

The 14 domains are Self-distraction, Active Coping, Denial, Substance Use, Using Emotional Support, Using Instrumental Support, Behavioral Disengagement, Venting, Positive Reframing, Planning, Humor, Acceptance, Religion, and Self-blame. Adequate retest reliability and predictive and concurrent validity have been reported (Cooper, Katona, & Livingston, 2008; Meyer, 2001). Internal consistency reports range from excellent to poor across domains, and across studies (Carver, 1997; Chamberlin, & Green, 2010; Cooper et al., 2008; Yusoff, 2010; Yusoff, Low, & Yip, 2010). Due to each scale having only two items, alpha coefficients of $\geq .50$ were regarded as minimally acceptable for further analysis (Carver, 1997; Chamberlin, & Green, 2010; Valvano & Stepleman, 2013). There are inconsistent reports on gender-based coping response selection, describing significant differences between women and men in some studies (Baumstarck, Alessandrini, Hamidou, Auquier, Leroy, & Boyer, 2017; Prati, Palestini, & Pietrantonio, 2009), and little difference in others (Hartley, Violanti, Mnatsakanova, Andrew, & Burchfiel, 2013; Olley et al., 2004). In this study the Brief COPE was used in its dispositional format (Carver, 1997), inquiring about coping choices generally, and without modifications referring to specific work or environmental contexts.

Data Analysis

The data were analyzed using statistical software (SPSS 23). Descriptive statistics are presented in tabular format. Differences of mean scale scores between divers, submariners, and general fleet personnel were analyzed using one-way ANOVA with Bonferroni *post hoc* tests, while differences

between women and men were analyzed using a t-test for independent samples. Coping response profiles were described by tabulating the frequency of endorsement or lack of endorsement of coping domains, as distributed across specialist groups. Internal consistencies for the 14 scales are reported in terms of Cronbach's alpha coefficients.

Brief COPE responses were further compared to other relevant groups, using two techniques. In cases where other studies used similar anchors for the Likert-type scale (i.e., 0 to 3; Hartley et al., 2013), t-tests for single samples were employed. Other studies used different anchors and ranges (e.g., 1 to 5; Prati et al., 2009), and the rank order of endorsement was considered for comparison.

Results and Discussion

General

No significant differences were found between women's and men's scores, and they were combined for further

analysis. The descriptive statistics for the 14 scales for divers, submariners, and general fleet personnel can be found in Table 1.1. Only one significant difference emerged between the mean scores of the divers and submariners: submariners used more Emotional Support than divers ($p < .01$). However, with the effect size very small, and the rankings of coping strategies the same, the two groups were combined for further comparison to external reference groups (Table 1.3.)

The Cronbach alpha coefficients were considerably lower than original reports (Carver, 1997) for eight scales, and included two unacceptable coefficients, with a further seven scales showing questionable internal consistency. The very low alpha for Venting may relate to a recent report pointing to possible alternative understandings of venting in a similar context (Van Wijk & Dalla Cia, 2016). Further, there are suggestions that cultures other than American or European may place less emphasis on Venting as a mechanism of emotional regulation (Roesch, Wee, & Vaughn, 2006). More research is required to better

Table 1.1. Descriptive statistics for divers and submariners, and a general fleet sample, with comparison statistics using ANOVA.

