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Abstract

Title of Dissertation: A Cognitive Behavioral Intervention for Seasickness

LT Margaret A. Koselka, Ph.D., 2000

Thesis directed by: Norman B. Schmidt, Ph.D., and Wendy A. Law, Ph.D.; faculty in the Department of Medical and Clinical Psychology and Jerome E. Singer, Ph.D; Department Chair (retired) Medical and Clinical Psychology.

The principal aim of this study was to assess the effectiveness of a cognitive behavioral intervention for seasickness. Specifically, this study examined the effect of an intervention that was designed to increase self-efficacy and self-control beliefs in trainees preparing for sea duty. Literature review indicated that successful psychological interventions for motion sickness generally include a cognitive component aimed at increasing subjects' confidence in dealing with motion sickness. In studies of seasickness, cognitive manipulations that increase self-efficacy beliefs and self-control initiative have been successful.

This study examined the effect of a cognitive intervention in reducing symptoms of seasickness in 247 US Naval Academy midshipmen taking part in summer sea training (14 day sea cruise). Participants were grouped by squadron and randomly assigned to intervention and control conditions. The principle hypothesis of the study was that the cognitive intervention group would experience fewer symptoms of seasickness compared to the control group. Self-efficacy, self-control and state anxiety were expected to mediate outcomes from the intervention. Trait anxiety, body vigilance, anxiety sensitivity and history of motion sickness were assessed as possible predictors of seasickness occurrence (independent of intervention effects). Outcome was measured in terms of symptom frequency and intensity, and performance ratings made by supervisors.

Results of the study were mixed. When evaluated by retrospective reports of seasickness symptoms the hypothesis that the intervention would decrease seasickness was not supported. Specifically, the intervention group reported significantly more symptoms of seasickness as compared to the control group. This outcome is believed to be an artifact of the naturalistic variables in this study (i.e. because of different port schedules the intervention group was exposed to a storm at sea and the control group was not). In order to control for the day of the storm, daily seasickness ratings for subjects (N = 56) that completed the daily checklists were averaged without data from the day of the storm. Examination of the daily average seasickness readings evidenced support for the primary study hypothesis; the average daily seasickness ratings for the intervention group were significantly less than for the control group.

A COGNITIVE BEHAVIORAL INTERVENTION FOR SEASICKNESS

By

LT MARGARET A. KOSELKA, MS

Dissertation submitted to the faculty of the Department of medical and Clinical Psychology of the Uniformed Services University of the Health Sciences in partial fulfillment of the requirements for the degree of Doctor of Philosophy 2000

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I would like to acknowledge the United States Naval Academy for their cooperation with this study. The permission of the Unites States Naval Academy allowed this study to be conducted in a naturalistic setting with a larger sample than otherwise may have been possible. Not only did the Naval Academy offer a study environment, the navigation officers and the psychologists on staff, particularly CAPT Elizabeth Holmes, supported the project and helped to organize my participation in their summer yard patrol craft training program.

Special thanks and acknowledgment also to Dr. Dov Eden, who translated questionnaires from Hebrew and offered me clarification on his study of a cognitive behavioral intervention for seasickness applied in the Israeli Navy.

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A Cognitive Behavioral Intervention for Seasickness

The experience of seasickness is unavoidable for almost anyone who has ever spent time traveling over water (Reason & Brand, 1975). While most people are able to adapt to sea travel after continued exposure over time, the adaptation period can be quite aversive. Further, 5% of individuals exhibit a complete failure to adapt to this atypical motion environment (Reason & Brand, 1975). Currently, pharmacological interventions are the treatment of choice for seasickness. However, especially in situations where the individuals must carry out sensitive work at sea. medications can present numerous additional problems, including work-impairing side effects. Treatment studies in laboratory settings suggest that cognitive behavioral approaches to interventions for seasickness may be complementary to, if not as efficacious as, medication. Although much of this work remains to be tested in a naturalistic setting, preliminary work suggests that applied use of psychosocial treatment techniques can be efficacious for motion sickness (Eden & Zuk, 1995). Including cognitive behavioral interventions with medication may decrease the amount of medication that needs to be taken, in turn decreasing the impact that side-effects of medication may have on function.

Symptomatology

Seasickness is a type of motion sickness that occurs as a result of ship motion. This discriminates seasickness from the general category of motion sickness which refers to nausea and vomiting following exposure to any form of movement. The primary symptoms of seasickness are nausea, vomiting. pallor and cold sweats. Other common symptoms include sighing, yawning, hyperventilation, flatulence, weight loss, headache. and drowsiness. Seasickness is also accompanied by characteristic psychological

symptoms. Studies done during the first and second World War describe a "psychic depression" that occurs with seasickness (Rolnick & Gordon, 1991). Other early studies suggest that mild depression and lack of motivation comprise a "sub-clinical phase" of motion sickness (Wendt, 1944). Apathy, inability to concentrate, lack of motivation, fatigue and decrements in performance are other common psychological sequelae of seasickness (Rolnick & Gordon, 1991).

Prevalence

Seasickness is a common problem. Ninety percent of the general population report having experienced seasickness at some point in their lives (Reason & Brand, 1975). Prevalence of seasickness varies with type of craft and type of sea. Eleven percent of personnel on amphibious (land-to-water) craft reported seasickness during mild swells, whereas on rough seas, 60% of personnel reported seasickness. On small boats and military transports, the rates were slightly higher with 15-70% of personnel reporting seasickness, depending on the type of sea.. Finally, in a survey of 2000 sailors in the British Navy, 70% reported experiencing symptoms of seasickness, especially on smaller craft (Rolnick & Gordon, 1991). These rates also vary in relation to rank and prior experience with sea duty, with the more experienced, higher-ranked personnel reportingng the least seasickness (Gal, 1975). Personnel in training, either in aviation or at sea, seem to experience the most difficulties adapting to motion. While adaptation to stimuli causing seasickness occurs over time, more than 50% of sailors reported continued symptoms, even after one year of essentially continuous sea duty (Rolnick & Gordon, 1991).

Not only is the common occurrence of seasickness a subjectively distressing experience, seasickness can also adversely affect performance. Eighty percent of sailors in the British Navy reported that they had difficulty completing work when they were seasick (Pingree, 1989). Studies done in the Israeli Navy found that 20% of sailors were unable to do their job, and another 45% were able to perform some functions, but not at a satisfactory level (Rolnick & Gordon, 1991).

Etiology of Seasickness

Literature on the etiology of seasickness and motion sickness focuses largely on general underlying physiological mechanisms.

Early Physiological theories

The frequency and severity of emetic symptoms (nausea and vomiting) that characterize seasickness suggest some involvement of the visceral gastrointestinal (GI) system. Various early theorists proposed that sea-wave action on the intestines resulted in the nausea and other symptoms associated with seasickness (Reason & Brand, 1975). Descriptive studies on the role of the viscera in seasickness indicated that 50% of individuals suffering from chronic seasickness evidenced unspecified abnormalities of the GI tract (Schwab, 1943). One nineteenth century theory posited that seasickness was the result of "hyperanemia", which at the time was defined as a high concentration of blood in the brain and spinal cord; a condition which purportedly resulted in the unstable conditions of CNS cells. This instability then resulted in dysfunction in the CNS, which produced the symptoms of seasickness (Whitham, 1887). While such creative physiological theories were prevalent before the turn of the century, pivotal articles were beginning to posit the influence of the vestibular system on seasickness. During the

twentieth century, with the aid of growing technology, research on the etiology of seasickness centered on the mechanics of the vestibular system and types of stimuli that result in motion sickness (Reason & Brand, 1975).

The Vestibular System

The vestibular system (also referred to as the labyrinthine system) is located in the inner ear and includes three semicircular canals, the utricle and the saccule. The three semicircular canals lie at approximately right angles to one another and are filled with a fluid called endolymph. The endolymph is very thick, and when the head experiences angular acceleration, the semi-circular canals move around the fluid (Guyton & Hall, 1996). This causes the fluid to deflect the cupula, a membrane in the inner ear, which when stimulated sends information to the vestibular receptors in the brain. Thus, the semicircular canals act as angular speedometers and indicate rotational movement (Reason & Brand, 1975).

The utricle and saccule contain the otolithic receptors (otoconia). These receptors are multidirectional and useful in determining linear acceleration. Little is known about the saccular otoliths (statoconia), however the physiology of the utricle otoliths is much more explicit. The utricle contains the macula, which is the base and receptor portion of the sensory structure. The macula consists of the otolith, a gelatinous substance covered with dense crystals (otoconia or statoconia), which is supported by strands of hair cells connected to sensory cells at the base of the macula. During movement, the weight of the crystalline otoliths shifts, which causes the strands extending up from the macula to move, and ultimately results in the sensory cells transmitting signals to the brain. The otoliths provide information on linear acceleration as well as information on the

orientation of the head with respect to gravity and tilt of the body (Reason & Brand, 1975).

The susceptibility for motion sickness appears to vary with age, being less in the very young and very old, and peaking in the 20s and 30s. This effect may be accounted for in part by changes in the otoconia. The otoconia are not fully developed in infacy, and some studies suggest that as individuals age, the crystalline otoconia phosphatize and the calcite in their structure is transformed via phosphorylation (Anniko, 1988). This change in the chemical make-up of the structure of the otoconia may result in a decreased sensitivity to adverse effects of over-stimulation of the vestibular system by motion.

Empirical support for the vestibular theory comes from numerous human and animal studies. Studies on animals whose labyrinthine systems have been surgically removed or destroyed illustrate that the destruction of the labyrinths confer immunity to motion sickness (Johnson & Taylor, 1961; Money & Friedburg, 1964). Conversely, these results suggested that the presence of the labyrinthine system was important to experience motion sickness. Furthermore, studies on humans indicated that people without labyrinthine systems do not experience motion sickness when exposed to provocative situations (i.e. motion simulators) (Graybiel, 1965). Based upon this empirical support, motion sickness would most likely occur due to unnatural or over stimulation of the labyrinth (Reason & Brand, 1975).

Despite the strong evidence for a causal role of the vestibular system in motion sickness, over time weaknesses in the explanatory power of models implicating inner ear structures have appeared. For example, visually-induced motion sickness (such as that occurring in flight simulators) cannot be explained by the otolithic theory because motion

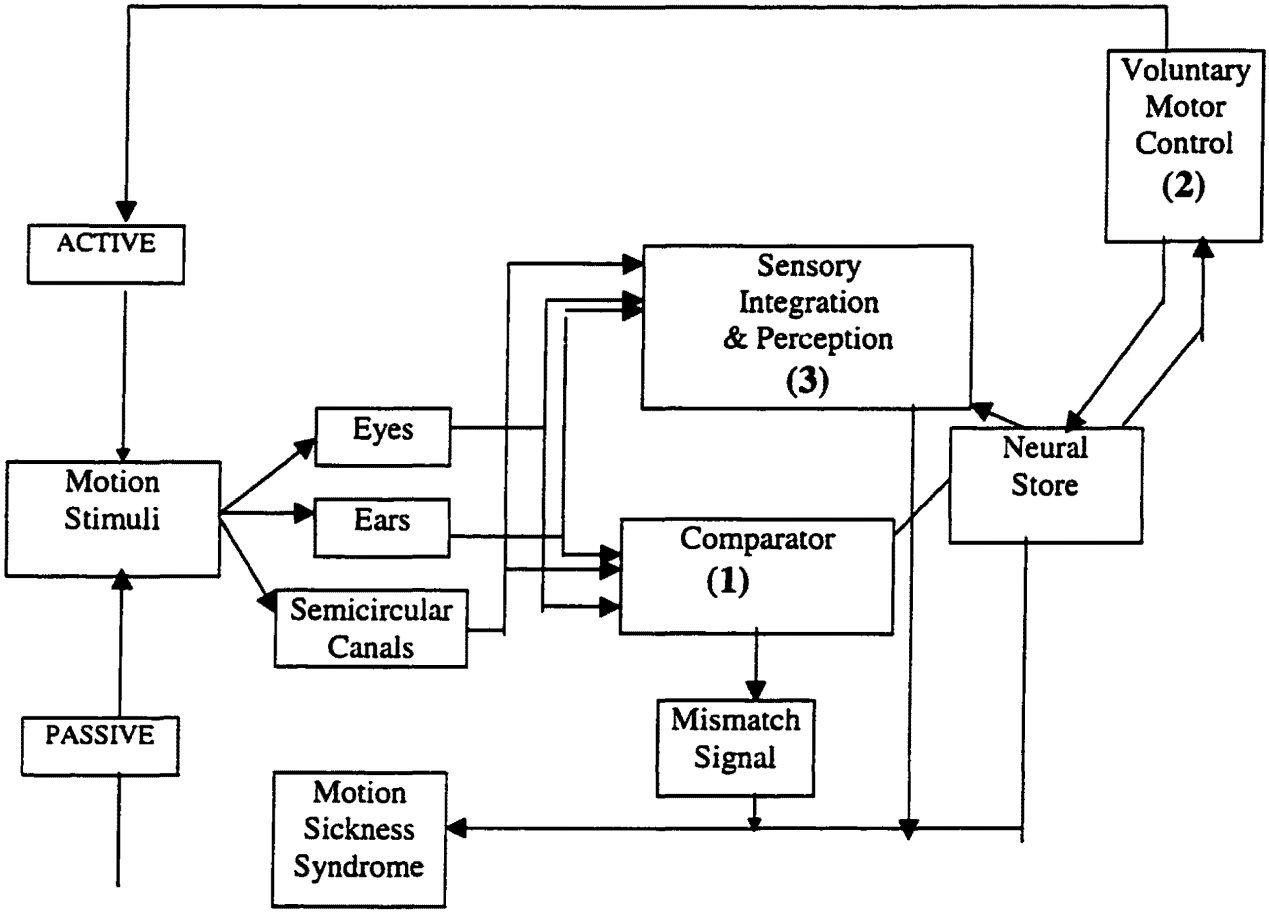
is not present to stimulate the inner ear. Acceleration in the Coriolis chair, an apparatus commonly used in studies of motion sickness, should produce the same otolithic response as tilting one's head; however, the motion sickness symptoms elicited are usually more profound. Finally, the role of otolithic receptors does not explain the occurrence of motion sickness in zero-gravity environments, surgical interference of the vestibular system, or adaptive aftereffects (i.e. "mal de debarquement", when a person feels motion sickness upon returning to land after long exposure to the sea) (Reason & Brand, 1975).

Sensory Conflict Theory and the Neural Mismatch Hypothesis

As studies indicated that one sensory system was incapable of explaining all occurrences of motion sickness, theories involving multiple systems and integrated mechanisms were developed. The sensory conflict theory suggests that motion sickness is due to sensory information from one set of receptors being incompatible with sensory information arriving from other inputs (Reason & Brand. 1975). This theory later evolved into the neural mismatch hypothesis which uses information processing theories to explain the response to sensory discordance resulting from atypical motion environments (Reason,1977). This model (see Figure 1. Reason, 1977) involves the sensory organs as well as hypothesized functions in the central nervous system (CNS). These CNS functions include: **(1)** a comparator unit that matches current sensory input with past stored sensory traces, **(2)** a voluntary motor control unit that initiates movement; and **(3)** a sensory integration and perception unit that combines input information and originates perceptions that relate to the matching task carried out by the comparator. In a motion environment, information from the eyes and ears is relayed to the comparator unit to compare new input with past experiences.

Figure 1

Principal Components of the Neural Mismatch Model of Adaptation



Taken from: J.T. Reason (1977). Learning to Cope With Atypical Force Environments. In M. Hove (ed.) Adult Learning: Psychological Research and its Applications. Wiley: London.

The valence of mismatch between the new information and stored information can be influenced by three things (Reason, 1977), (1) how discrepant the information is from each sensory unit alone, (2) the number of sensory units total that are sending discrepant information, and (3) strength of the sensory combination memory from the neural store (based upon repeated exposure). The degree of dissonance between new information and information stored based on past experience will determine the level of mismatch (Pingree, 1989). A large mismatch results in autonomic arousal and the corresponding symptoms of seasickness.

Studies positing the mechanism of the stimulus conflict model emerged in the late 1800s (Stratton, 1897). With the growth of technology and increasing use of motion simulators in the study of motion, researchers have been able to examine the effects of altering sensory input to one system (e.g. the visual system) without altering input to another (e.g. the vestibular system) (Smith & Smith, 1962; Kottonhoff & Lindhal, 1960; Guedry, 1964). For example, subjects may be instructed to wear glasses that invert the retinal image, and then they are asked to report on motion sickness-like symptoms (Kottonhoff & Lindhal, 1960). In another study, subjects' vestibular proprioceptors (sensory receptors) were influenced by the motion of a rotating room, while their visual input remained unaffected (Guedry, 1964). In both these examples, symptoms of motion sickness were reported, supporting the neural mismatch model. Reason and Brand (1975) provide a comprehensive review of many studies examining this model, and the general conclusion is that when information on position and motion conflict, usually with the involvement of the vestibular system, motion sickness will result.

What the Neural Mismatch Model Accounts for

Studies on motion sickness have employed various stimuli. Early studies on the sensory conflict model emphasized the use of visual stimuli and simple acceleration stimuli. Most of these studies resulted in few subjects becoming nauseated; in one study, 40% of the subjects reported no nausea, and another 31% reported dizziness without nausea (Crampton & Young, 1953). The authors suggested that individual differences in the experience of nausea could be related to the motion susceptibility of the subjects. A later study, involving the use of rotational motion resulted in 68% of the subjects becoming nauseous with considerable symptom variation across subjects (Crampton, 1954).