Scale (with Cronbach α for total group, $N = 505$, and then specialists, $N = 369$)	Navy divers ($N = 174$)			Submariners ($N = 195$)			General fleet ($N = 136$)			F^a	p	η^2
	R	M	SD	R	M	SD	R	M	SD			
Self-Distraction ($\alpha = .50$; $\alpha = .51$)	8	2.97	1.5	8	3.05	1.8	8	3.15	1.6	.457	.63	<.01
Active Coping ($\alpha = .50$; $\alpha = .52$)	1	4.86	1.3	1	5.01	1.3	1	4.85	1.3	.797	.45	<.01
Denial ($\alpha = .57$; $\alpha = .59$)	11	1.06	1.3	11	0.84	1.2	11	0.93	1.3	1.498	.23	<.01
Substances ($\alpha = .65$; $\alpha = .65$)	14	0.14	0.4	14	0.08	0.4	14	0.21	0.7	2.743	.07	.01
Use Emotional Support ($\alpha = .70$; $\alpha = .71$)	7	3.22	1.6	7	3.72	1.7	7	3.69	1.6	5.217	<.01**	.02
Use Instrumental Support ($\alpha = .80$; $\alpha = .83$)	5	4.00	1.7	5	4.19	1.7	6	4.15	1.5	.670	.51	<.01
Behavioral Disengagement ($\alpha = .56$; $\alpha = .44$)	13	0.45	0.9	13	0.24	0.7	13	0.61	1.2	6.489	<.01**	.03
Venting ($\alpha = .29$; $\alpha = .42$)	10	2.01	1.4	10	1.96	1.3	10	2.11	1.6	.441	.64	<.01
Positive Reframing ($\alpha = .57$; $\alpha = .60$)	3	4.22	1.4	3	4.38	1.5	4	4.24	1.4	.688	.50	<.01
Planning ($\alpha = .60$; $\alpha = .59$)	2	4.73	1.3	2	4.98	1.3	2	4.76	1.4	2.038	.13	<.01
Humor ($\alpha = .78$; $\alpha = .79$)	9	2.59	1.7	9	2.62	1.8	9	2.47	1.7	.248	.75	<.01
Acceptance ($\alpha = .49$; $\alpha = .45$)	3	4.22	1.4	4	4.35	1.4	3	4.33	1.5	.400	.67	<.01
Religion ($\alpha = .78$; $\alpha = .78$)	6	3.75	1.8	6	4.06	1.9	4	4.24	1.8	2.796	.06	.01
Self-Blame ($\alpha = .56$; $\alpha = .54$)	12	0.70	0.8	12	0.53	0.7	12	0.80	1.1	4.083	.02*	0.2

Note. R = rank; M = mean; SD = standard deviation

^a $df = 2,502$

* $p < .05$,

** $p < .01$.

understand the use of venting as a coping strategy in ICE environments, and with due consideration of such specialists' cultural background.

Coping Style Profiles for Navy Divers and Submariners

The coping responses profile of SAN divers and submariners can be found in Table 1.2, which presents the coping domains most often and least often endorsed, according to specialty.

The main cluster of Active Coping and Planning was prominent across specialties. In the same way, the cluster of Substance Use, Behavioral Disengagement, Self-blame, and Denial was largely absent across both specialties. The main cluster was complemented by somewhat more nuanced specialty-specific coping domains. Divers also reported Using Instrumental Support and Acceptance as preferred coping responses, while submariners reported also using Positive Reframing and Religion as preferred coping responses.

The main coping cluster, consistently reported across all groups, seems contextually appropriate in the very practical world of diving and submarine operations. USN divers have been described with a personality that "tends to shape their environment to suit their needs" (Beckman et al., 1996, p. 718), which would find an outlet in Active Coping as a way to deal with the challenges of their environment. They have also been described as analytical (Beckman et al., 1996), well suited to use Planning as a preferred coping style. They are not alone in this regard, as Norwegian submariners and polar expeditioners also use problem-directed strategies to cope (Leon et al., 1989; Sandal et al., 2003).

Military divers and submariners previously reported a strong internal locus of control (Biersner & LaRocco, 1983; Van Wijk, 2008), indicating a belief in their own ability to affect outcomes. Their use of Active Coping appears to be a practical reflection of such beliefs. Further, their internality may also contribute to explaining their low endorsement of Behavioral Disengagement. High confidence and good

self-esteem have previously been reported in these groups (Van Wijk & Waters, 2000, 2001), which may contribute to understanding the low endorsement of Self-blame. The low use of Denial could be linked to the practical world, and the anecdotally practical stance of divers, in that they need to see the world as it is in order to actively cope through problem-solving.