As motion simulators evolved, researchers were able to manipulate stimulation of the vestibular receptors and measure motion sickness. For example, the Coriolis vestibular reaction occurs when the individual's head rotates in a different plane than the individual is rotating in (Reason & Brand, 1975). This type of motion sends different sensory input to each of the vestibular receptors, which would not occur under normal motion circumstances, and is analogous to cutting the person's skull in half, and moving each half in a different direction (Reason & Brand, 1975). Studies using this type of motion simulation procedure produce the most conflict among neural sensors, and create symptoms of motion sickness in 90 to 98% of the subjects exposed to the motion simulation (Guedry, 1970, Reason & Graybiel, 1970; Reason & Diaz, 1971). However, while some subjects exhibited severe symptoms like nausea, many subjects exhibited lesser degrees of disturbance, such as mild dizziness (Reason & Diaz, 1971). For example, in one study, only 50% of the subjects reported nausea, although most subjects

reported some symptoms (only 11% of subjects reported no ill effects; Guedry, 1970). In addition, another study found that subjects evidenced fluctuations in symptoms, with periods of increased well-being during the experiment (Reason & Graybiel, 1970). Such individual differences in the symptoms reported, despite being exposed to the same motion, suggest that variables other than conflicting sensory stimuli, such as psychosocial variables (e.g. anxiety, individual expectations) affect the experience of motion sickness.

Psychosocial and Behavioral Etiological Factors

In an attempt to elucidate the modulating role that psychological variables may have in relationship to motion sickness, numerous psychosocial and personality variables have been evaluated (Reason & Brand, 1975; Fox & Arnon, 1988). Most of these variables can be subsumed under five main categories: conditioning and learning theory, attentional focus, state and trait anxiety, perceived control and self-efficacy beliefs, and behavioral health factors (e.g. smoking, alcohol use).

Conditioning and Learning Theory

Psychologists have used conditioning and learning to explain the effects of exposure in decreasing seasickness. The hypothesized mechanism for the decline in seasickness following exposure is that the person consolidates information on what to expect from being at sea. Thus, when the comparator unit compares sensory input to information in memory, the neural mismatch decreases as information in memory is updated. As the individual undergoes further exposure to the sea and stores more information (for example, information on what happens in choppy seas, or with high winds, etc.) seasickness is further reduced (Wendt, 1948: Reason, 1977).

Anecdotal evidence suggests that most people habituate to atypical motion environments when given enough time and repeated exposure. Repeated exposure provides the individual with knowledge regarding what to expect, and this appears to lessen susceptibility to seasickness (Wendt, 1948). Although this hypothesis has not been empirically tested, anecdotal evidence suggests that the person's expectations or knowledge regarding what will occur in a new environment may provide a target for preventative measures. Conditioning may also play a role in the onset of nausea and vomiting at sea. Money (1970) described cases of individuals who have become conditioned to experience nausea and vomiting at the sight of a ship, or during the act of boarding a ship.

Attentional Focus

Empirical study has illustrated the influence of attentional focus on the experience of somatic symptoms. Sensory information, including interoceptive information, is often ambiguous and requires that the individual selectively search for and encode specific information (Pennebaker & Skelton, 1981). One empirical study of this presented ambiguous stimuli to subjects who had been given the expectation that the stimulus would either produce pleasurable sensations, or in another condition, painful sensations (Anderson & Pennebaker, 1980). This study found that individuals who expected the stimulus to produce pain selectively attended to the information that confirmed the stimulus as painful. The other subjects, believing the stimulus to be pleasurable, attended to the information that confirmed the pleasurable nature of the stimulus (Anderson & Pennebaker, 1980).

Barsky & Klerman (1983) characterize individuals who are sensitive to the nature of internal stimuli as having an "amplifying somatic style".. These individuals actively monitor normal bodily sensations that others might dismiss as unremarkable. Individuals with this internal attentional focus and amplifying somatic style are also more likely to react to symptoms with distress, and to attribute somatic cues to illness.

Attentional focus has been hypothesized to play a role in the susceptibility of individuals to seasickness. A common example is that subjects exhibit a higher degree of tolerance to atypical motion when they are given a task to work on, or an alternate attentional focus (Corriera & Guedry, 1967; Guedry, 1964;Wendt, 1948). For example, twelve subjects were instructed to attend to postural cues during a motion simulation, four subjects were instructed to complete a key press task, and four subjects were required to do mental arithmetic during a motion simulation. None of the subjects in the postural attention condition were able to complete the simulation, but all of the subjects given an alternative task to focus on were able to complete the simulation (Corriera & Guedry, 1967). It has been suggested that individuals who are susceptible to seasickness may be hypervigilant to motion cues. which appears to amplify the adverse reactions to motion (Sterle, 1963; Money, 1970).

Anxiety

There is a large body of literature on the effects of fear and anxiety on motion sickness. Fox and Arnon (1988) found that both state and trait anxiety were correlated with the occurrence of motion sickness symptoms ($r = .37$ [state]; $r = .32$ [trait]). A global measure of anxiety, combining results from the 16PF, EPQ, Taylor Manifest

Anxiety Scale, and the State Trait Anxiety Inventory was also significantly correlated with the occurrence of motion sickness symptoms (r = .41; Fox & Arnon, 1988).

Zwerling (1947) examined the effect of anxiety on motion sickness by admir ering electric shocks to subjects being spun in a motion simulator. Subjects receiving the electric shocks exhibited decreased tolerance for atypical motion (i.e. subjects in the shock condition were more likely to request termination of the simulation before twelve minutes elapsed). This study has been criticized for various reasons. for example, the subjects in the shock condition may have requested the termination of the motion in an effort to terminate the shock (Reason & Brand, 1975). However, this study provides some empirical support for the role of fear in the experience of motion sickness.

The psychodynamic view of seasickness postulates that the anxiety that is often experienced in flying or sea going environments is not fully expressed, and this leads to somatic expression of anxiety (Reinhardt, 1959). Some anxiety may be experienced overtly, however some is kept from consciousness and displayed through visceral expression (i.e. gastrointestinal upset). Reinhardt presented anecdotal evidence for this theory. describing the anxiety of inexperienced pilots as an "emotional G", which is the affective corollary of the physical "G" (gravitational force of acceleration) experienced by all pilots. Anxiety symptoms in inexperienced pilots therefore, would parallel the somatic feelings that normally accompany the changing environment of flight. Many sources of motion to which people are not accustomed will produce physiological symptoms generally ascribed to "motion sickness".. However, since people are not accustomed to many of these environments, feelings of anxiety also occur. Anxiety symptoms in fact, can be very similar to the physiological changes produced in motion

environments. Therefore, some researchers feel anxiety is the common factor underlying the experience of motion sickness, not necessarily the motion itself. Because anxiety can occur in a wide range of environments, this affective experience has been hypothesized to explain the occurrence of motion sickness in many very different environments (i.e. sea vs. air vs. space vs. driving) (Reinhardt, 1959; Fox & Arnon, 1988). These authors hypothesize that the degree to which anxiety affects the person's experience of motion sickness depends to some degree on the meaning that the situation and the anxiety have for the person.

Nausea is a symptom commonly associated with motion sickness, but it is also commonly reported in cases of anxiety. Researchers suggest that nausea co-occurs with atypical motion because atypical motion produces fear, fear produces sympathetic activation, and the result is nausea (Stebbins, 1966). The fear reaction becomes more salient as the environment becomes more unknown or more threatening (e.g. if it is the person's first time at sea; if the sea becomes rough) and the person's autonomic arousal continues to increase. Fox and Arnon (1988) suggest that feelings of mild motion sickness reflect anxiety symptoms, but that anxiety may play more of an exacerbating or maintaining role in more intense motion sickness. For example, anxiety may maintain seasickness by hindering homeostatic processes the body utilizes to overcome motion sickness (Fox & Arnon, 1988). Cognitive variables like catastrophizing and misappraisal have also been implicated in the association between anxiety and the symptoms of seasickness, as these cognitive processes have been shown to be common among anxious individuals. Fox & Arnon suggest that individuals experiencing anxiety at sea also exhibit these cognitive processes, and this may affect information processing which takes

place according to the neural mismatch model. Anxiety therefore may create difficulties in matching conflicting data from sensory organs, leading to increased mismatch and increased motion sickness (Fox & Arnon, 1988).

Self-Efficacy and Self-Control

Self-efficacy refers to an individual's judgment of how well he or she can utilize cognitive, behavioral or social skills to deal with a specified situation (Bandura, 1983). Bandura stresses that self-efficacy refers to what the individual believes that he or she can achieve with the skills he or she has (e.g. a person may know how to drive a car in gener but he or she may or may not feel efficacious in applying these rudimentary skills to a challenging mountain road).

Empirical studies on self-efficacy indicate that individuals with low self-efficacy regarding their ability to cope with aversive events will experience increased fear and distress (Bandura, Adams & Beyer, 1977; Bandura, 1983). When a person's self-efficacy beliefs are increased, they feel less fear and perform better on experimental tasks (Bandura, Adams & Beyer, 1977; Bandura, Reese & Adams, 1982). Self-efficacy has also been associated with autonomic arousal in aversive settings (Bandura, Reese & Adams, 1982). People who doubt their ability to function in a situation, exhibit increased autonomic arousal in an aversive situation, whereas individuals with higher levels of self-efficacy do not evidence as much autonomic arousal related to the aversive event.

Self-efficacy has been studied in relationship to seasickness. In their study using the Seasickness Self-efficacy Evaluation (SSE), Eden and Zuk correlated self-efficacy specifically for dealing with seasickness and self-efficacy in general, to the experience of seasickness (both frequency and intensity were measured, but it was not specified what

"seasickness" as the outcome measure referred to specifically). Overall, Eden & Zuk (1995) found that the belief in ability to function effectively while seasick led to a better outcome at sea. Results suggested that self-efficacy for sea sickness was most predictive of the sailors' ability to learn new skills and perform despite sea sickness (based on supervisor ratings of gains made in training).

Self-control, a variable conceptualized by Rosenbaum (1980a), is closely related to self-efficacy. The construct of self-control takes into account the individual's self-efficacy beliefs, but also measures the individual's tendency to use specific skills to actively deal with aversive situations (i.e. self-statements, application of problem solving skills, and application of delayed gratification). Measurements of self-control describe an individual's use of self-management techniques (i.e. coping strategies, individual skills) that allow him or her to change his/her behavior independent of strong internal stimuli (pain, fear) or strong external stimuli (high seas, environment with phobic object) (e.g. "When I feel down I try to act cheerful so my mood will change"; Rosenbaum, 1980a). Self-efficacy is an important part of the self-control construct, because an individual must believe that he or she has the ability to control behavior before the individual will make an overt effort to take control of the situation (Rosenbaum, 1980a). The strength of self-efficacy beliefs determines whether a coping strategy is initiated, how much effort is employed, and how long the effort is sustained in the face of adversity (Bandura, 1977). Self-control, on the other hand, determines what type of coping strategy is employed (i.e. trying to change one's self versus trying to change others).

The construct of self-control has been evaluated as a predictor of individual response to aversive situations. People who score high on self-control evidence the

ability to tolerate a cold presser task for a longer duration than individuals with lower self-control (Rosenbaum, 1980b). Also, individuals who score high on self-control reported decreased pain and less of a focus on the sensory dimensions of pain related to headaches, as compared to low self-control individuals (Courey, Feuerstein & Bush. 1982).

Self-control has also been examined in relationship to seasickness. Rosenbaum and Rolnick (1983) found that subjects with high self-control were more likely to apply self-control methods like active coping, including problem solving and cognitive reappraisal, when working in an at-sea environment. Furthermore, subjects with high self-control exhibited fewer performance deficits under stormy sea conditions (Rosenbaum & Rolnick, 1983). In another study, Gal (1975) found two factors that were predictive of seasickness: the ability to function effectively under seasickness-producing conditions, and a personality style that employed active coping strategies. Empirical evidence suggests that self-efficacy and self-control have a positive effect on treatment outcomes. Because these variables moderate the frequency and intensity of motion sickness symptoms, these variables should be examined in relation to the treatment of seasickness.

Perceived Control

Perceived control is defined as the individual's belief that he or she has the ability to influence the aversiveness of an event (Thompson, 1981). Perceived control is independent of the actual level of control conferred (i.e. the subject is told they can end a stressor by pressing a button or turning a dial. however the button or dial does not actually influence the stressor) (cf. Sanderson. Rapee & Barlow, 1989).

Providing subjects with perceived control (for example, being able to stop shock or loud noise) has evidenced increased tolerance during a stressor, with fewer performance errors (Glass & Singer, 1972; Kanfer & Seider, 1973). In studies examining perceived control and anxiety, results indicated that providing subjects with a method of counteracting the anxiogenic stimulus resulted in fewer panic attacks, less anxiety and fewer catastrophic cognitions (Sanderson et al., 1989; Telch, Silverman & Schmidt, 1996). In one study (Sanderson et al., 1989), only 20 % of those patients provided with perceived control experienced a panic attack, whereas 80% of the subjects without perceived control reported panic attacks.

In a laboratory study of the effects of perceived control on motion, investigators yoked two subjects, one who controlled a motion simulator, and the other who could not control the motion or stop the simulator (Rolnick & Lubow, 1991). Subjects with control of the stimulus intensity and duration (i.e. could stop the motion simulator) reported fewer symptoms of motion sickness and less of a decline in well-being, compared to subjects who were not given control. Subjects who were able to stop the motion were also likely to experience control as a result of their perceived ability to prevent the onset of symptoms.

Cognitive control allows an individual to process threatening material in such a way that the long-term stress is decreased (Thompson. 1981). Techniques used to increase cognitive control include cognitive restructuring and decisional control. Decisional control, or being able to choose from various courses of action, can be conceptualized as self-efficacy.

Averill (1973) reports that even if the response choices available to the individual are not useful to reduce or prevent the impact of a stressor, the very fact that the individual is aware of multiple responses, confers a sense of control. Eden & Zuk (1995) increased their subjects' perceived control by providing them with a list of things to do in case of seasickness. In a single pre-cruise briefing, the sailors were provided with a cognitive treatment designed to increase self-efficacy. Subjects receiving this treatment performed better under seasickness conditions, and reported less seasickness (Eden & Zuk, 1995).

In another naturalistic study of cognitive control, sailors who were encouraged to believe they could do something to reduce their seasickness felt less helpless and evidenced improved performance at sea (Rolnick & Gordon, 1991). These findings suggest that sailors provided with cognitive control would report a decrease in the severity of seasickness symptoms, as well as an increased tolerance of seasickness.

Providing subjects with information may also engender feelings of control (Thompson, 1981). This includes information about sensations, expectations, and in some cases procedure (e.g. when a patient is undergoing a medical procedure). Studies have shown that providing accurate information on sensations likely to be experienced, providing accurate expectations, and providing procedural information resulted in a decrease of anxiety and distress, as well as an increase in tolerance (Mills & Krantz, 1979).

Providing sailors with information on base rates of seasickness as well as proactive methods of dealing with seasickness will increase perceived control regardless of whether the information allows for instrumental behavioral control or not. Reason

(1974) states that people are often unaware of the perceptual difficulties presented by atypical motion environments. Providing people with a framework for understanding the occurrence of motion sickness may help susceptible individuals to keep symptoms within tolerable limits, or to help them prevent the symptoms all together (Reason, 1974). Information can be palliative, by providing a warning signal (i.e. "be aware that about 30% of people studied become seasick to the point of vomiting during the first two or three days at sea"); or by providing a message about the characteristics of the situation (e.g. rougher seas will lead to increased seasickness), the sensations to be experienced (e.g. symptom progression from malaise to nausea to vomiting), or causes of the distress (i.e. seasickness etiology).

Behavioral Health Factors

Behavioral health factors such as exercise, eating, smoking and drinking have been implicated in the occurrence and experience of motion sickness, although the evidence for this is mainly anecdotal (Kirkner, 1949; Money, 1970; Reason & Brand, 1975). Cigarette smoking appears to increase seasickness symptoms. Some authors suggest that this is related to the observation that any noxious or strong odors will increase feelings of nausea associated with seasickness (Bruner, 1955). Another hypothesis regarding the nauseogenic effect of cigarette smoking is related to the physiological actions of nicotine as an emetic agent (Money, 1970).

Alcohol intake may also affect the experience of seasickness. For example, a person who is intoxicated or suffering from alcohol withdrawal will be more likely to feel symptoms like nausea, whether seasick nor not (Money, 1970). There is also some suggestion that dehydration increases seasickness susceptibility, and alcohol use

dehydrates the individual (Reason & Brand, 1975). On the other hand, older references on seasickness suggest that various types of alcohol (iced champagne, neat brandy, or stout) may be palliative for seasickness (Bruner, 1939).

Good physical condition in general has been anecdotally associated with low motion sickness susceptibility (Kirkner, 1949). Eating behavior, perhaps related to time of day, can effect the experience of seasickness (Bruner, 1955). Keeping something in one's stomach lessens the gastrointestinal upset that accompanies motion sickness and reduces the occurrence of dry heaving. Also, people who spend a lot of time at sea suggest from experience that avoiding fatty foods, maintaining a proper diet and drinking plenty of water are important in minimizing seasickness (Money, 1970).

Summary of Psychosocial Variables

Many psychosocial variables have been anecdotally linked to motion sickness. Anxiety, control and control-related beliefs (i.e. self-efficacy, self-control) have been empirically shown to modulate the occurrence and/or intensity of motion sickness. Interventions which are aimed toward increasing perceived control and control-related beliefs should therefore decrease motion sickness. Furthermore, although not empirically studied in the context of an intervention, decreasing anxiety may also decrease motion sickness.

Other psychosocial variables may provide potential predictors of who is likely to experience seasickness, and may predict intervention outcome. The most widely studied of these variables is the attentional focus of an individual. Hypotheses suggest that individuals who are sensitive and highly vigilant to internal cues will experience increased motion sickness.

Incorporating Psychosocial Variables into the Neural Mismatch Model

As discussed earlier, the neural mismatch hypothesis does not explain all responses to atypical motion environments. For example, the comparator may signal a mismatch to the individual, which should result in seasickness, but the individual may be too busy to take notice of the symptoms. In a different example, a person may be looking forward to a roller coaster ride and feel no ill effects from conflicting sensory input, whereas their companion who was fearfully anticipating the ride, becomes ill. Examples like these illustrate the contribution of psychological variables to motion-induced symptoms, and underscore the need for a model integrating psychological and physiological etiological factors of seasickness.