The low use of Substances as a coping style might need to be understood contextually, rather than dispositionally. Navy divers and submariners are subject to regular medical monitoring, associated with early identification and referral of problematic substance use, thus allowing for interventions to develop alternative coping skills. Further, divers and submariners are generally aware of the potential adverse effects of substance use in safety-critical tasks, and peer norms may regulate the extent to which substance use would be tolerated in the diving teams or submarine crews. Worldwide, the use of substances that may have deleterious effects on the health of military personnel remains a highly complex and situational phenomenon (Kennedy, Jones, & Grayson, 2006).

Apart from the main coping cluster, further complementary coping styles were associated with specific groups. Divers use Acceptance, which may be particularly suitable to the potentially short-term nature of diving stressors—military diving operations are generally of shorter durations. Submariners use Positive Reframing. Submarine operations are generally of longer duration, and practical measures of coping with chronic stressors may not always be sufficient, thus facilitating the use of emotional-focused 'cognitive' measures to cope. Similar use of positive reappraisal coping patterns was reported among polar expeditioners (Leon et al., 1989).

Coping Profile Discrimination

While the coping styles of these naval specialists appear contextually appropriate, it is not clear whether they would differ from any other group working in high-demand contexts. In comparison with the sample comprising general

Table 1.2.
Brief COPE responses by frequency of domain indicators.

	Four domains most used ^a		Four domains least used ^a	
	Coping domain	Used this "a lot"	Coping domain	Used this "not at all"
Divers <i>N</i> = 174	Active Coping	70%	Substances	90%
	Planning	61%	Behavioral Disengagement	74%
	Acceptance	41%	Self-Blame	51%
	Use Instrumental Support	41%	Denial	50%
Submariners <i>N</i> = 195	Active Coping	75%	Substances	94%
	Planning	70%	Behavioral Disengagement	89%
	Positive Reframing	52%	Self-Blame	59%
	Religion	47%	Denial	58%

^aonly included if more than 35% endorsement.

fleet personnel, the two specialty groups differed significantly on three scales. Divers used less Emotional Support ($p < .05$) and submariners used less Behavioral Disengagement ($p < .01$) and Self-blame ($p < .05$) than general fleet personnel. The rank order of endorsed styles was largely consistent across all the groups (Table 1.1).

When compared to police officers (without military background; Hartley et al., 2013), significant differences emerged on 12 scales (Table 1.3). SAN specialists make more use of Active Coping, Instrumental Support, Positive Reframing, Planning, Acceptance, and Religion, and relied less on Substance Use, Behavioral Disengagement, Venting, Humor, and Self-blame than police officers. The large effect sizes for the comparative non-endorsement of Substance Use and Self-blame among the naval specialties were noteworthy.

However, in spite of the differences in mean scores, three of the top four ranked coping strategies were similar (Active Coping, Planning, Acceptance), while the SAN specialists endorsed the use of Positive Reframing more often, and the use of Emotional Support less often, than the police officers. The four lowest ranked coping strategies were also the same, although in a somewhat different order.

When ranking the frequency of endorsement of coping strategies, the SAN specialists again shared three of the top four ranked coping strategies with a sample of 1200 Italian emergency workers (Prati et al., 2009), as well as all four of the lowest ranked coping strategies, although again in a different order.

Thus, naval specialists have 'unique' coping style profiles more in terms of degree, rather than direction. The endorsement of coping preferences appears similar across many high-demand occupations, with groups sharing rank-

order profiles. The current study sample reported using some responses more often, and others less often, than reference groups, and in this case the coping style profiles appeared contextually appropriate.

Neither gender nor job description were identified as significant explanatory variables in predicting individuals' coping styles. All the profiles discussed here came from highly specialized occupational environments, and it could be hypothesized that the overarching nature of these high-demand environmental contexts, possibly combined with self-selected personality profiles often found in specific environments (Holland, 1997), may exert greater influence on primary and secondary appraisal, and subsequently on coping response selection, than pre-defined personal categories, such as gender or individual job descriptions.

In conclusion, divers and submariners appear to generally favor similar coping response styles, with some context appropriate nuances in their reports. Further, they share much of their profiles with other high-demand occupational settings.

Study 2

Objective

The relatively homogenous psychological profiles reported for these specialists, as well as previous reports of habitual coping (Gil et al., 1997; Moos & Holahan, 2003; Powers et al., 2003), raise the question whether SAN specialists' coping responses would be stable across time. Study 2 thus aimed to investigate the dispositional nature of coping responses among these specialists, by examining the temporal stability of endorsement of coping response styles over an extended period.

Table 1.3.
Comparison statistics for SAN specialists and referent group, using a single sample t-test.

Scale	SAN specialists (<i>N</i> = 369)			Police officers (<i>N</i> = 303) ^a		<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	Rank	Mean	SD	Rank	Mean			
Self-Distraction	8	3.01	1.7	8	3.09	-.945	.35	0.07
Active Coping	1	4.93	1.3	1	4.41	7.766	>.001**	0.56
Denial	11	0.94	1.3	13	0.78	2.492	.02*	0.02
Substances	14	0.11	0.4	12	0.93	-39.87	>.001**	2.81
Use Emotional Support	7	3.49	1.7	4	3.54	-.633	.53	0.04
Use Instrumental Support	5	4.10	1.7	5	3.35	8.668	>.001**	0.62
Behavioral Disengagement	13	0.34	0.8	14	0.60	-6.057	>.001**	0.46
Venting	10	1.98	1.3	9	2.68	-9.928	>.001**	0.76
Positive Reframing	3	4.30	1.5	6	3.33	12.895	>.001**	0.91
Planning	2	4.86	1.3	2	4.18	10.274	>.001**	0.74
Humor	9	2.60	1.8	7	3.16	-6.014	>.001**	0.44
Acceptance	4	4.29	1.4	3	3.99	4.137	>.001**	0.30
Religion	6	3.92	1.9	10	2.67	12.892	>.001**	0.93
Self-Blame	12	0.61	0.8	11	2.20	-38.99	>.001**	2.79

^afrom Hartley et al., 2013, Table 3

* $p < .05$,

** $p < .001$.

Method

From the sample used in Study 1, some 237 participants also completed a repeat Brief COPE, with a mean administration interval of 22.5 ± 2.8 months, range 14 to 32 months. This was a convenience sample, recruited from the active duty specialists rotating through their annual health screening. All gave written consent for their psychometric data to be used. The dispositional nature of coping responses was examined using t-tests for paired samples to compare the responses of the first and second administrations.

Results and Discussion

The reported coping responses were remarkably stable over the period of almost 2 years (Table 2.1). Participants did not report a significant change in coping response endorsements between administrations on 13 of the 14 scales. This finding was not unexpected, as the study used the Brief COPE in its dispositional format, and it supports previous reports of the habitual nature of coping (Moos & Holahan, 2003). The high correlation between administrations may further suggest that specific coping profiles may be particularly adaptive for regulating the environmental demand ↔ personal resource appraisals in specific ICE environments. Thus, when these specialists develop response styles that are perceived to facilitate adaptation in their specific environments, they maintain that response set over time. In conclusion, it appears that coping response preferences of navy divers and submariners, as measured by the Brief COPE, are stable over a considerable time period.

Study 3

Objectives

Studies 1 and 2 described how SAN submariners generally cope with life, and the dispositional nature of their

Table 2.1.
Repeat administration paired sample correlations and differences ($N = 237$).

	Paired samples		Paired differences	
	Correlation	<i>p</i>	<i>t</i>	<i>p</i>
Self-Distraction	.450	.000	-1.604	.11
Active Coping	.351	.000	-.532	.60
Denial	.465	.000	.052	.96
Substances	.100	.126	-.652	.52
Use Emotional Support	.455	.000	-2.197	.06
Use Instrumental Support	.532	.000	-3.300	<.01*
Behavioral Disengagement	.302	.000	-.379	.71
Venting	.370	.000	-.696	.49
Positive Reframing	.382	.000	-2.142	.06
Planning	.475	.000	.000	1.00
Humor	.615	.000	-1.962	.06
Acceptance	.292	.000	-1.742	.08
Religion	.703	.000	-.963	.34
Self-Blame	.256	.000	-1.023	.31

* $p < .01$.

coping strategies. This posed the question whether the same profile will be visible during specific submarine missions, or whether different—situational—coping strategies would be reported on board. Study 3 thus aimed to investigate coping during a fixed-time, operational, submarine mission. It set two objectives: Objective 1 was to describe reported coping responses during deployment, and compare that to the general coping profiles described in Study 1. Objective 2 was to investigate whether choice of coping responses would show temporal change over the course of a deployment, i.e., whether individual styles of coping would be responsive to time effects while on patrol.