The neural mismatch model can easily be modified to account for psychosocial variables (Dobie & May, 1990). This model is similar to that proposed by Reason (1977) with a sensory input unit, a unit that compares incoming information with stored information, and an output unit. However, a bio-psychological model incorporates a cognitive unit which can interact with all the other units involved. The cognitive unit can influence information processing at the sensory level. for example, an individual's anxiety about an impending storm at sea might induce hypervigilance to interoceptive cues. The cognitive unit can also interact with the comparator to compare sensory input with stored information on past experience, and also with knowledge or expectations about the situation. A person with high self-efficacy beliefs that they can handle a boat on rough seas, may get the sensory input that the seas are getting rougher, but at the comparator unit the mismatch would be reduced because of the individual's belief that he or she could deal with the high seas effectively. Self-control beliefs would also have an

effect at this level, through the relationship between self-control and self-efficacy, although self-control is more likely to have its influence at the output level. At the output level, the cognitive unit can influence the system by blocking nauseogenic cues when the organism is too busy to attend to them, or by affecting how the individual reacts to these cues. For example, an individual with high self-control might react to the initial feelings of seasickness by employing active coping measures to prevent the further development of seasickness. Such a model is presented in Figure 2.

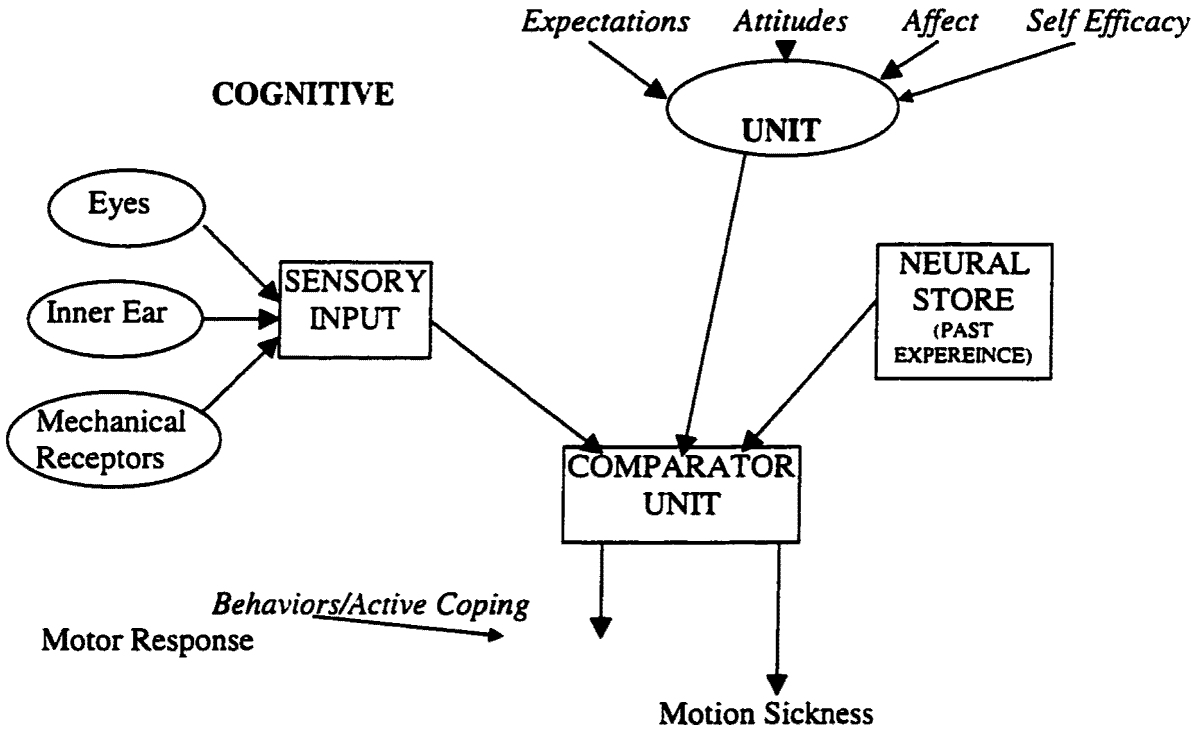


Figure 2. A Cognitive Unit in the Neural Mismatch Model

Treatment

The most common treatment utilized in the amelioration of seasickness symptoms has been medication, however there are various drawbacks associated with medication use. Many medications require that the individual take them hours before the onset of

symptoms is likely, and the medications provide little relief if taken once symptoms have begun. Medications may also produce side effects that can hinder performance as much as the seasickness itself does. Cognitive behavioral treatments provide an alternative approach to treatment without side effects.

Pharmacotherapy

Three types of drugs, anticholinergic, antihistaminergic, and sympathomimmetic drugs, are commonly used for the treatment of seasickness (Tokola et al., 1984; Drug & Therapeutics Bulletin, 1989; Pingree, 1989; Noel & Harris, 1996). Scopolamine, an anticholinergic medication, has evidenced significant decreases in seasickness symptoms, and is considered one of the most effective singular drug treatments for seasickness (Parrott, 1989). Scopolamine can be taken orally, injected parenterally, or administered via transdermal patch (Parrott, 1989). Placebo controlled drug trials have shown scopolamine to be efficacious in treating seasickness symptoms. For example, a three day trial in the Israeli Navy decreased reported seasickness among individuals at sea at the rate of 74% the first day, 73% the second day, and 34% on the third day (Attias, Gordon, Ribak, Binah & Rolnick, 1987). The advantages of scopolamine are its long lasting effects (up to 72 hours) and its ease of use. Unfortunately, since scopolamine acts as an antagonist of the acetylcholine muscarinic receptors it can also have a number of salient side effects. The side effect with the most impact is probably the disruption of vision. Anticholinergic side effects are evidenced by over half of patients taking the medication, and include blurred vision (as a result of impaired accommodation, lasting up to 24 hours), dry mouth, drowsiness, decreased memory and attention, bradycardia, and at times hallucinations, confusion, agitation and disorientation (Drug & Therapeutics

Bulletin, 1989; Parrott, 1989). Another drawback in using scopolamine is the amount of time prior to the onset of symptoms that the medication must be administered. When using the transdermal patch it is necessary to apply the patch 6-8 hours before the medication is needed (Drug & Therapeutics Bulletin, 1989), and oral scopolamine must be taken 13 hours before the experiencing of symptoms.

Histamine receptor antagonists, antihistamines like dimenhydrinate, meclizine and promethazine, have been prescribed in the treatment of seasickness. NASA has selected promethazine as the treatment of choice for acute motion sickness because of its usefulness in treating acute symptoms (Noel & Harris, 1996). Some studies suggest that meclizine may not perform as well as scopolamine (Parrott, 1989), however meclizine has advantages over scopolamine including a more rapid absorption and a faster peak in blood concentration (meclizine takes 1-2 hours; Kazung, 1995). Meclizine also has a long acting effect, about six to twelve hours (Mazel, 1992) with some sources indicating up to twenty four hours (Kazung, 1995). Unfortunately, antihistamines have a strong sedative effect (Noel & Norris, 1996), often making them contraindicated treatments for people who need to remain alert.

Sympathomimmetic agents are helpful when taken with antihistamines or anticholinergic drugs because they can balance some of the somnolescent side effects. Some of these drugs however have a high potential for addiction (i.e. amphetamine), and may interfere with the individual's habituation to the sea environment as a result of its effects on the noradrenergic systems hypothesized to be active in habituation (Noel & Norris, 1996).

Psychological Treatments

One early author cited the 20% improvement from a placebo as evidence of the role of psychological factors in seasickness, noting that any form of therapy appears to have a beneficial effect on seasickness (Noble, 1948). Controlled outcome studies on psychological treatments for seasickness suggest an improvement rate higher than the rate of placebo response. Many studies have evidenced a better than 20% improvement rate, and cognitive behavioral techniques evidence improvements significantly greater than the improvements evidenced by the control groups.

Most studies of cognitive behavioral treatment of motion sickness have tak place the laboratory. Some r earchers have hypothes d the role of autonomi dysre ation in the experience of motion sickness. Therefore, studies utilizing biofeedback have been aimed at training subjects to control their autonomic responses. The studies examining biofeedback alone are equivocal in their results. One study, done by NASA. compared autogenic (ANS) feedback using information on heart rate, respiration rate. pulse in the face and hands, galvanic skin response and muscle reactivity with sham training (probability monitoring task) and a no treatment condition. Results indicated that subjects in the autogenic biofeedback group withstood the stress of the Coriolis chair acceleration significantly longer than the group instructed to complete a cognitive task (Cohen's $\underline{d} = 1.51$). The group receiving biofeedback also performed better than subjects who received no treatment ($\underline{d} = 1.44$; Toscano & Cowings, 1982). The authors suggest the mechanism of treatment lies in providing knowledge about the threat, and providing the subject a way to predict stress by monitoring physical sensations. In this study, biofeedback was characterized as an avoidance coping strategy.

A Canadian study examining ANS control through biofeedback (heart rate and skin temperature), found that autogenic control was not related to the subjects' ability to withstand Coriolis stimulation. The authors concluded that because subjects were able to decrease heart rate using biofeedback during training, but were unable to decrease heart rate during motion simulation, biofeedback was not a useful coping skill that could be applied in the motion environment (Jozsvai & Pigeau, 1996). The difference in the success of these applications of biofeedback may be that the NASA study emphasized instructing the subjects in selective attention techniques as well as training them in such a way as to reduce the dependence on the external biofeedback apparatus (Toscano & Cowings, 1982). The necessary mechanism of treatment therefore, may not be the biofeedback itself, but the increased sense of perceived control over the situation, an aspect stressed in the NASA study relative to the Canadian study.

The United States Navy has carried out motion sickness treatment studies including desensitization and cognitive therapy with exposure in a motion simulator. The desensitization consisted of ten sessions of progressive exposure (beginning at 75% of subject's baseline amount of time in simulator) to a simulator without education or encouragement from the experimenters. Cognitive counseling involved education on seasickness and normalization of the experience as well as reviewing past experiences with the subject and reinforcing the notion that these past experiences had created unrealistic anticipatory fears. In the cognitive counseling condition subjects were instructed to relax and focus on the work at hand, or to focus on a complex mental task.

One study compared desensitization alone with cognitive therapy alone, a group with both desensitization and cognitive therapy and a no treatment control group (Dobie,

May, Fisher & Bologna, 1989). Only the groups that received counseling designed to increase self-efficacy (included in cognitive therapy and the combination group) remained in the motion simulator for a significantly increased amount of time ($\underline{d}$ = 1.49; a time difference of about 2 minutes vs. the desensitization group and 5 minutes vs. the control group). The combination group was most effective in decreasing reported symptomatology as well ($\underline{d}$ = .945). These results, suggesting the greatest improvement among subjects receiving treatment with a cognitive component, underscores the importance of the cognitive factor in multi-modal motion sickness treatments.

Another study compared a combination of confidence counseling (lessons that a positive, confident attitude could decrease anticipatory autonomic arousal) and desensitization, with an EMG and temperature biofeedback group, a combination of the two treatments, and a no treatment control group (Dobie, May, Fischer, Elder & Kubitz, 1987). The treatment groups that included counseling designed to increase self-efficacy reported fewer motion sickness symptoms after the treatment ($\underline{d}$ = .82), while the biofeedback condition was equivalent to the control condition. Six subjects in the combination treatment condition were able to complete the motion simulator protocol, and three subjects in the cognitive group were able to complete the motion simulator protocol (Dobie et al., 1987). All subjects from the remaining groups aborted the experiment before the motion simulator protocol was completed. These results suggest that cognitive components of treatment may have greater efficacy in the treatment of motion sickness relative to biofeedback training directed at relaxation and desensitization.

The United States Air Force has been applying a multi-modal approach to treatment in the laboratory and as applied to flying situations. Results have shown that behavioral treatment including biofeedback, relaxation, desensitization and cognitive modification techniques has been successful in returning aviators previously grounded for chronic motion sickness to flying status (Giles & Lochridge, 1985; Jones, Levy, Gardner, Marsh & Patterson, 1985; Jackson, 1994). Giles & Lochridge reported a 95% success rate for returning grounded pilots to flight status with their multi-modal air sickness treatment program. Jones et al. (1985) applied cognitive behavioral treatment to fifty-three aviators grounded for chronic air sickness. Following treatment 79% returned to and maintained flight status, 6% were partially successful, and only 15% were later grounded. These results were maintained at one and two year follow-up evaluations.

Few naturalistic studies exist examining the effects of cognitive behavioral treatment on seasickness in an open water environment. Eden and Zuk (1995) address this deficiency in their study on self-efficacy and performance at sea. Cadets in the Israeli Navy were randomly divided into an experimental and a control group. Individuals in the experimental group were provided feedback that their questionnaire scores were indicative of people who performed well at sea. The experimental group was also provided with psychoeducation and an intervention aimed at increasing self-efficacy. Subjects who received the cognitive therapy experienced less seasickness ($\underline{d}$ = 1.14; based on type of symptoms and degree of symptoms reported) and evidenced increased performance ($\underline{d}$ = 1.72; based on supervisor ratings) compared to subjects who did not receive the treatment (Eden & Zuk, 1995). Moreover, cadets with lower self-efficacy

scores evidenced an increased response to treatment, but the effect was non-significant (Eden & Zuk, 1995).

Criticisms of cognitive behavioral treatment studies rest on the fact that most of the laboratory paradigms involve long periods of time (for desensitization sessions) and costly equipment (biofeedback equipment, motion simulators, etc.) (Dobie & May, 1994). Reviews have concluded that such treatments should be reserved for those personnel whose training is costly, and for whom replacements would be unlikely to find (Dobie & May, 1994). The study by Eden and Zuk (1995) indicates, however, that psychosocial treatments for seasickness need not be long or individualized, but can be carried out quickly and in a group format. Furthermore, cognitive interventions in a naturalistic situation can be relatively inexpensive. Finally, the Eden and Zuk study highlights the possibilities for the primary prevention of seasickness.

Summary

Empirical evidence supports the palliative effects of perceived control and increased self-efficacy on the experience of adverse conditions (i.e. pain, anxiety and seasickness). Studies in the general literature and in literature specific to seasickness suggest that increasing self-control and self-efficacy may be an important aspect of cognitive treatments aimed at preventing seasickness or reducing seasickness symptoms.

The literature does not provide many treatment studies for seasickness, especially studies carried out in a naturalistic environment. This study will provide an applied empirical evaluation of the effects of a cognitive intervention on the frequency and intensity of seasickness symptoms as well as the performance of individuals at sea. Although psychosocial variables have been hypothesized as having an etiological role in

motion sickness, these variables have not been evaluated as treatment mediators. This study will examine the variables of self-efficacy, self-control and anxiety as predic s and potential mediators of intervention outcome.

Hypotheses

The current study prospectively assessed the effects of a cognitive intervention on the experience and aversive effects of seasickness in a naturalistic setting.

Hypothesis: A cognitive intervention involving education, cognitive reappraisal, and confidence building will decrease seasickness symptomatology and improve performance during the cruise.

Control theory suggests that psychoeducation providing options for ways to deal with seasickness will decrease distress and increase tolerance because subjects will gain behavioral control (response options) as well as cognitive control (the ability to choose). Furthermore, providing sailors with strategies to deal with seasickness allows them to engage in more of an active coping effort as opposed to a passive acceptance of the situation. Active coping has been correlated with better performance under seasickness conditions (Gal. 1975). Past studies have shown that increasing cognitive control leads to an increase in performance and an increase in tolerance to an aversive motion environment. The effect of this increase in control is likely affected by the increase in self-efficacy and a decrease in anxiety, based on receiving information that increases cognitive control as well as methods of cognitively re-appraising the aversive situation.

Hypothesis: The effects of the intervention in improved symptoms of seasickness will be mediated by self-efficacy expectations specific to sea duty and anxiety regarding the upcoming sea cruise.

Based upon evidence from prior studies on self efficacy and seasickness (Eden & Zuk, 1995), individuals with high self-efficacy for dealing with seasickness will report fewer symptoms and will perform better under seasickness conditions than those subjects who have lower self-efficacy scores.

This intervention, whicl ombines information (ţ choeducation) and cog ve traini designed to increase pe ceived control should decrease anxiety. Empirical evidence suggests that the aversiveness of a stressor in general is decreased by providing subjects with perceived control (Thompson, 1981); and that providing subjects with information regarding a stressor decreases distress and anxiety (Johnson, 1983). It is also likely that normalizing the experience of seasickness in a nautically-naïve population will decrease distress when exposed to seasickness. Consequently, the decreased distress and anxiety should be associated with an increase in performance and a decrease in symptom reporting.

Hypothesis: Individual differences on psychosocial variables such as high body vigilance, high trait anxiety, active coping personality styles, and prior history of motion sickness are expected to predict intervention outcome.

Specifically, individuals with high scores on the Body Vigilance Scale will be more likely to report seasickness. This is based upon the idea that individuals who are more hypervigilant to interoceptive cues will be more susceptible to seasickness.

Specifically, individuals with high scores on state and trait anxiety measures will report more symptoms of seasickness. Good intervention outcome should be associated with decreased anxiety.

Individuals who report active coping personality styles are predicted to report fewer seasickness symptoms and an increased ability to perform while seasick. Lastly, individuals with a prior history of exposure to motion sickness should report fewer symptoms of seasickness and should perform better. This expected outcome is based upon neural mismatch theory which states that mismatch declines as neural traces develop based upon exposure to atypical motion environments (Reason, 1977).

Method

Procedural Overview

Over two hundred and fifty naval academy midshipmen were invited to attend a seasickness briefing during the many briefings they attend for their summer cruise experience. Two hundred forty-seven midshipmen attended the presentations. After an initial explanation of the protocol and an explanation of their voluntary participation. midshipmen were given self-report questionnaires to fill out. Following this, individuals were divided into two groups based upon their yard patrol craft (YP) assignment (1/2 of the subjects are assigned to alpha squadron and the other 1/2 of the subjects are assigned to bravo squadron). One group was provided a cognitive intervention designed to increase self-efficacy and self-control and decrease anxiety, thus reducing seasickness. This intervention consisted of a psychoeducational didactic presentation including information on the epidemiology and prevalence of seasickness, as well as proactive interventions geared toward ameliorating the symptoms of seasickness. The second group received a presentation of the same length of time which focused mainly on describing the medical program of the Uniformed Services University of the Health Sciences (USUHS), as well as research done by USUHS which is applicable to the military. During the YP training cruise, all third class midshipmen were requested to maintain a daily record of performance and seasickness symptomatology. When the midshipmen returned from their cruise, they were given follow-up self-report questionnaires, debriefed with an explanation of the research and provided an open forum for questions.

Design

This study incorporated a factorial design with repeated measures. The independent variable of interest was the intervention. There were two main dependent variables of interest: seasickness symptomatology and performance while seasick. her seasic ess predictor variables re also evaluated, incl ng: demographics, prio exper ce at sea. coping strate s, a measure of hyperv lance, and a measure of anxiety sensitivity. The variables of self-control, self-efficacy and anxiety were included because they were thought to mediate intervention effects.

Measures

There were four time points during this study at which questionnaires were administered. Most measures were taken pre-intervention and then immediately following the intervention or control presentation. Self-efficacy and self-control were also measured post-cruise, when the midshipmen returned. Daily checklists and supervisor ratings were completed during the cruise, and a seasickness symptom checklist was administered after the cruise was completed. See Figure 3 for a complete timeline.

Figure 3. Schedule of Assessments

	Pre Intervention	Post Intervention	During Cruise	Post-Cruise
Psychosocial Mediator Variables				
SSE	X	X		X
SCS	X	X		X
STAI (state)	X	X		
Psychosocial Predictor Variables				
ASI	X	X		
BVS	X			
COPE Inventory	X			
STAI (trait)	X			
MSQ	X			
Demographics	X			
Outcome Measures				
Daily Checklist			X	
Supervisor Rating			X	
SSC				X
Seasickness Quiz		X		

SSE = Seasickness Self-Efficacy Questionnaire, SCS = Self-Control Schedule, STAI = State Trait Anxiety Inventory, ASI = Anxiety Sensitivity Index, BVS = Body Vigilance Scale, MSQ = Motion Sickness Questionnaire, SSC = Seasickness Symptom Checklist

Outcome Measures

Daily Checklist (Appendix A1)

The Daily Checklist is designed to maintain the individual's subjective ratings of the most commonly occurring seasickness symptoms (based on other seasickness studies) and of performance, mood and medication use. Type and amount of medication taken were asked about because midshipmen were not asked to refrain from using medication to cope with seasickness. Anecdotal evidence suggests that most midshipmen forget to take their medication until it is too late to ameliorate the symptoms. However, if medication is used on a regular basis, this can be controlled for during statistical analyses.

The daily checklist provides measures of symptoms and performance because empirical evidence has shown that while individuals may not report being sick, especially to the point of vomiting, performance still may be impaired (Rolnick & Gordon, 1991). Furthermore, performance in laboratory settings may remain unaffected longer than performance in naturalistic settings where lower levels of disability can create greater

decreases in performance (Alexander et al., 1945b). Furthermore, subjects may experience more distress related to the need to perform in a naturalistic setting, which may not be present in the laboratory.

Supervisor Performance Ratings (Appendix B)

Three first class midshipmen on each YP act in a leadership role for third class midshipman, creating an analogue to the officer/enlisted relationship in the operational Navy. First class midshipmen were asked to rate the performance of the third class midshipmen for each day at sea (each squadron is in port for four days throughout the cruise). They were provided a log with an instruction sheet explaining what the performance ratings were based upon, and they were given a short presentation on making ratings. Performance ratings should include whether or not the midshipman was able to carry out assigned duties (i.e. watch), an indication of whether the midshipman maintained camaraderie/social contacts, and finally, the level of interest and involvement in technical systems and skills training aboard ship. One rating incorporating all of these factors was made on a scale of 0 to 5, with 0 being inability to perform/unsatisfactory performance, 1 poor/marginal performance, 2 average performance, 3 above average performance, 4 excellent performance, and 5 outstanding performance.

Seasickness Symptom Checklist (SSC; Appendix A2)

The SSC is derived from Israeli Defense Forms originally used by Eden and Zuk (1995) in their study of self-efficacy and seasickness. This scale has been revised slightly to make items more easily understandable following translation from Hebrew to English. Some items (i.e. smoking more than usual) were deleted because these behaviors are not allowed on the YP and therefore would not apply to the sample in this study. This scale

assesses the experience of 33 seasickness symptoms based on 5 point scales (1 being not experienced at all, 5 being experienced to a great extent). This checklist has good psychometric properties (α = .93). This scale was administered during the post-cruise debriefing as an overall, retrospective report of seasickness symptoms experienced during the cruise.

Hypothesized Mediators of Intervention Efficacy

Mediators of intervention outcome represent those psychosocial variables that have been identified as predictive of, or associated with, seasickness. Past empirical evaluations of psychosocial interventions for motion sickness have indicated self-efficacy, self-control and anxiety consistently mediate the effect of seasickness treatments. The intervention in this study was hypothesized to affect these variables, thus they were designated a priori as mediators of intervention efficacy. These three constructs were evaluated by using previously validated self-report instruments described below.

Seasickness Self-Efficacy Questionnaire (SSE; Appendix A3)

The SSE is based upon one part of a three-part self-efficacy questionnaire utilized by Eden & Zuk (1995). The wording was changed slightly to make directions and items easier to read, following translation from Hebrew to English. Eden and Zuk found that this scale had good psychometric properties (α = .94; test-retest, r=.71). The other two parts of the questionnaire measured responses to the same items but with different instructions (i.e. make a decile rating comparing yourself to other cadets; Eden & Zuk, 1995). Therefore theses two scales were left out, and two questions designed to tap this information were added to the SSE ("How high would you rate your ability to deal with

seasickness compared to other midshipmen?" and "How do you feel your supervisors would rate your ability to perform despite feeling sick at sea?"). This questionnaire is intended to assess the individual's belief that he or she can deal successfully with symptoms of seasickness.

Self-Control Schedule (SCS, Appendix A4)

Rosenbaum (1980) developed the 36 item SCS as a method of assessing self-control behavior. This scale has been utilized in descriptive studies of seasickness indicating that high self-controllers experienced fewer performance deficits related to seasickness (Rosenbaum & Rolnick, 1983). Based on prior study, midshipmen who score highly on this scale should be less likely to experience adverse effects from seasickness. This scale has reasonable psychometric properties, $\alpha = .72 - .91$ and test-retest reliability, $r = .77$. This measure can be found in Measures for Clinical Practice (Fischer & Corcoran, 1994).

State Anxiety (STAI-state; Appendix 5)

Anxiety has been associated with seasickness symptoms. Psychosocial interventions may affect seasickness because of their effects on anxiety. The STAI is useful because it provides two scales, one of trait anxiety and one of state anxiety (20 items per scale; Speilberger, Gorsuch, Luchene, Vagg & Jacobs, 1983). Subjects who are anxious about the upcoming cruise should evidence high levels of state anxiety. If the efficacy of the intervention is mediated by a decrease in anxiety, the level of state anxiety should decrease following the intervention. Psychometric properties for the state scale of the STAI are good ($\alpha = .93$; Knight, Waal-Manning & Spears, 1983).

Intervention Outcome Predictors

Motion Sickness Questionnaire (MSQ, Appendix A6)

The MSQ is a brief self-report measure designed to assess lifetime exposure to motion sickness environments, current exposure to motion sickness environments, and the overall experience of motion sickness (Reason & Brand, 1975). This scale provides a numerical representation of susceptibility to motion sickness. This scale is included to control for differences in rates of seasickness based on prior exposure to a sea-going environment as well as frequency of past bouts of sickness. Individuals with a high score on the MSQ are generally more susceptible to seasickness and would be expected to report more symptoms, as studies on brief motion sickness history questionnaires have been related to increased susceptibility (Alexander, Cotzin, Hill, Ricciuti & Wendt, 1945a).

Trait Anxiety (STAI -trait; Appendix A7)

Studies indicate that seasickness susceptibility may be related to anxiety (Fox & Arnon, 1988). Furthermore, studies on control and illness and stressors indicate that providing control can decrease general distress (Thompson, 1981). This inventory is included to measure distress and anxiety, as these variables may be affected by the intervention. State anxiety is more likely to be affected by this intervention than trait anxiety, however if trait anxiety behaves like other personality variables then this variable may provide a more stable predictor of general distress. Psychometric properties are adequate for the trait scale of the STAI (α = .87; Knight, Waal-Manning & Spears, 1983).

COPE Inventory (Appendix A8)

The COPE inventory consists of 11 factors (20 items) that describe different methods of coping. The sub-scales representing these factors of the inventory however, show marginal reliability (α <.80; Carver, Scheier & Weintraub, 1989). The four-item active coping sub-scale was used in this study because past studies have suggested that individuals with an active coping strategy experience less impairment from seasickness (Gal, 1975). The psychometric properties of the active coping sub-scale were marginal (α = .62; $\underline{r}$ = .56) however, specific active coping scales utilized in other studies were not available in English. The four-item turning to religion sub-scale of coping was included because it has reasonably good psychometric properties (α = .92; $\underline{r}$ = .86) (Carver et al., 1989).

Body Vigilance Scale (BVS; Appendix A9).

The BVS is a short, four item scale aimed at assessing attention to internal bodily sensations (Schmidt, Lerew & ' kowski, 1997). Money (1970) suggests that attentional processes, such as hypervigilance to motion sensations, may play a role in the intensity of the seasickness experience. The BVS is designed to assess somatic attentional focus, including the individual's sensitivity to changes in their bodily sensations, as well as the amount of time they spend attending to these sensations (Schmidt, Lerew & Trakowski, 1997). The last item also includes a list of symptoms commonly associated with anxiety. Anxiety symptoms overlap the symptoms experienced during seasickness (e.g. nausea, upset stomach, dizziness), thus the BVS may provide a measure of sensitivity to seasickness symptoms as well as anxiety symptoms. Psychometric properties for this measure are adequate, α = .83; test-retest reliablity $\underline{r}$ =.68 (Schmidt et al., 1997).

Anxiety Sensitivity Index (ASI; Appendix A10).

The ASI is a 16-item questionnaire that measures fear of somatic symptoms related to arousal (Peterson & Reiss, 1987). Each item assesses concern about the possible negative consequences of anxiety symptoms on a 0 to 4 point Likert Scale. This test is scored by summing each response to provide a total score. The ASI has demonstrated adequate internal consistency (α = .82; Telch, Shermis, and Lucas, 1989) and test-retest reliability (r = .71; Maller & Reiss, 1992). Literature on seasickness suggests that individuals who are anxious or fearful are more likely to experience seasickness. Furthermore, many individuals experience seasickness symptoms but not all individuals report distress. It is likely that those individuals who score highly on the ASI, and fear somatic symptoms, are more likely to express distress related to the somatic symptoms that are experienced at sea.

Demographics (Appendix A11)

These questions assessed for demographics including age, gender and ethnicity. All subjects have the same educational background (up through 1 year of college) and the same occupational background (naval midshipmen).

Participants

Participants included two hundred forty-seven midshipmen who had completed their first year at the United States Naval Academy (USNA). These midshipmen were assigned to YP crews based on preference and request of the individuals. However, the ships included in the study were essentially chosen at random from all the midshipmen participating in the summer YP cruise program (the training was broken up into four blocks, with two squadrons of six ships in each block). Twelve YPs (two squadrons)

were included in this study, with 21 third class midshipmen on each YP. One squadron received the intervention and the other squadron was the control group condition. No a priori requirements were set for ethnicity or socioeconomic status because group assignment for the study comprised the entire squadron. and was out of the experimenter's control. Gender distribution was not matched, but reflects the gender distribution existing within USNA.

Procedure

The midshipmen involved in the YP program underwent an extensive briefing prior to their participation in the cruise. One hour of this briefing was set aside for the protocol of this study. Prior to the beginning of the protocol midshipmen were informed of the study and its aims, as well as the voluntary nature of the study. Midshipmen who agreed to participate in the study were given a packet of forms by the civilian assistant.

General Procedure for Experimental Condition

Crews from six of the YP boats received a cognitive intervention for seasickness, including a cognitive component and a psychoeducational component. The cognitive component of the treatment included confidence-building techniques similar to those used by Eden and Zuk (1995). Essentially, subjects were told that they have the ability to overcome seasickness. The midshipmen were given a short presentation on Lord Admiral Nelson. a famous histo cal figure who achievec reat success in the Briti Navy espite a well known struggle with seasickness. It was stressed that Lord Admiral Nelson was able to overcome his seasickness using cognitive techniques and by maintaining a high level of confidence. A ten-minute video clip, taken from a

biographical video on Nelson was then shown, including anecdotes about Nelson's adventures as a midshipman.

The educational component of this intervention involved a presentation that was made by a military officer from the psychology department of USUHS. The video began by presenting prevalence data on seasickness. The experience of seasickness was normalized for these subjects, and they were provided with accurate expectations regarding how many people we likely to experience seasickness. Following this, the etiology of seasickness was described, with a reiteration of the psychological variables that can influence the experience of seasickness.

As a final part of the intervention, subjects were given a small, pocket-sized laminated card with the list of dos and don'ts techniques that are useful in ameliorating seasickness (Kirkner, 1949; Reason, 1974). For details, see Appendix D. These dos and don'ts were discussed with the midshipmen during the psychoeducational component of the intervention. Time was provided for the midshipmen to ask questions. Subjects were also asked to fill out daily checklists recording their seasickness symptoms and their performance ability.

General Procedure for Control Condition

Subjects in the control condition were provided a presentation of the same time length (about an hour) as that presented to subjects in the experimental condition. The experimenter was a military officer, introduced as a USUHS student working on research relevant to the military. Information was provided to subjects on the university's post-graduate educational opportunities of USUHS, as well as opportunities for military relevant research. A ten-minute video clip on USUHS and its military related programs

was p esented. Subjects in the control condition were told that this research is one of many projects designed to outline concerns in the military. The rationale presented to them was: one concern of the operational navy is seasickness, and therefore, they should fill out daily checklists recording their seasickness symptoms and their level of performance so we could better understand seasickness in an operational environment. Participants in this group were given a laminated card with information not related to seasickness on it (the Navy Hymn, Appendix D).

Both the control and experimental groups were rated by supervisors in terms of performance (Appendix B). The control group was comprised of one squadron, and the experimental group was comprised of a second. The YP training was organized so that each squadron was in a different port at a different time. Thus, it was necessary to control for the different sea states either squadron experienced. Although this information is not normally maintained on YPs, first class midshipmen on all YPs were oriented to a commonly used sea state rating scale (see Appendix C), and asked to make sea state ratings at the start of each three hour watch period.

Post-Experimental Assessment

All midshipmen then participated in the fourteen-day YP cruise. Upon return, a debriefing was conducted. Midshipmen were asked to fill out the SSE, the SCS and the Seasickness Symptom Checklist (as it related to their experience on the cruise). After all the post-cruise self-report forms were completed, subjects were informed of the rationale behind the study and the expected results. Subjects were encouraged to ask questions at that time.

Results

Analytical Overview

Differences in demographic variables between groups were assessed using one-way analysis of variance tests where appropriate (e.g., age) and non-parametric tests where applicable (e.g., ethnicity).

Dependent variables (measures of seasickness) were assessed using stepwise regression analyses to determine the contributions of the various psychosocial (mediator and predictor) variables to the occurrence of seasickness. Demographic variables which were significantly different between the groups were also included in the regression equations where appropriate.

ANCOVAs were conducted on dependent variables in order to co-vary for medication use in the two group conditions.

Repeated measures were assessed using multiple regression analyses to determine if the main psychosocial mediational variables (SSE, SSC and STAI) changed over time. Path analyses were intended to be conducted on those mediational variables exhibiting significant time effects in order to determine the relative contribution of the mediators on intervention outcome.

Demographic Characteristics

All midshipmen who have completed a year at the naval academy are required to take a two-week cruise on small yard patrol crafts (YPs). Midshipmen as a population are fairly homogeneous, especially when looking at a single year group. Those

midshipmen entering their second year at the academy are generally between the ages of 18 and 22, have the same employment and marital status (single), and about the same level of education (at least 1 year of college). Like many military populations, the midshipmen sample is made up primarily of Caucasian males. Thus, we would expect a similar homogeneity in our sample, reflective of the demographic of the larger midshipmen population. Statistical tests were done to determine whether there were significant differences between the control and intervention groups. A summary of overall demographics are shown in Table 1. The groups evidenced significant differences in age ($p < .001$) and gender ($p < .01$).

Table 1. Demographic characteristics of subjects in the study

Demographic Variable	Intervention Group N (%)	Control Group N(%)
Age (mean)	19.27	18.92
Gender		
Male	112 (91.8)	99 (79.2)
Female	10 (8.2)	25 (20)
Ethnicity		
Caucasian	96 (78.7)	101 (80.8)
Non-Caucasian	26 (21.3)	23 (19.2)
Smoke		
Yes	3 (2.5)	1 (.8)
No	119 (97.5)	123 (99.2)
Marital Status (single)	122 (100)	124 (100)

The subjects in the intervention group were. on average, older than subjects in the control group. However, this may not have practical significance, given the closeness in age between the groups. Regarding the gender differences, there were significantly more females in the control group than in the treatment group.