Method

Participants and Context

A sample of submariners completed a modified Brief COPE every fourth day during a 23 day operational patrol, and their data were analyzed on their return to base. The patrol was spent either at periscope depth or fully submerged. The 4-day interval was chosen to align with operational scheduling. As with the previous studies, this was conducted according to the principles in the Declaration of Helsinki of 2013, as well as with prior permission from both Naval and Military Health Service commands.

All crew members on board were invited, of whom 30 (73%) participated in the study. The sample comprised seven women and 23 men, with a mean age of $33.6 (\pm 6.7)$; median = 31, range 25–50). Some of these participants may also have been part of the sample in Study 1.

Measure

The Brief COPE (Carver, 1997) was modified for this study by excluding two domains considered inappropriate within the context of the submarine mission (namely Substance Use and Self-blame). This resulted in a 24-item scale, presented in its situational format, with instructions referring to “over the past 4 days.” The scale was completed every fourth day, resulting in data for five time points. A sixth administration was scheduled, but due to changes in the mission schedule, was not completed.

Data Analysis

The reported use of coping strategies is described by tabulating the mean scores and ranking the frequency of endorsement across the five time points. Temporal changes were investigated through a repeated measures ANOVA, and presented in tabular as well as graphical formats.

Results and Discussion

Coping Style Profiles During Submarine Mission

The ranking profile of endorsement of coping strategies can be found in Table 3.1. The predominant profile of

Table 3.1.
Rank order of coping strategies across the five time points.

Mean scores	Time points				
	1	2	3	4	5
>2.5	Acceptance Positive Reframing	Acceptance Positive Reframing			
>2.0	Religion Humor		Acceptance Active Coping		Religion
>1.5	Self-Distracton Active Coping Planning	Self-Distracton Active Coping Humor Religion Planning	Self-Distracton Positive Reframing Religion	Acceptance Religion Self-Distracton Humor Positive Reframing	Humor Acceptance Self-Distracton Active Coping Positive Reframing
>1.0	Use Emotional Support Use Instrument Support	Use Emotional Support Use Instrument Support	Planning Humor Use Emotional Support Use Instrument Support	Active Coping Planning Use Emotional Support	Planning Use Instrument Support Use Emotional Support
<1.0	Venting Denial Behavioral Disengagement	Venting Behavioral Disengagement Denial	Venting Behavioral Disengagement Denial	Use Instrument Support Venting Behavioral Disengagement Denial	Venting Denial Behavioral Disengagement

coping strategies across the duration of the mission was reliance on Acceptance, Positive Reframing, Religion, Humor, Self-distraction, and Active Coping, and little use of Denial, Behavioral Disengagement, and Venting. The rank order of most often endorsed coping strategies remained generally the same across time points, even though the degree of endorsement varied.

Five of the top six strategies reported (Active Coping, Positive Reframing, Humor, Acceptance, Religion) were similar to those reported in Study 1 as used generally in life, and thus indicative of the dispositional nature of coping among this sample. Self-distraction was more prominent during the deployment, and may indicate situational coping in this context. Submariners may have enough to keep them stimulated in life when ashore, but when deployed may need to find ways of occupying themselves during missions.

In terms of the most often reported strategies, Self-distraction and Religion appeared to rise in ranking towards the latter part of the mission, which may indicate a greater reliance on strategies suggestive of withdrawal into private coping. However, this remains hypothetical, as the data do not allow for the analyses required for firm conclusions. In general, inward or emotion-focused coping (Acceptance, Religion, Positive Reframing) were more often endorsed than problem-focused coping (Active Coping), which may be a reflection of the situation on board submerged submarines, and suggests that coping responses, though mainly dispositional for this sample, are also responsive to the changes in environment, with situational coping strategies employed specifically (and possibly only) during actual missions.