As a result of the significant differences in age and gender between the two groups, these two variables were controlled for in subsequent regression analyses. Age

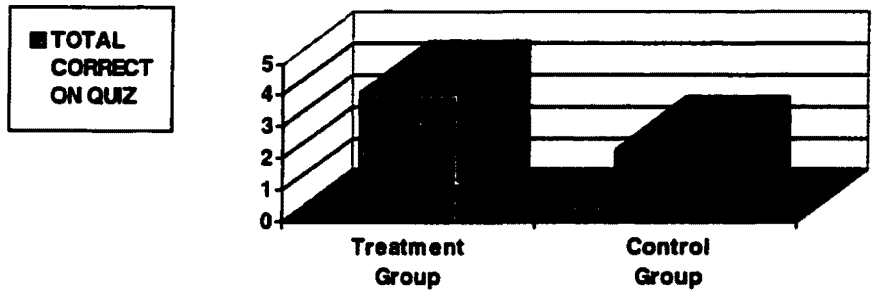
did not contribute significantly to any outcomes. In contrast, females had higher daily average seasickness ratings (mean daily sickness = 4.2 for females compared to 1.2 for males). However, since the number of females in the subgroup of individuals who filled out daily average seasickness measures was equivalent between the two groups, gender was not a likely contributor to intervention effects. Gender did not contribute significantly to retrospective ratings of seasickness symptoms (SSC scores).

Salience of the Intervention

In order to determine whether the educational portion of the intervention provided the information for which it was designed, a short questionnaire was given to both the treatment and control groups immediately following the presentations (for details see Appendix D). Along with 5 questions designed to assess knowledge of seasickness, four questions were included evaluating whether the presentation kept the person's attention, whether the person felt they learned anything useful, what the person judged the level of "technicality" was in the presentation, and whether the amount of information provided in the presentation was adequate. It was hypothesized that the presentation for the intervention group would be rated as more useful, and scores on the seasickness quiz would be higher. This was confirmed.

The treatment group had significantly higher overall scores on the quiz, indicating more correct items on the seasickness knowledge portion of the quiz ($F(1,241) = 169.60$; $p < .001$). Figure 4 compares the treatment and control group on the total number of items correct from the seasickness quiz (5 being 100% correct).

Figure 4. Total items correct on seasickness quiz by group



There were also significant differences on the ratings of usefulness of the presentations. The intervention group indicated that they had learned something useful more frequently than participants in the control group ($F(1,241) = 55.48$; $p < .001$), suggesting that the intervention group participants felt it might be germane to their situation. Finally, there was a significant difference between groups on ratings of how well the presentation held their attention. The intervention group reported that the presentation kept their attention significantly more than the control group ($F(1.241) = 5.07$; $p < .05$).

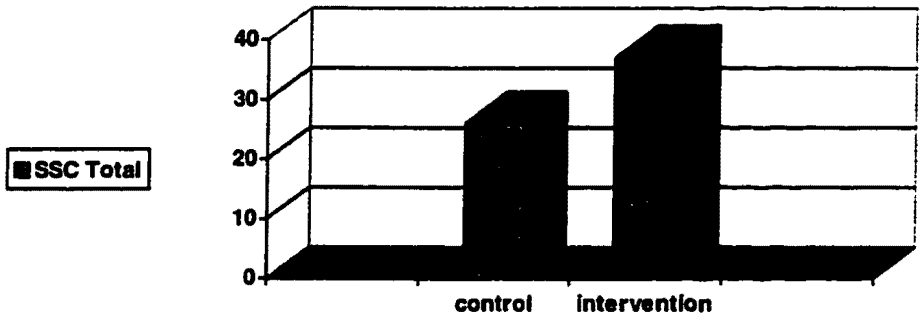
Intervention Outcome Measures

Seasickness Symptom Checklist (SSC). One of the main outcome measures of this study was the intensity and frequency of reported seasickness symptoms. A checklist with thirty-three symptoms related to seasickness was administered after the cruise, asking subjects to rate how often they had experienced each of the symptoms. Scores range from 0 to 165, with 165 being highest endorsement of all symptoms (very seasick).

It was hypothesized that the intervention would decrease reported seasickness symptoms. This was not supported by the data. Although the intervention evidenced a

significant effect on retrospectively reported seasickness symptoms ($r = .55$; $p < ..001$) the result was opposite the hypothesized direction, i.e. the control subjects reported less seasickness than the intervention subjects (see Figure 5).

Figure 5. Intervention effect on Retrospectively Reported Seasickness Symptoms



SSC = Seasickness symptom checklist, total score

One reason for this apparent result of the intervention making the participants more seasick. is that the intervention group underwent a storm at sea, whereas the control group did not. General measures of the state of the seas during the cruise were determined to be invalid, and for reasons which will be discussed later, they could not be co-varied in the analyses. Thus, the average daily seasickness rating was included in the regression analyses with the day of the storm omitted, thereby adjusting for sea state differences.

Daily Seasickness Ratings The intervention was hypothesized to decrease average daily seasickness in terms of the overall intensity and frequency of symptoms. particularly once the day of the storm was removed from the analyses. There were fewer subjects included in these analyses, because fewer people fully completed the daily ratings ($N = 56$), however, the hypothesis was supported. A summary of the results of the regression analyses of the mediator and other variables on the average daily seasickness rating is shown in Table 2.

Table 2. Variables Regressed Upon Daily Average Seasickness Ratings

Variable	Beta weight	t score	significance * p<.05
Demographics			
age	-.052	-.330	.743
gender	.341	2.524	.016
SCS Pre intvtn	.128	.418	.678
Post intvtn	.081	.261	.796
Post cruise	-.245	-1.540	.131
SSE Pre intvtn	.028	1.369	.179
Post intvtn	.024	-1.270	.212
Post cruise	.014	-3.097	.004*
Other Psychosocial			
BVS	.060	-1.372	.178
ASI 1	.081	.592	.557
2	.059	.466	.644
Active coping	.178	-1.987	.054***
Relgs coping	-.250	1.298	.202
Underreporting	-1.920	-1.44	.156
Intervention condition	-1.744	-.262	.064 (w/o gender = .027)*

SCS = self-control schedule. SSE = Seasickness Self-Efficacy Evaluation. BVS = Body vigilance scale. ASI = Anxiety Sensitivity Index. Relgs = Religious. Intvtn = Intervention

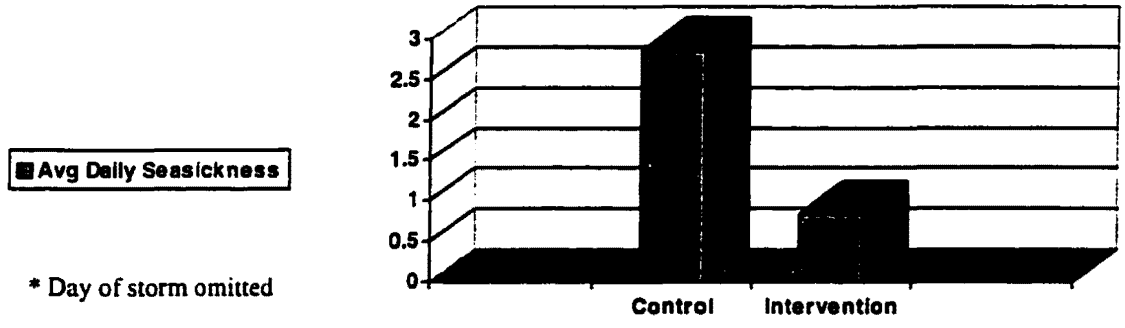
*** While the Active Coping scale evidenced a trend for significance, the overall r squared change value in the regression equation associated with this effect was not significant. Therefore, this finding was not considered in the results.

In examining this table it is clear that gender presents a problem in terms of masking the significance of the intervention. However, the significant effect of gender is most likely due to the disproportionate number of males in the sample, particularly in the sub-sample that completed daily checklists (n females = 8). Because there were so many more males than females; and because the number of females who completed daily checklists were equivalent between the intervention and control groups ($\underline{X}^2$ (2) = 1.63, $\underline{p}$ > .05), gender was removed for the overall analysis of daily seasickness. Removing the effect of gender elucidated the significant effect of the intervention. Age and gender did

not show significant effects on retrospective ratings (see Appendix E for summary of regression analysis). Furthermore, a variable coding compliance to completing daily checklist also did not account for significant variance in terms of seasickness reporting retrospectively. Therefore, we can conclude that although there were gender differences in the subgroup that completed the daily checklist, neither age nor gender were significantly different between the group that completed the daily checklist and the sample overall that completed retrospective ratings. Thus, the effect of the intervention as evidenced by daily seasickness ratings is not likely an artifact of any one characteristic of the sub-sample that completed the daily checklists.

When examining the effect of the intervention on average daily seasickness rating, there was a clear effect of the intervention ($r = .66$; $p < .05$). See Figure 6.

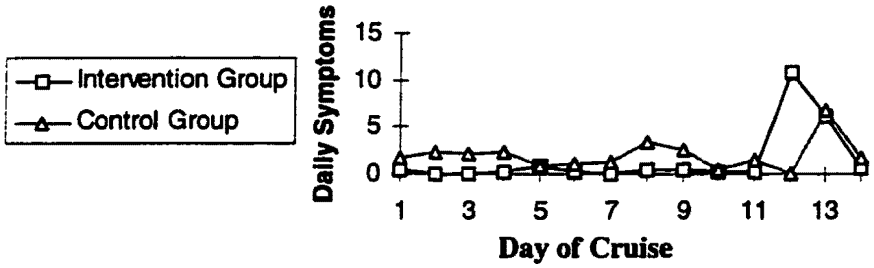
Figure 6. Intervention Effects on Daily Seasickness Ratings*



* Day of storm omitted

Post hoc analyses of the data indicate that daily seasickness symptom ratings were significantly less in the intervention group ($p<.05$) on four days of the cruise (Day 2, 3, 7 and 8) with a trend for significantly less symptoms ($p<.08$) on Days 1 and 4. The only day on which intervention subjects reported more symptoms was the day of the storm (Day 12). For a graphical representation of daily seasickness ratings with the storm day included, see Figure 7.

Figure 7. Daily Ratings of Seasickness Symptoms



Supervisor Ratings Supervisor ratings of performance were used as an adjunct outcome measure, because seasickness has been found to impact performance even when seasickness symptoms are not highly endorsed. Performance, as rated by supervisors was hypothesized to decrease with increased seasickness, and to increase with the intervention. When reported seasickness was not accounted for, the intervention group scored significantly lower, indicating poorer performance, on supervisor ratings ($r = .57$, $p < .001$). However, this effect was eliminated when the amount of reported seasickness was included in the regression equation ($r = .65$, $p = .306$).

As a result of the design of this study, it was not possible to get ratings on individual subjects from different supervisors. Therefore data on inter-rater reliability could not be obtained.

Effects of Hypothesized Mediator Variables

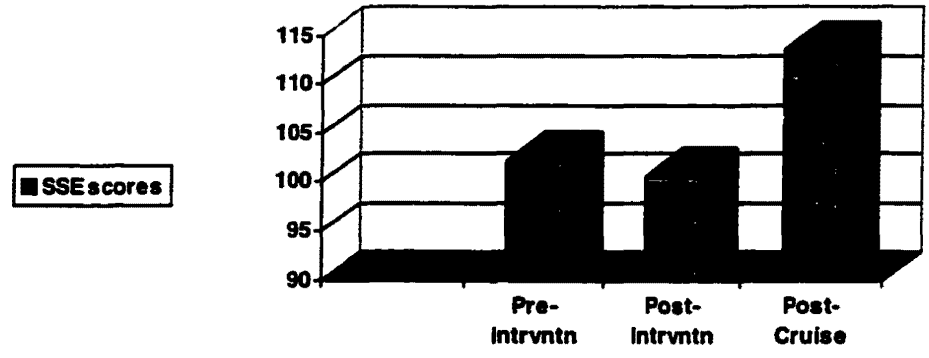
Between Group Effects of Mediator Variables. Three cognitive variables were hypothesized to mediate the experience of seasickness and were the focus of the intervention provided in the study. These included : seasickness self-efficacy (the person's belief that they can deal effectively with seasickness symptoms), self-control (how active the person is in coping with seasickness), and state anxiety (current feelings of anxiousness). If these variables mediated the effect of the intervention there should be

significant differences between groups for post-presentation scores on these measures. There should also be significant group differences in the post-presentation change in scores on these measures, if the pre-intervention measures were comparable.

There were no significant between-group differences at baseline (pre-intervention). Further, the intervention did not appear to produce any significant changes in the proposed mediator variables. There were no significant group differences on self-report questionnaire scores immediately following the intervention. There were also no significant group differences on post-cruise scores. Change scores computed for these measures (pre-post intervention and pre-post cruise) also indicated no significant effect of the intervention. Therefore, we cannot conclude that the intervention had any effect on self-efficacy, self-control behaviors and cognitions or global state anxiety.

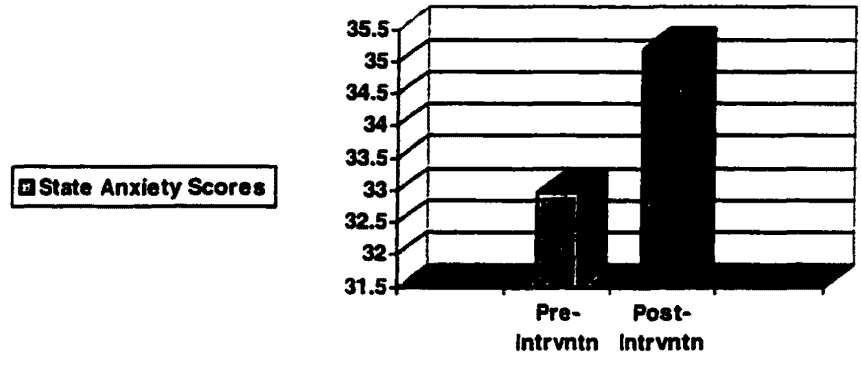
Repeated Measures (Within-Subjects) Effects. Self-efficacy, self-control and anxiety have all been linked to seasickness in the literature. Therefore, while between-group differences were not apparent, within-subjects analyses were done to determine whether measures of these traits changed over time, irrespective of intervention. Analyses indicate significant within subject differences on the seasickness self-efficacy scale (SSE; $F(1, 245) = 4.10$; $p < .05$; Figure 8), indicating that SSE did appear to increase over time, irrespective of intervention.

Figure 8. Seasickness Self-Efficacy (SSE) scores over time



There were also significant within-subject differences on state anxiety (F (1, 245) = 7.58; $p < .01$; Figure 9).

Figure 9: State anxiety scores over time

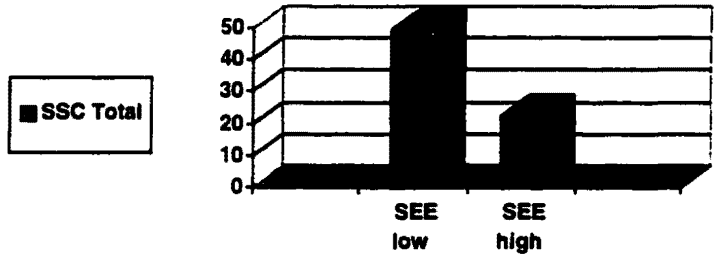


Mediator variables and Within-Subjects Relation to Seasickness

Although there were no between-group differences on the proposed mediator variables. past studies have link self-efficacy, self-control and anxiety with seasickness. Based on this we hypothesized that increased seasickness reporting would be related to low self-efficacy, low self-control scores and high anxiety. Our findings supported the relationship between seasickness self-efficacy (SSE) and self-control style (SCS) and the retrospective report of seasickness (SSC). Anxiety however was not significantly related.

Scores on the post-cruise SSE were significantly related to retrospective reports of seasickness as indicated by scores on the seasickness symptom checklist (SSC; $r = 0.48$; $p < .001$). The graph (Figure 10) below compares seasickness ratings of midshipmen who scored low on the post-cruise SSE (below the median) to midshipmen who scored high on the post-cruise SSE.

Figure 10. Seasickness Self-Efficacy (SSE) Scores and Retrospective Ratings of Seasickness Symptoms

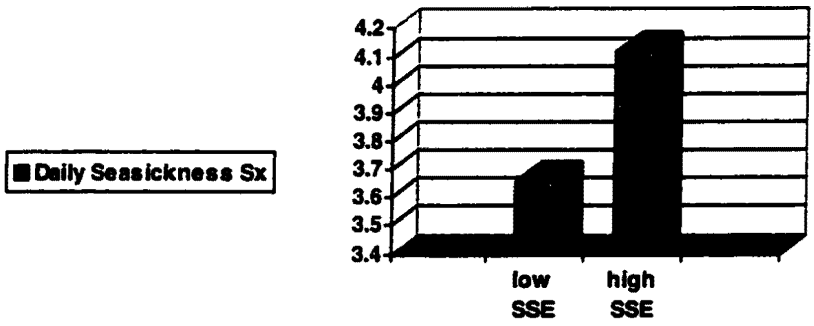


SSC = Seasickness Symptom Checklist, total score

These findings replicate past results in the literature showing that individuals with high seasickness self-efficacy post-cruise generally experienced fewer seasickness symptoms.

SSE was also included in regression analyses on daily average seasickness ratings (see Table 3 above). Post cruise self-efficacy was significantly related to daily average seasickness ratings ($r = .60$; $p < .005$). Figure 11 illustrates the average daily seasickness symptoms (with day of storm omitted) reported in subjects with low post-cruise SSE compared to subjects with high post-cruise SSE (median split).

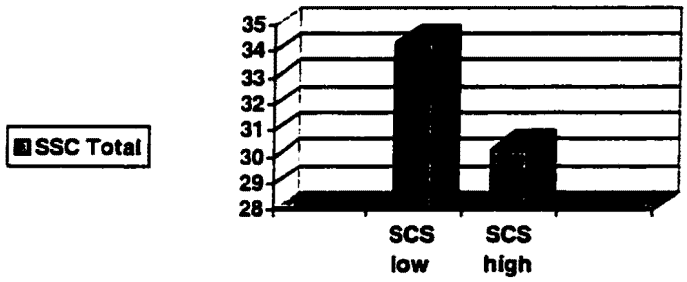
Figure 11. Seasickness Self-Efficacy (SSE) Scores and Daily Ratings of Seasickness Symptoms



SSE = Seasickness Self-Efficacy Evaluation, total score below (low) and above the median (high)

Scores on the post-cruise SCS were also significantly related to scores on the SSC ($r = 0.15$; $p < .05$). The graph (see Figure 12) compares scores on the seasickness symptom checklist with a median split of post-cruise self-control schedule scores.

Figure 12. Post-Cruise Self-Control Schedule (SCS) Scores & Retrospective Seasickness Symptoms



SSC = Seasickness Symptom Checklist, total score; SCS = Self-Control Schedule below (low) & above median (high)

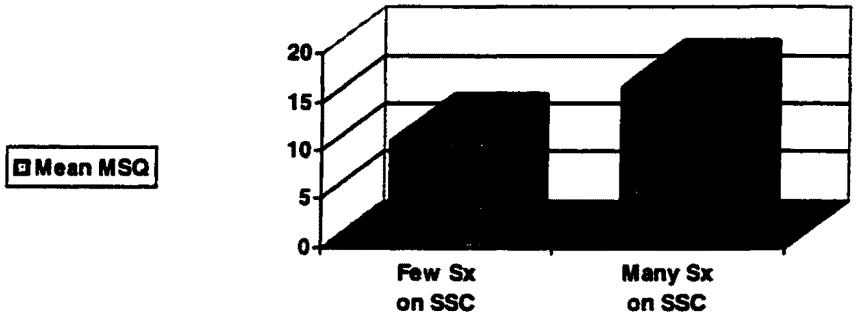
Data again supports general conclusions from the literature, indicating that people who score high on self-control generally experience fewer seasickness symptoms compared to people who score low on self-control.

Predictors of Intervention Outcome

A number of questionnaires were included in this study to examine which variables are related to the experience of seasickness. The strongest predictor of

seasickness in past studies has been the individual's past experience with motion sickness. History of motion sickness, as measured by the MSQ, evidenced a trend in relation to retrospective ratings of seasickness symptoms (SSC; $r = .18$, $p = .06$). The MSQ expresses past use of motion-producing vehicles and the amount of sickness experienced on them as a single numerical value. Larger numbers indicate that the person reported feeling motion sickness at some time in the past (with higher numbers indicating more severe motion sickness. Figure 13 illustrates the difference in MSQ scores for people who endorsed fewer seasickness symptoms compared to the people who endorsed many symptoms (median split).

Figure 13. History of Motion Sickness and Retrospective Seasickness Symptoms



MSQ = Motion Sickness Questionnaire; SSC = Seasickness Symptom Checklist, total score

Scores on the MSQ evidenced a smaller trend in relation to average daily seasickness symptoms reports ($r = .41$; $p = .081$).

Anxiety trait-related variables (STAI-trait, ASI and BVS) were not significantly related to any measures of seasickness. Other character traits, including coping style and tendency to underreport were not related to measures of seasickness either.

Covariates The occurrence of seasickness can be affected by situational environmental factors of being at sea. One of these is sea-state. When the seas are rough,

people are more likely to report seasickness. Midshipmen were asked to rate the sea state at the start of each three-hour watch period. Unfortunately, as mentioned above, the sea state ratings were not deemed reliable, indicating that the sea state measures were not suitable to use as a co-variate. This unreliability was indicated by the fact that a storm on day 12 was widely reported by both midshipmen and officers, but the sea state log entries did not reflect this (average sea state ratings on day 12 were around 2, a rating indicative of small wavelets and light breeze, equivalent to sea state ratings made on all other days of the cruise). Therefore, there was no reliable way to co-vary for the storm when analyzing SSC data. Consequently, for all analyses the average daily seasickness was computed without including the day of the storm (day 12) in order to adjust for confounding effects of the storm.

Medication is another common environmental factor that can impact the experience of seasickness. The Naval Academy encourages midshipmen to begin taking meclizine the day prior to leaving on the cruise. Meclizine is also dispensed on the YP if needed. Midshipmen were asked to record the kind and amount of seasickness medication they had taken on a daily basis. However, the obtained record only indicated whether or not medication had been taken at all on each day. Therefore, average days of medication use was included in the statistical model. Self-reported average medication use was not significantly different between the two conditions regardless of whether or not the storm day was included. We hypothesized that seasickness treatment medication use would be less in the group that received the intervention, because they would have cognitive and behavioral means of dealing with seasickness. There were no significant

differences between the intervention and the control group on reported medication use during the cruise. See Table 3.

Table 3. Reported Medication Use in Intervention and Control Groups

	INTERVENTION GROUP	CONTROL GROUP
Reported "yes" to Medication during Cruise	16 / 50%	10 / 44%
Reported "No" to Medication during Cruise	16 / 50%	12 / 56%
TOTAL	32 / 100%	22 / 100%

The corrected model of regression on daily average seasickness ratings, accounting for medication, still evidenced a significant beneficial effect of the intervention ($F(2,50) = 3.63$; p< 5) with an observed po r of ..645. However, the intervention group continued to demonstrate significantly greater retrospective seasickness ratings, even when medication was co-varied for.

Discussion

Overview

The aim of this study was to determine the effectiveness of a cognitive behavioral intervention in decreasing seasickness. One group of midshipmen on a summer cruise were presented with an intervention designed to increase feelings of self-efficacy and self-confidence regarding management of seasickness symptoms during time at sea. The other group of midshipmen were given a control presentation which did not provide ideas for preventing or ameliorating seasickness. Variables of interest were assessed before the intervention, immediately after the intervention, and after the cruise.

Pre-Intervention differences

The control and intervention groups did not differ significantly, with the exception of age and gender. Age was factored into the analyses and did not make any significant contributions to results. Gender was a more problematic factor, especially because the literature suggests that females generally experience more seasickness than males (Mazel, 1995), which could result in a confounding gender effect. However, gender did not appear to significantly impact the results. As the literature would predict, females on average, irrespective of group, reported more daily seasickness symptoms than males. Results suggested that overall the intervention group evidenced lower average daily seasickness ratings, which could have been an artifact of the significantly smaller proportion of females in the group in comparison with the controls. However, of the subjects that filled out daily seasickness ratings, the number of females in each group was equivalent. Therefore, one would expect that, given that females report more seasickness, the groups would have had equal rates of seasickness. In fact, there were less symptoms reported in the intervention group, and a post hoc comparison of means suggested that the intervention may have had a differential effect on females.. While on average all females in the study reported more retrospective seasickness symptoms than males, females in the intervention group actually reported fewer seasickness symptoms than the average number reported by females overall.

There were no significant differences on psychosocial variables between the two groups when measured prior to the intervention. Questionnaires assessing anxiety traits including anxiety sensitivity, body vigilance and state and trait anxiety did not show any significant pre-intervention differences overall. Also, the hypothesized mediator

variables of self-control and self-efficacy did not show any significant differences prior to the intervention.

Intervention Efficacy

Midshipmen preparing for their summer cruise go through a week of nearly continuous classes and briefings. This constant barrage of information leaves many midshipmen minimally receptive and less attentive to new information. The presentation was made in a multi-media style in an attempt to maintain audience attention. In order to determine the level of attention and interest, the midshipmen were asked to indicate if they felt the presentation was effective in providing new information, if it was too technical or not, and whether or not the presentation kept their attention. Results indicate the midshipmen in the intervention group rated their presentation as more attention keeping and informative in terms of useful information, than the control group. These results indicate that the intervention presentation was successful to some degree in getting the midshipmen's attention and in conveying useful information.

As a measure of how much of this information was actually retained, the midshipmen took a short quiz with questions that were designed to measure general knowledge of seasickness-related material, but were also based on specific information included in the seasickness lecture. Midshipmen in the intervention group answered more of these questions correctly on average than midshipmen in the control group. If the intervention had presented information on seasickness that was already common knowledge, the scores of the intervention group should be equivalent to scores in the control group. Since subjects in the intervention group scored higher, it is likely that the intervention presentation provided some information that was new to the midshipmen.

Overall, the results on this questionnaire support the internal validity of the psychoeducational nature of the intervention.

The specific content and focus of the seasickness presentation should be discussed here, because post hoc examination of content highlighted some possible weaknesses in content. The intervention was designed to "normalize" the experience of seasickness, stressing that "everyone" gets seasick at some point and that everyone has the ability to deal with these symptoms. Statistics were presented to support this (i.e. high percentages of seasickness occurrence in operational populations in worst case scenarios like storms). While this information may normalize the experience of seasickness, this information may also sensitize some people to seasickness. Young adults are generally of the "it won't happen to me" mindset (Eiser & Hoepfner, 1991; Greening & Chandler, 1997). Thus, providing overwhelming proof that seasickness happens to everyone may have been more doom-saying than comforting. The literature indicates that the occurrence of seasickness also is highly suggestible (Money, 1970; Mazel, 1995). This is important to keep in mind when the intervention appears to create seasickness.

Another aspect of the intervention that may have been counterproductive is the focus on active coping strategies and self-control. In the junior midshipmen population the common coping skill is not likely to be an active, self-initiated one. Midshipmen are under a great deal of supervision and regulation, making it more likely that any coping they do is, by design, more passive. Further, military populations in general are not given to cogitate over feelings, but are more likely to "suck it up", tough out the situation, put discomfort out of mind and go on with the job. Empirical studies indicate that successful military members avoid emotion focused coping (Svennsson, Angelborg-Thanderz, &

Sjoeberg, 1993); however, studies also indicate that active coping and self-control should be preferred ways of coping in the military (Clemson, 1996), and that was not the case with the midshipmen in this study. This intervention could be conceptualized as encouraging the opposite of the stereotypic military coping approach. Trying to change methods of coping when current coping methods are well adapted to the micro-environment (even if they are not desirable on a macro level) may make the individual worse, especially since the information provided encourages behavior that is counter to the learned adaptive strategies up to this point (Goldfried, 1980).

There were also limitations with the dos and don'ts cards provided with the intervention, particularly with their ability to "stand alone".. Without the intervention presentation, some of the techniques were ambiguously written. For example, "Do...attempt to match up or decrease conflicting sources of information reaching the brain (i.e. looking at horizon, closing eyes)." Someone unfamiliar with how to deal with seasickness would not know whether to close their eyes, or to look at the horizon, and which would be more efficacious at what time. Some of these dos and don'ts also may not be applicable to many sub-populations within the Navy, for example "Don't...spend all your time below deck" may not be a reasonable suggestion for many carrier personnel, who ε required to spend days low deck. Finally, the et suggestions (e.g. eating fresh vegetables, less fried foods) may be problematic since the variety of food available on board a military ship is determined by what is available in the ship's mess, which may not be accommodating to these kind of diet changes. The dos and don'ts techniques should be reviewed and revised specifically for any population used in later studies so as to avoid ambiguity and inapplicable statements.

Post-Intervention

Immediately following the thirty minute presentation, the subjects were given the questionnaires they had been given prior to the intervention, including the state anxiety index (STAI-state), the anxiety sensitivity index (ASI), the seasickness self-efficacy scale (SSE), and the self-control schedule (SCS). This was done to determine if the intervention had any immediate effects on the proposed mediator variables. There were no significant differences immediately post-intervention on these scales. Unfortunately, given the short time between the pre and post measurements, most midshipmen remembered the questionnaires well. Many commented to the experimenter a misunderstanding of why they had to fill out the same questionnaires. Some openly stated that they remembered the questionnaire and were going to use the same answers they gave the first time. Subjects were instructed to think about the questions in light of the information they had been presented, but this was not stressed for fear of creating an experimenter demand driven effect of intervention as opposed to a change in attitude brought about by actual information from the presentation. This is clearly a design limitation which should be remedied in future studies.

During Cruise Measures

Outcome measures taken during the cruise included daily checklists with questions regarding seasickness symptoms and medication use, supervisor ratings, and sea-state ratings. Data gained from the outcome measures completed during the cruise were less than optimal. The problem of compliance may be due, in part, to the nature of the training exercise. The two-week training cruise is designed as an intensive activity to expose midshipmen fully to applied seamanship and navigation skills. Like many

military training populations, the midshipmen have little free time, and the free time they do have is usually spent catching up on sleep. Thus, it is not surprising that the compliance with making voluntary ratings was low. Subject compliance overall can be increased by decreasing the amount of information requested from the subject. A little over 1/5 of the sample completed daily ratings, and less than ½ of the sample was rated by supervisors. Of these ratings there is really no way of determining how many subjects simply made the ratings for all 14 days retrospectively when they were asked to turn in their ratings at the debriefing.

Another possible confound in the compliance to daily checklists, is that recording daily information on seasickness symptoms necessarily increases the individual's attention to bodily symptoms on an ongoing basis. The literature suggests that increased visceral or interoceptive attention may worsen the experience of seasickness (Corriera & Guedry, 1967; Guedry, 1964;Wendt, 1948). Subjects may not have wanted to record daily symptoms in order to avoid exacerbating the seasickness.

Further, if the common coping style for the military regarding sickness is to ignore the symptoms and get to work, daily record keeping of symptoms is likely to be counter to their coping strategies, and therefore not engaged in. Overall then, it is not surprising that compliance was low, and it is possible that compliance with the record keeping may actually increase seasickness. This is less likely to result in between-group differences in this experiment however, because both control subjects and intervention subjects were asked to catalogue their symptoms. Thus, both groups would be prone to increased seasickness as a result of increased interoception. To account for this possibility, compliance to treatment in terms of filling out the daily checklists was

included in the statistical analyses. Actually filling out the daily ratings did not significantly affect seasickness ratings retrospectively or a daily basis. Another way to have accounted for the question of sensitization to symptoms may have been to include a measurement control group, a group of individuals who just filled out the questionnaires and nothing else.

Sea-state ratings were particularly unreliable, and they are generally not kept on training cruises. In light of the other log work that needed to be done on the bridge of the training ships, it is likely the sea-state logs were generally forgotten. The logs turned in were probably done retrospectively and arbitrarily (most of the log ratings consisted of the number 2 across the page for two or three lines straight). Future studies may circumvent this shortcoming by using populations on larger ships where extensive sea-state information is recorded as part of the daily procedure.

It is clear that naturalistic variables in this study, such as the sea state, presented limitations to the conclusions that could be drawn. Another way to decrease the effect of sea state in the future would be to randomize subjects so that some subjects from the control group and some from the intervention group would be on each YP; or perhaps half of the YPs in one squadron receive the intervention presentation, and half of the squadron receive the control presentation. In this way, control and intervention subjects would be experiencing the same sea state. This would increase the likelihood that intervention subjects would discuss strategies with control subjects, but it would address the problems with sea state.

Medications were another co-variate considered in this study. Overall, forty four percent of subjects in the control condition reported use of medication *at some point*

during the cruise and fifty percent of subjects in the intervention group reported use of medication *at some point.*. This provides some indirect support for the hypothesis of decreased medication use in the intervention group, because although reported seasickness was significantly greater in the intervention group (on day 12 specifically, and on the retrospective ratings after the cruise), there were no significant differences between the groups in overall medication use. Direct support for decreased medication use in the intervention group was not possible from the data that was obtained. However, in future studies, medication use could have been measured more reliably by recording a count of the total meclizine pills each individual was given at the start of the cruise, and then counting the remaining pills turned in by each individual at the end of the cruise.

Post-Cruise differences

Of the psychosocial variables assessed, only scores on the MSQ showed a trend for being significantly related to reported seasickness. While this trend is in the direction of the literature (more experience with motion and less seasickness is correlated with less seasickness currently), one might question why the effect was not fully significant. One reason for the non-significant finding could be carelessness in responding on the part of some subjects. For example, some subjects indicated that they had been in a car between 0 and 3 times in their life. This led to lower than expected MSQ scores, because it is not likely in typical US society a person would have that little exposure to motion vehicles (especially automobiles). Another reason for the non-significant effect might have been that the intervention decreased seasickness, and was particularly salient for those people who knew first hand what motion sickness was like (based on past exposure).

The finding that none of the proposed predictor variables were related to seasickness symptom reports was problematic. One explanation for this may be that the self-report questionnaires used were not sensitive for "normal" individuals, as many questionnaires (i.e. ASI, BVS) were developed on and used for populations with Axis I anxiety diagnoses. It may have been useful to use other susceptibility measures with variables that appear more objective or physiologically based. One such variable that fulfills this requirement is the perceptual style of field dependence. Studies determining field-dependency using the Rod and Frame test (RFT) have shown that field-independence is significantly related to reported motion sickness, and that this perceptual style is a relatively enduring characteristic (Barrett & Thornton, 1968). Individuals who are field-independent in perceptual style are more likely to experience seasickness because they are more aware of conflicts between sensory cues. Unfortunately, the way the protocol for the current study was designed it would not have been feasible to administer the RFT, and paper and pencil tests hypothesized to measure field dependence (i.e. the Embedded Figures Test; Barrett, Cabe & Thornton, 1968) have not shown a similarly significant relationship with seasickness. Field dependence traits might also affect whether subjects would do better to go on deck and look at the horizon or to close their eyes to reduce seasickness (therefore, the dos and don'ts techniques might change based on individual characteristics).

Overall, based on retrospective reports of seasickness symptoms, the control group reported significantly fewer seasickness symptoms than the intervention group. This is most likely due to the fact that the intervention group underwent a storm at sea on the twelfth day of the cruise, whereas the control group did not. Another possible reason

for the increased seasickness would be if the intervention, instead of normalizing seasickness, actually sensitized subjects toward the experience of seasickness, as discussed above.