Table 3.2.
Change in mean scores across five time points using repeated measures ANOVA.

Domain	F	p	Partial η^2
Self-Distracton	.554	.63	.03
Active Coping	.542	.65	.03
Denial	1.785	.13	.09
Use Emotional Support	.379	.79	.02
Use Instrumental Support	.200	.85	.01
Behavioral Disengagement	.977	.39	.05
Venting	.235	.81	.01
Positive Reframing	3.781	.02*	.17
Planning	.899	.44	.05
Humor	.700	.56	.04
Acceptance	6.231	<.01**	.26
Religion	.655	.58	.04

*p < .05,
**p < .01.

The three least often endorsed strategies (Behavioral Disengagement, Denial, Venting) were consistently least reported across time points, and were also consistent with results from Study 1, again indicative of the dispositional nature of coping among this sample.

Temporal Changes in Reported Coping

The degree of endorsement of coping strategies remained generally consistent across the duration of the mission, with only two strategies varying significantly over time. Table 3.2 presents the results of a repeated measures ANOVA, while

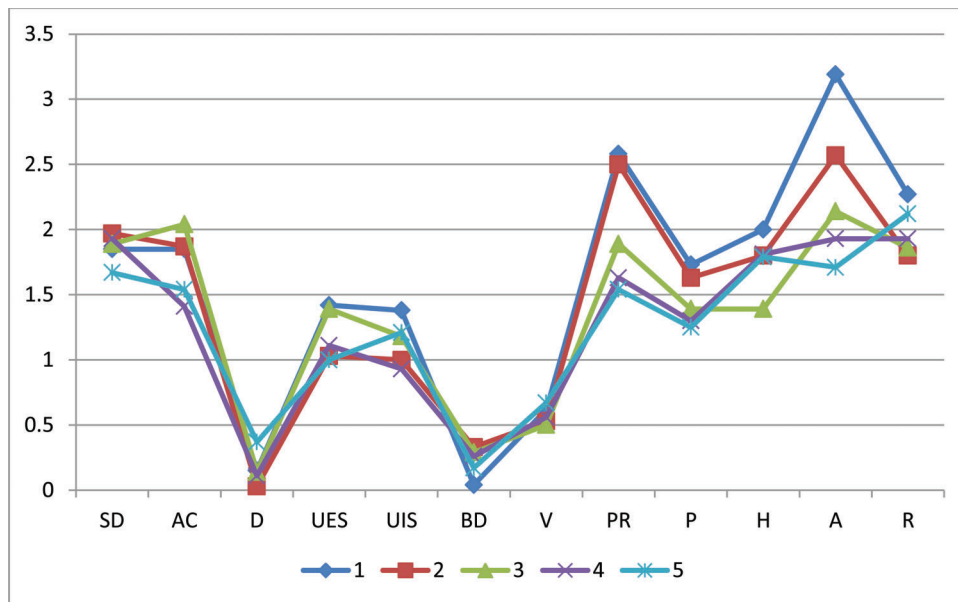


Figure 3.1. Mean scores per coping domain across five time points.

Figure 3.1 provides a visual representation of mean scores. The means and standard deviations of the 12 coping strategies across the five time points are tabulated in the supplementary materials.

Although Positive Reframing and Acceptance each displayed a linear downward progression (i.e., lesser endorsement over time), both were at their lowest levels still among the most endorsed strategies (Table 3.1).

In conclusion, the rank profiles of endorsement of coping strategies were fairly consistent, and similar to the dispositional profile reported in Study 1. In the framework of the dispositional nature of coping, submariners report their strategies for submarine missions as they do for general life. The exception seems to be Self-distraction which was endorsed during the mission only, and which can thus be considered a situational coping strategy for this sample. Submariners therefore appear to rely on similar coping strategies no matter their circumstances in life, while also drawing on appropriate situational strategies when required. Thus, while they rely on dispositional coping styles, they also seem responsive to changing environments.