In order to examine the effect of the intervention without the confound of the storm, daily average seasickness ratings were examined. Although the sample size for these data was markedly smaller (N= 56 out of 247), results indicated that the intervention group reported fewer seasickness symptoms than the control group. This was a large effect size ($\underline{d} = 0.78$). An informal, post hoc analyses of the data (see Figure 7) indicated that in general, the intervention group reported fewer symptoms of seasickness for the first nine days of the cruise, at which point the groups began to report similar numbers of symptoms, close to 0. The groups remained comparably low until day 12, the day of the storm, when the intervention group reported a high number of symptoms. On the last two days of the cruise however, the symptom report by groups was again comparable. This informal look at the data supports what the literature suggests, that over time individuals will acclimate to being at sea. However, the data also suggest that the subjects who received the intervention appeared to acclimate more quickly than the control subjects. Around day 9 and 10 the subjects in the control group had reached the level of acclimation that the intervention subjects experienced from day one. Once acclimated to being at sea, both groups evidenced equivalently low rates of reported symptoms until the storm. Then, after the storm passed, the intervention group again returned to reporting symptom levels equivalent of those in the non-storm, control group.

What was the mechanism of this change? The hypothesized mechanism for this change, as evidenced in Eden and Zuk's study, was a change in self-efficacy, or as evidenced in Rosenbaum's work, a change in perceived self-control. In the present study, self-control did not increase over time, ratings of seasickness self-efficacy increased post-cruise, and post-cruise measures of self-efficacy and self-control were both related to seasickness reports in both groups. Subjects with low self-efficacy reported more seasickness symptoms than subjects with high self-efficacy. It is interesting to note that in this study, in the case of daily average seasickness ratings, higher seasickness self-efficacy was related to higher daily seasickness scores (see Figure 11). Although this difference is not large, it is statistically significant and may suggest that individuals who are aware of their own ability to deal with seasickness are also more willing to make daily ratings of seasickness-related information. However, overall, the findings in the present study were consistent with findings by Eden and Zuk (1995). Furthermore. subjects with low self-control report more seasickness symptoms, findings which are consistent with findings by Rosenbaum (1980).

While intervention, self-efficacy and self-control were individually related to seasickness symptoms, the intervention was not significantly associated with either self efficacy or self-control. This suggests that the intervention did not affect existing levels of self-efficacy or self-control beliefs. This leads to the questions of what does affect self-efficacy, and how can cognitive interventions (or other factors) influence self-efficacy?

To answer these questions one can look to two sources. The first of these is the study by Eden and Zuk (1995) which appears to have demonstrated a cognitive

intervention effect on self-efficacy, specifically for seasickness. The latter is to look at more general studies on modeling, behavior change and self-efficacy. In their study, Eden and Zuk used false feedback of high SSE scores. This may have provided subjects with an objective "proof" of their abilities (i.e. they did not have to take the presenter's word for it that they could overcome seasickness, they had the test results as well). Feedback on test scores was not provided in the current study. Another salient differences between the present study and the Eden and Zuk study, was the presenter of the intervention. The presenter in Eden and Zuk study was a male commander in direct command of the cadets, with perceived (and most likely realistic) experience at sea. This was a highly credible source for the cadets. In this study, the presenter was a young, female, lower ranking officer, without any reported experience at sea, and not in the direct chain of command for the midshipmen. Most likely, this presenter was perceived by the target audience as a less credible source to be presenting a briefing on seasickness. Studies have shown that similarity of the model (particularly related to gender) increases greater change in subjects (Kazdin, 1974). This supports the idea that the presenter or model can be of great importance in changing behavior, and possibly self-efficacy. It is likely that in this intervention, the information was just as useful as in the presentation by Eden and Zuk (1995). However, self-efficacy may not have been affected because the model was not perceived as efficacious to begin with.

Adjunct measures of outcome included in the study were medication use and performance as rated by supervisors. Medication use was the same between the two groups. Because of the significant increase in symptoms during the storm in the intervention group, we would expect increased use of medication in that group. Since

medication rates remained the same, this suggests that the intervention may have decreased medication use in the intervention group. This provides some support for the efficacy of the intervention because although symptom report was higher in the intervention group, there was no corresponding increase in medication use. Also, the number of subjects who filled out daily checklist/medication information was small. A larger N may have brought out larger (and possibly significant) group differences on medication use.

After amount of seasickness and gender were accounted for there were no significant effects of the intervention on supervisor ratings. However, neither gender nor reported seasickness was significantly related to supervisor ratings. Thus, this lack of difference between groups on supervisor ratings offers some support for the intervention because despite the storm and increased seasickness, performance ratings for the intervention group did not show a decline. Another way to assess supervisor ratings may have been to ask if they felt performance decreased as a function of seasickness. If the intervention decreased the effect of seasickness on performance. then supervisors from the intervention group may report less subjective perception of a decline than supervisors in the control group ships. It is likely that many supervisors would agree that seasickness had a salient adverse effect on performance.

Summary and Conclusions

- Seasickness occurs frequently enough to be an operational concern of the Navy. Furthermore, seasickness can be a chronically occurring condition.
- The conventional treatment for seasickness has been medications and both anticholinergic and antihistaminergic types of pharmaceuticals have been used.

Medications have side effects which can prove as adverse for some people as the seasickness itself. Medications can also impact operational performance (e.g.. sleepiness caused by antihistamines).

- Strong support has been shown over the years for the impact of cognitive variables on the occurrence of seasickness. Anxiety, self-efficacy and self-control have been related to seasickness and motion sickness symptoms.
- The intervention in this study was designed to examine the malleability of the cognitive factors affecting seasickness by targeting the self-efficacy beliefs of one group and not the other.
- Results of this intervention were confounded by the naturalistic environmental aspects of the study. In this case the intervention group experienced a storm at sea whereas the control group did not.
- Overall however, we can conclude that the cognitive intervention was efficacious in reducing daily average seasickness ratings. We can further hypothesize that the intervention may have affected the use of medication by the intervention group, as the overall medication use between the two groups was not significantly different even with the day of the storm included in analyses.
- Finally, the cost of the intervention was very low. If this intervention were provided as part of the operational training briefings that the midshipmen go through in the course of their training for the YPs, the cost would be minimal. This presentation could be done by a commanding officers trained by the base psychologist, decreasing the cost further. Overall, it appears that providing this intervention would be a cost-effective way to ameliorate seasickness.

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APPENDICES

APPENDIX A: Questionnaires

- Note: The questionnaires in the appendix are copies of the original forms used in the study. The forms used in the study were printed on special forms designed for computer scoring provided by a testing service. These forms cannot be scored if photocopied, and this is why the answer bubbles may appear too light to read. Furthermore, these questionnaires may not accurately reflect the original instruments. Some items from the original sources may have been deleted or revised. To obtain the original questionnaires, please see the primary references for each assessment instrument in the body of this paper (See Methods, starting page 34).

DAILY SYMPTOM AND PERFORMANCE CHECKLIST

CODE: _____

Date:_____

Rate the severity of the following symptoms
on a scale of 0 to 5, 0=no symptoms, 5 = strong symptoms
nausea
0 1 2 3 4 5
need to vomit
0 1 2 3 4 5
cold sweat
0 1 2 3 4 5
dizziness
0 1 2 3 4 5
disorientation
0 1 2 3 4 5
headache
0 1 2 3 4 5
fatigue
0 1 2 3 4 5
physical or psychological uneasiness/discomfort
0 1 2 3 4 5

Rate your general feeling of well being, 0 = "I feel fine" and
10 = "I feel awful, just like I'm going to vomit" :
0 1 2 3 4 5 6 7 8 9 10

Rate your level of activity while seasick (as compared to the activity
you would engage in during a normal day at sea).
Not active 0 1 2 3 4 5 more active

Rate your ability to concentrate or to solve problems while seasick
no difficulty 0 1 2 3 4 5 not able to concentrate at all

On a scale of 0 to 10, with 0 = very depressed, 10 = very happy
(5 being so/so or "average") how would you rate your mood:
0 1 2 3 4 5 6 7 8 9 10

Rate the quality of your performance today:
poor 0 1 2 3 4 5 above average

Medication: y n Type: Dosage:

Behavioral techniques: y n Type: __ postural/decreased movement
__ diet/drinking/smoking
__ decreasing conflict
Cognitive techniques: y n Type: __ attentional focus
__ acceptance
__ attributions/expectations

Date: _____

Rate the severity of the following symptoms
on a scale of 0 to 5, 0 = no symptoms, 5 = strong symptoms:
nausea
0 1 2 3 4 5
need to vomit
0 1 2 3 4 5
cold sweat
0 1 2 3 4 5
dizziness
0 1 2 3 4 5
disorientation
0 1 2 3 4 5
headache
0 1 2 3 4 5
fatigue
0 1 2 3 4 5
physical or psychological uneasiness/discomfort
0 1 2 3 4 5

Rate your general feeling of well being, 0 = "I feel fine" and
10= "I feel awful, just like I'm going to vomit":
0 1 2 3 4 5 6 7 8 9 10

Rate your level of activity while seasick (as compared to the activity
you would engage in during a normal day at sea).
Not active 0 1 2 3 4 5 more active

Rate your ability to concentrate or to solve problems while seasick:
no difficulty 0 1 2 3 45 not able to concentrate at all

On a scale of 0 to 10, with 0 = very depressed, 10 = very happy
(5 being so/so or "average") how would you rate your mood:
0 1 2 3 4 5 6 7 8 9 10

Rate the quality of your performance today:
poor 0 1 2 3 4 5 above average

Medication: y n Type: Dosage:

Behavioral techniques: y n Type: __ postural/decreased movement
__ diet/drinking/smoking
__ decreasing conflict
Cognitive techniques: y n Type: __ attentional focus
__ acceptance
__ attributions/expectations

Subject ID			

Seasickness Symptom Checklist

Directions:

Fill in circles completely.
Erase errors completely.
Keep within boxes.
Do NOT make any stray marks.
Do NOT fold.

Acceptable marks: ● ●

This is a machine readable form. Please do not fold or make extraneous marks.

Use ONLY a #2 pencil
Erase cleanly

Answer the following items based upon your last cruise. Below there is a list of symptoms and sensations that may occur due to seasickness. On a scale of 0 to 5; **0 = no symptom/sensation, 5 = experienced symptom/sensation to the fullest**, to what extent did you experience each of these sensations. Fill in the bubble corresponding to your response.

1. vomiting
2. spasms as before vomiting (i.e. retching/throat spasms)
3. nausea
4. increased salivation
5. perspiring
6. drowsiness
7. yawning
8. stomach discomfort
9. loss of appetite
10. burping
11. need to have bowel movement
12. depression or bad mood
13. apathy (not caring)
14. headache
15. dizziness with eyes open
16. dizziness with eyes closed
17. general discomfort
18. boredom
19. heavy head (tired or sore neck)
20. blurred vision
21. disorientation
22. reduced salivation
23. faintness
24. heavy breathing/hyperventilation
25. confusion
26. physical fatigue
27. mental fatigue
28. increased sweating
29. smoking more than usual
30. desire for specific food (food cravings)
31. anxiety/frustration from closed spaces
32. annoyance at people around you
33. tendency to become angry

Subject ID

SSE Evaluation

Directions:

Fill in circles completely.
Erase errors completely.
Keep within boxes.
Do NOT make any stray marks.
Do NOT fold.

Acceptable marks

This is a machine readable form. Please do not fold or make extraneous marks.

Use ONLY a #2 pencil
Erase cleanly

Different people evaluate their ability to deal with different things in different wasy. Read each of the statements below and fill in the bubble which best describes your ability to overcome seasickness, and your ability to perform while working at sea.

Note: At the end of each item add the words: "even though I may feel ill at sea". For example: Item 1 : "I can maintain a good appetite...even though I may feel ill at sea."

Item	Rating: I don't have the ability									I can perform very well
1. I can maintain a good appetite	○	○	○	○	○	○	○	○	○	○
2. I can maintain a high morale	○	○	○	○	○	○	○	○	○	○
3. I can be alert	○	○	○	○	○	○	○	○	○	○
4. I can be active	○	○	○	○	○	○	○	○	○	○
5. I can remain interested in my work	○	○	○	○	○	○	○	○	○	○
6. I can overcome physical fatigue	○	○	○	○	○	○	○	○	○	○
7. I can overcome mental fatigue	○	○	○	○	○	○	○	○	○	○
8. I can overcome seasickness	○	○	○	○	○	○	○	○	○	○
9. I can perform tasks requiring attention	○	○	○	○	○	○	○	○	○	○
10. I can perform stressful tasks	○	○	○	○	○	○	○	○	○	○
11. I can perform tasks requiring accuracy	○	○	○	○	○	○	○	○	○	○
12. I can peform tasks requiring alertness	○	○	○	○	○	○	○	○	○	○
13. I can perform tasks requiring physical effort	○	○	○	○	○	○	○	○	○	○
14. I can perform organizational tasks	○	○	○	○	○	○	○	○	○	○
15. I can perform well at sea	○	○	○	○	○	○	○	○	○	○
16. I can respond well to situations as they develop (i.e. I can think on my feet)	○	○	○	○	○	○	○	○	○	○

17. How high would you rate your ability to deal with seasickness compared to other midshipmen:

bottom 10% ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ top 10%

18. How do you feel your commanding officers would rate your ability to perform despite feeling sick at sea:

very low ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very high

Administration: ○ ○ ○

Subject ID

Self Control Schedule

Directions:

Fill in circles completely.
Erase errors completely.
Keep within boxes.
Do NOT make any stray marks.
Do NOT fold.

Acceptable marks

This is a machine readable form. Please do not fold or make extraneous marks.

Use ONLY a #2 pencil
Erase cleanly

Indicate how characteristic or descriptive each of the following statements is of you by using the code below:

+3 = very characteristic of me
+2 = rather characteristic of me
+1 = somewhat characteristic of me
-1 = somewhat uncharacteristic of me
-2 = rather uncharacteristic of me
-3 = very uncharacteristic of me

Thank you for your cooperation.

1. When I do a boring job, I think about the less boring parts of the job and about the reward I will receive when I finish.
2. When I have to do something that makes me anxious, I try to visualize how I will overcome my anxiety while doing it.
3. By changing my way of thinking, I am often able to change my feelings about almost anything.
4. I often find it difficult to overcome my feelings of nervousness and tension without outside help.
5. When I am feeling depressed, I try to think about pleasant events.
6. I cannot help thinking about mistakes I made.
7. When I am faced with a difficult problem, I try to approach it in a systematic way.
8. I usually do what I am supposed to more quickly when someone is pressuring me.
9. When I am faced with a difficult decision, I prefer to postpone it even if I have all the facts.
10. When I have difficulty concentrating on my reading I look for ways to increase my concentration.
11. When I plan to work, I remove everything that is not relevant to my work.
12. When I try to get rid of a bad habit, I first try to find out all the reasons why I have the habit.
13. When an unpleasant thought is bothering me, I try to think about something pleasant.
14. If I smoked two packs of cigarettes a day, I would need outside help to stop smoking.
15. When I feel down, I try to act cheerful so that my mood will change.
16. If I have tranquilizers with me, I would take one whenever I feel tense and nervous.
17. When I am depressed, I try to keep myself busy with things I like.

Subject ID

Self Control Schedule (continued)

Directions:

Fill in circles completely.
Erase errors completely.
Keep within boxes.
Do NOT make any stray marks.
Do NOT fold.

Acceptable marks

This is a machine readable form. Please do not fold or make extraneous marks.

Use ONLY a #2 pencil
Erase cleanly

Indicate how characteristic or descriptive each of the following statements is of you by using the code below:

+3 = very characteristic of me
+2 = rather characteristic of me
+1 = somewhat characteristic of me
-1 = somewhat uncharacteristic of me
-2 = rather uncharacteristic of me
-3 = very uncharacteristic of me

Thank you for your cooperation.

18. I tend to postpone unpleasant tasks even if I could perform them immediately.	○ ○ ○ ○ ○ ○
19. I need outside help to get rid of some of my bad habits.	○ ○ ○ ○ ○ ○
20. when I find it difficult to settle down and do a task, I look for ways to help me settle down.	○ ○ ○ ○ ○ ○
21. Although it makes me feel bad, I cannot help thinking about all sorts of possible catastrophes.	○ ○ ○ ○ ○ ○
22. I prefer to finish a job that I have to do before I start doing things I really like.	○ ○ ○ ○ ○ ○
23. When I feel physical pain, I try not to think about it.	○ ○ ○ ○ ○ ○
24. My self-esteem increases when I am able to overcome a bad habit.	○ ○ ○ ○ ○
25. To overcome bad feelings that accompany failure, I often tell myself that it is not catastrophic and I can do anything.	○ ○ ○ ○ ○ ○
26. When I feel that I am too impulsive, I tell myself to stop and think before I do something about it.	○ ○ ○ ○ ○ ○
27. Even when I am terribly angry at someone I consider my actions carefully.	○ ○ ○ ○ ○ ○
28. Facing the need to make a decision, I usually look for different alternatives instead of deciding quickly and spontaneously.	○ ○ ○ ○ ○ ○
29. Usually, I first do the thing I really like to do even if there are more urgent things to do.	○ ○ ○ ○ ○ ○
30. When I realize that I am going to be unavoidably late for an important meeting, I tell myself to keep calm.	○ ○ ○ ○ ○ ○
31. When I feel pain in my body, I try to divert my thoughts from it.	○ ○ ○ ○ ○ ○
32. When I am faced with a number of things to do, I usually plan my work.	○ ○ ○ ○ ○ ○
33. When I am short of money, I decide to record all my expenses in order to budget more carefully in the future.	○ ○ ○ ○ ○ ○
34. If I find it difficult to concentrate on a task I divide it into smaller segments.	○ ○ ○ ○ ○ ○
35. Quite often I cannot overcome unpleasant thoughts that bother me.	○ ○ ○ ○ ○ ○
36. When I am hungry and I have no opportunity to eat, I try to divert my thoughts from my stomach or try to imagine that I am satisfied.	○ ○ ○ ○ ○ ○

Administration ○ ○ ○

Subject ID

STAI-1

Directions:

Fill in circles completely.
Erase errors completely.
Keep within boxes.
Do NOT make any stray marks.
Do NOT fold.