In a similar manner, their coping styles appeared stable across the duration of the mission. The slight changes in rank order, and degree of endorsement of strategies, appeared contextually appropriate, and may again indicate responsiveness to situational changes over time. The results need to be interpreted with caution though, as it was a small study using only one mission.

General Discussion

The divers and submariner samples reported fairly homogenous Brief COPE profiles, suggesting that groups with relatively homogenous psychological profiles and

exposed to the same environmental demands would favor similar coping response styles. The two groups largely shared the same coping profile (and also with other occupations in high demand settings), but with specialty-specific nuances reported. In the case of each specialty, the specific coping response styles appeared contextually appropriate; and also often appeared related to prominent personality factors described for those groups.

All participants had at least 2 years' operational service, which would also require a commander's recommendation for continuing service, and were volunteer-only, which together would suggest good adjustment in their respective ICE work environments. Given their assumed good adjustment, their profiles could be considered indicative of adaptive coping styles in that context.

Their high-demand contexts necessitate a strong reliance on technological life-support systems, and their use of the problem-focused coping cluster of Active Coping and Planning seemed well suited to this. Similarly, their non-use of the coping cluster of Substance Use, Behavioral Disengagement, Denial, and Self-blame seems appropriate, as each could undermine their ability to survive in a hostile physical environment, by directing focus away from actively managing the demands of the environment. It was noteworthy that the use of both problem- and emotion-focused strategies were reported, demonstrating that both approaches have a role to play in facilitating good coping in these ICE environments.

Additional to the study sample being considered good copers in their respective environments, they can also be considered dispositional copers. The sample showed a remarkable temporal stability in the reporting of coping response styles, which supports previous reports of habitual coping (Moos & Holahan, 2003).

Dispositional coping appeared to be a good indicator of mission specific coping, with additional situation-specific coping strategies reported. The combined coping response styles appeared contextually appropriate to the environmental demands. It was noteworthy that while the reported coping profile held stable, the degree of coping response endorsements fluctuated during the submarine mission. This opens new questions for further investigation.

Limitations

The Brief COPE, by nature of its brevity, does not capture the full spectrum of coping responses. It is therefore plausible that the sample used coping strategies not tapped by this scale. Future research could incorporate more comprehensive ways to measure coping in specific contexts. The administration of the Brief COPE occurred during the annual health screening, which may have introduced a bias for positive reporting, additional to any response bias (whether self-deception, or social conformity, etc.) of self-report measures generally (Valvano & Stepleman, 2013). Habitual responses (rather than actual behaviors) during repeated administrations, as well as the risk of participants memorizing patterns to save time and effort, may have been a confounding influence in the stability of reporting. Future studies could use alternative versions (e.g., same items randomized in different orders) to counter this.

Lastly, good coping was implied through participants' successful operational experience, but not objectively measured. Future studies could benefit by correlating objectively measured coping with specific strategies reported.

Future Directions

The data presented here do not address the debate of whether individuals with specific coping styles (e.g., active coping and planning) are attracted to this context, adapt well because of their pre-existing coping skill set, and remain in this environment because they appear suited for it, or whether they develop those skills in response to the demands of the context, and remain there because they have now managed to develop the coping skill set that would allow continuing good adjustment. While that debate falls outside the scope of this data-analysis, it remains an interesting avenue for future research.

Two further directions for investigation seem productive. Firstly, investigating the association between personality and coping, possibly through the association of psychometric measures of personality with coping scales. This may elucidate the relationship between different dispositional constructs, like personality and coping, in the adjustment to extreme environments, which in turn may allow opportunities for the prediction of adjustment and subsequent preparation of specialists for missions in ICE environments.

Secondly, it may be worth examining whether changes in degree of coping response endorsement across specific mission time frames are associated with any specific time period during mission (irrespective of actual length) like the so-called third quarter phenomenon (Sandal, 2000), or whether other factors (e.g., actual duration of mission) influence this. This may reveal possibilities for optimizing coping through either realistic preparation or other mission-specific interventions.

In conclusion, navy divers and submariners reported specific and dispositional coping profiles, which appear contextually appropriate. Practically, these findings could be used to assist divers and submariners to develop optimal coping strategies suited to their environments.

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