Acceptable marks

This is a machine readable form. Please do not fold or make extraneous marks.

Use ONLY a #2 pencil
Erase cleanly

A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *feel* right now, that is, ***at this moment***. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	○	○	○	○
2. I feel secure	○	○	○	○
3. I am tense	○	○	○	○
4. I am regretful	○	○	○	○
5. I feel at ease	○	○	○	○
6. I feel upset	○	○	○	○
7. I am presently worrying over possible misfortunes	○	○	○	○
8. I feel rested	○	○	○	○
9. I feel anxious	○	○	○	○
10. I feel comfortable	○	○	○	○
11. I feel self-confident	○	○	○	○
12. I feel nervous	○	○	○	○
13. I am jittery	○	○	○	○
14. I feel "high strung"	○	○	○	○
15. I am relaxed	○	○	○	○
16. I am content	○	○	○	○
17. I am worried	○	○	○	○
18. I feel over-excited and "rattled"	○	○	○	○
19. I feel joyful	○	○	○	○
20. I feel pleasant	○	○	○	○

Administration: ○ ○ ○

Subject ID

Motion Sickness Questionnaire

Directions:

Fill in circles completely.
Erase errors completely.
Keep within boxes.
Do NOT make any stray marks.
Do NOT fold.

Acceptable marks

This is a machine readable form. Please do not fold or make extraneous marks.

Use ONLY a #2 pencil
Erase cleanly

This questionnaire is designed to find out (a) how susceptible to motion sickness you are, and (b) what sorts of motion are most effective in causing that sickness. Answer these questions regarding the **last 10 years.**

	cars	buses or coaches	trains	airplanes	small boats	larger ships	swings	merry-go-rounds	carnival rides
Indicate approximately how often you have travelled on each type (over the last 10 years) by using one of the following choices: 0 = no experience 1 = less than 5 trips 2 = between 5 and 10 trips 3 = more than 10 trips	○	○	○	○	○	○	○	○	○

Considering only the types of transport that you have marked 1, 2, or 3 (i.e. those that you have traveled on), go on to answer the two questions below: (use the following to indicate your response):
0 = never 1= rarely 2 = sometimes 3= frequently 4= always

How often have you felt sick (i.e. queasy or nauseated) while travelling?	○	○	○	○	○	○	○	○	○
How often were you actually sick (i.e. vomitting) while travelling?	○	○	○	○	○	○	○	○	○

STAI-2

Subject ID

Directions:

Fill in circles completely.
Erase errors completely.
Keep within boxes.
Do NOT make any stray marks.
Do NOT fold.

Acceptable marks

This is a machine readable form. Please do not fold or make extraneous marks.

Use ONLY a #2 pencil
Erase cleanly

A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you ***generally feel***. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
21. I feel pleasant	○	○	○	○
22. I tire quickly	○	○	○	○
23. I feel like crying	○	○	○	○
24. I wish I could be as happy as others seem to be	○	○	○	○
25. I am losing out on things because I can't make up my mind soon enough	○	○	○	○
26. I feel rested	○	○	○	○
27. I am "calm, cool, and collected"	○	○	○	○
28. I feel that difficulties are piling up so that I cannot overcome them	○	○	○	○
29. I worry too much over something that really doesn't matter	○	○	○	○
30. I am happy	○	○	○	○
31. I am inclined to take things hard	○	○	○	○
32. I lack self-confidence	○	○	○	○
33. I feel secure	○	○	○	○
34. I try to avoid facing crisis or difficulty	○	○	○	○
35. I feel blue	○	○	○	○
36. I am content	○	○	○	○
37. Some unimportant thought runs through my mind and bothers me	○	○	○	○
38. I take disappointments so keenly that I can't put them out of my mind	○	○	○	○
39. I am a steady person	○	○	○	○
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	○	○	○	○

Administration: ○ ○ ○

Subject ID

COPE Inventory

Directions:

Fill in circles completely.
Erase errors completely.
Keep within boxes.
Do NOT make any stray marks.
Do NOT fold.

Acceptable marks

This is a machine readable form. Please do not fold or make extraneous marks.

Use ONLY a #2 pencil
Erase cleanly

Each person confronts difficult or stressful situations in different ways. This questionnaire asks you to indicate what you generally do and feel when you experience stressful events. There are no right or wrong answers and response sshould reflect what you do as an individual, not what you think most people would do. For each item choose one of the following: "I usually don't do this at all", " I usually do this a little bit", "I usually do this a medium amount" or "I usually do this alot".

	not at all	a little bit	a medium amount	a lot
1. I take additional action to try to get rid of the problem.	○	○	○	○
2. I seek God's help.	○	○	○	○
3. I concentrate my efforts on doing something about it.	○	○	○	○
4. I put my trust in God.	○	○	○	○
5. I do what has to be done. one step at a time.	○	○	○	○
6. I try to find more comfort in my religion.	○	○	○	○
7. I take direct action to solve the problem.	○	○	○	○
8. I pray more than usual.	○	○	○	○

BVS

Subject ID

Directions:

Fill in circles completely.
Erase errors completely.
Keep within boxes.
Do NOT make any stray marks.
Do NOT fold.

Acceptable marks

This is a machine readable form. Please do not fold or make extraneous marks.

Use ONLY a #2 pencil
Erase cleanly

This measure is designed to index how sensitive you are to internal bodily sensations such as heart palpitations or dizziness. Fill it out according to how you have been for the **past week.**

1. I am the kind of person who pays close attention to internal bodily sensations.

Not at all Like Me — Moderately Like Me — Extremely Like Me

2. I am very sensitive to changes in my internal bodily sensations.

Not at all Like Me — Moderately Like Me — Extremely Like Me

3. On average, how much time to do you spend each day "scanning" your body for sensations (e.g., sweating, heart palpitations, dizziness)?

No Time — Half of the Time — All of the Time

4. Rate how much attention you pay to each of the following sensations using this scale:

0 None | 1 | 2 Slight | 3 | 4 | 5 Moderate | 6 | 7 | 8 Substantial | 9 | 10 Extreme

1. Heart Palpitations
2. Chest Pain/Discomfort
3. Numbness
4. Tingling
5. Short of Breath/Smothering
6. Faintness
7. Vision changes
8. Feelings of Unreality
9. Feeling detached from self
10. Dizziness
11. Hot
12. Sweating/clammy hands
13. Stomach upset
14. Nausea
15. Choking/Throat Closing
16. Itchiness
17. Burning
18. Sweet taste
19. Other:_____
20. Other:_____

Administration:

ASI

Subject ID

Directions:

Fill in circles completely.
Erase errors completely.
Keep within boxes.
Do NOT make any stray marks.
Do NOT fold.

Acceptable marks

This is a machine readable form. Please do not fold or make extraneous marks.

Use ONLY a #2 pencil
Erase cleanly

Darken the bubble corresponding to the one phrase that best represents the extent to which you agree with the item. If any of the items concern something that is not part of your experience (e.g., "it scares me when I feel shaky" for someone who has never trembled or had the "shakes"), answer on the basis of how you think you might feel *if you had* such an experience. Otherwise, answer all items on the basis of your own experience.

	VERY LITTLE	A LITTLE	SOME	MUCH	VERY MUCH
1. It is important to me not to appear nervous.	○	○	○	○	○
2. When I cannot keep my mind on a task, I worry that I might be going crazy.	○	○	○	○	○
3. It scares me when I feel 'shaky' (trembling).	○	○	○	○	○
4. It scares me when I feel faint.	○	○	○	○	○
5. It is important to me to stay in control of my emotions.	○	○	○	○	○
6. It scares me when my heart beats rapidly.	○	○	○	○	○
7. It embarrasses me when my stomach growls.	○	○	○	○	○
8. It scares me when I am nauseous.	○	○	○	○	○
9. When I notice that my heart is beating rapidly, I worry that I might have a heart attack.	○	○	○	○	○
10. It scares me when I become short of breath.	○	○	○	○	○
11. When my stomach is upset, I worry that I might be seriously ill.	○	○	○	○	○
12. It scares me when I am unable to keep my mind on a task.	○	○	○	○	○
13. Other people notice when I feel shaky.	○	○	○	○	○
14. Unusual body sensations scare me.	○	○	○	○	○
15. When I am nervous, I worry that I might be mentally ill.	○	○	○	○	○
16. It scares me when I am nervous.	○	○	○	○	○

Administration: ○ ○ ○

Demographics

Subject ID

Directions:

Fill in circles completely.
Erase errors completely.
Keep within boxes.
Do NOT make any stray marks.
Do NOT fold.

Acceptable marks

This is a machine readable form. Please do not fold or make extraneous marks.

Use ONLY a #2 pencil
Erase cleanly

Age

Sex

- ○ ○

Ethnicity

- ○ African-American/Black
- ○ Asian/Pacific Islander
- ○ American Indian/Alaskan Native
- ○ Caucasian (Non-Hispanic)
- ○ Hispanic/Latino
- ○ Other

Marital Status

- ○ Never married
- ○ Separated
- ○ Divorced
- ○ Widowed
- ○ Married
- ○ Living with someone as if married (not currently married or separated from another person)

8. Smoking Status

Do you smoke? ○ YES ○ NO

IF yes, for how many years have you smoked regularly (at least 1 cigarette per day)?

If less than 1 year, fill in "00"

AND, how many cigarettes do you smoke per day?

IF no, have you ever been a regular smoker in the past? ○ yes ○ no

For how many years did you smoke?

If less than 1 year, fill in "00"

If yes, how many years has it been since you quit smoking?

If less than 1 year, fill in "00"

APPENDIX B: Supervisor Rating Instructions

First Class Supervisor Ratings of Third Class Midshipmen
LANTPATRAMID 1998

Please rate the performance of each of the third class midshipmen on your YP each day you are at sea. When making the rating please take the following three categories into account:

⇒ **Assigned Duties:** ability to meet divisional responsibilities required by the first class mishipman
- including, but not limited to acting as duty mess cook who should complete the following duties:
  - prepare all meals IAW the daily menu
  - clean up after all meals and maintain cleanliness of mess deck and galley
  - ensure provisions required for the following day's meals are correctly thawed
  - bag, remove, and correctly stow all trash from the galley
- active involvement in daily planned revolutions
  - lectures and briefs (towing lectures, unrep lectures, ops/safety briefs)
  - drills and training evolutions (leap frogs, flaghoist drills, manoverboard drills, divtacs, unrep, towing, anchor, etc.)
  - disaster control olympics

⇒ **Social Involvement :** ability to maintain camaraderie, social contact and military bearing
- conversing with other midshipman
- convening in the mess hall when appropriate
- involvement in Boston BBQ
- planning for/attending liberty activities
- appropriate uniform both on duty and on liberty

⇒ **Technical Interest:** level of interest/involvement in technical systems and skills training aboard ship
- works actively toward Command Assistant Competitive Award
- active in rotating through (as assigned) the following watch stations:
  - conning officer
  - helmsman
  - lee helmsman
  - quartermaster of the watch
  - lookout/bearing taker
  - communications watch/radar operator
  - engineering/sound and security watch

The above categories should be considered when assigning a cumulative rating of performance on a scale of 0 to 5.

0 = inability to perform/ unsatisfactory performance

Indicates an inability to complete any of the above activity. Individuals on bed rest/too sick to leave rack get a rating of 0 (remember, this is not a fit rep rating, but a generic rating of ability to perform).

OR, the midshipman was unable to complete at least half of the activities in each of the major categories outline above.

1 = poor/marginal performance

The midshipman is able to perform a majority of tasks, however is unable to complete certain activities. For example, the midshipman may not be able to act as duty mess cook, or may be unable to complete a rotation as communications/radar operator but is able to complete all other required activities. Another example would be that the midshipman is carrying out all duties but unable to maintain some aspect of social contact, camaraderie or military bearing.

The midshipman may be able to complete all the activities above, but does not complete them in a satisfactory manner (i.e. they must be fixed later or re-done).

2 = average performance

The midshipman completes all the activities outlined above in a manner that is satisfactory and requires no follow up work/re-doing of work.

3 = above average performance

The midshipman completes all activities outlined above in a satisfactory and timely manner, as well as demonstrating good leadership skills. The midshipman receives grades within the top 25% of the squadron. The midshipman demonstrates peer leadership skills. The midshipman is active in drills and training.

4 = excellent performance

The midshipman completes all activities outlined above in an exceptional manner, including high scores on tests and maintaining an active role in drills and training. The midshipman volunteers for training/leadership opportunities when possible. The midshipman is completing many of the requirements for the Command Assistant Competitive Award.

5 = outstanding performance

The midshipman completes all activities outlined above in a manner that is unmatched. The midshipman's scores are at the top of the squadron on his or her tests. The midshipman stands out as a peer leader. The midshipman is completing all requirements for the Command Assistant Competitive Award.

Please note that these ratings are confidential and will not affect the third class midshipman in anyway. They are for the purpose of a study on seasickness and will not be reflected in Academy records....

These ratings are not given to the OICs or AOICs, and they will not be included in the end of cruise fitness reports. These ratings will not be kept on file anywhere at USNA, and will be coded for confidentiality following the cruise.

Thank you for your assistance

Name _____ alpha

Please rate the midshipman's performance overall, including assigned duties, social involvement and technical interest, on a scale of 0 (inability to perform/unsat performance) to 5 (outstanding performance).

6/19	0	1	2	3	4	5
6/20	0	1	2	3	4	5
6/23	0	1	2	3	4	5
6/24	0	1	2	3	4	5
6/25	0	1	2	3	4	5
6/26	0	1	2	3	4	5
6/27	0	1	2	3	4	5
6/30	0	1	2	3	4	5
7/01	0	1	2	3	4	5
7/02	0	1	2	3	4	5
7/03	0	1	2	3	4	5

Ratings do not need to be made on days in port (6/21, 6/22, 6/28, 6/29)

Name _____ bravo

Please rate the midshipman's performance overall, including assigned duties, social involvement and technical interest, on a scale of 0 (inability to perform/unsat performance) to 5 (outstanding performance).

6/19	0	1	2	3	4	5
6/20	0	1	2	3	4	5
6/21	0	1	2	3	4	5
6/22	0	1	2	3	4	5
6/23	0	1	2	3	4	5
6/26	0	1	2	3	4	5
6/27	0	1	2	3	4	5
6/28	0	1	2	3	4	5
7/01	0	1	2	3	4	5
7/02	0	1	2	3	4	5
7/03	0	1	2	3	4	5

Ratings do not need to be made on days in port (6/24, 6/25, 6/29, 6/30)

APPENDIX C: Sea State Rating Scale

UNDERWAY SEA STATE RATINGS

LANTPATRAMID 1998

Please make sea state ratings (the number in the "force" column) at the beginning of each watch. If you are not underway for the watch time period please indicate this with a rating of "N/U" (not underway).

Beaufort Scale				
Force	**Wind Knots**	**Description**	**Offshore**	**Waves**
0	Under 1	Calm	Sea like a mirror	None
1	1 to 3	Light Air	Small ripples	0.3 ft
2	4 to 6	Light Breeze	Small wavelets, not breaking	0.6 ft
3	7 to 10	Gentle Breeze	Large wavelets, breaking crests	2 ft
4	11 to 16	Moderate Breeze	Small waves, some whitecaps	3 ft
5	17 to 21	Fresh Breeze	Moderate waves, many whitecaps, possible spray	6 ft
6	22 to 27	Strong Breeze	Large waves, extensive whitecaps, some spray	10 ft
7	28 to 33	Near Gail	Sea heaps up, white foam beginning to blow in streaks.	13 ft
8	34 to 40	Gale	Moderately high waves, heavy spray, streaks of foam	18 ft
9	41 to 47	Strong Gale	High waves, dense foam streaks, crests roll over, spray may reduce visibility	23
10	48 to 55	Storm	Very high waves, long overhanging crests, sea looks white, visibility greatly reduces, sea becomes heavy and shocklike.	29
11	56 to 63	Violent storm	Exceptionally high waves, all crests blown into froth, sea completely white with foam and spray	38
12	64 to 71	Hurricane	Air filled with foam and spray, sea completely white with driving spray.	45

NU = not underway at time of measurement

UNDERWAY SEA STATE RATINGS

LANTPATRAMID 1998

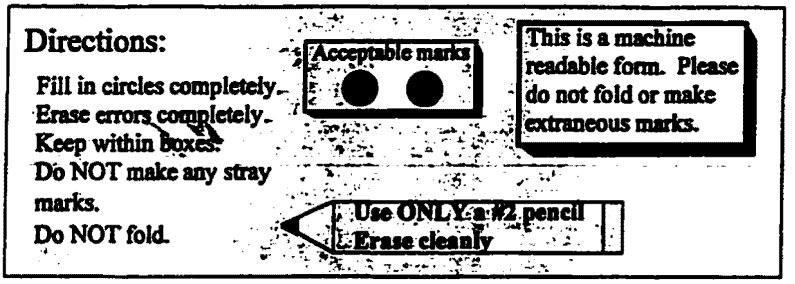
Please write the Beaufort force rating for the sea state prevailing at the start of each assigned watch.

	0000-0400	0400-0700	0700-1200	1200-1600	1600-1800	1800-2000	2000-2400
19 JUN 98							
20 JUN 98							
21 JUN 98							
22 JUN 98							
23 JUN 98							
24 JUN 98							
25 JUN 98							
26 JUN 98							
27 JUN 98							
28 JUN 98							
29 JUN 98							
30 JUN 98							
01 JUL 98							
02 JUL 98							
03 JUL 98							

APPENDIX D: Handouts

Subject ID

Seasickness Quiz



1. Seasickness occurs in :
   - ◯ 10% of the population
   - ◯ 20% of the population
   - ◯ 50% of the population
   - ◯ 90% of the population

2. The physiological mechanism for seasickness is:
   - ◯ weak stomach
   - ◯ wave motion concusses sensitive brain areas
   - ◯ inner ear organs (i.e. vestibular system)
   - ◯ purely psychological

3. Cognitive variables that have been shown to make seasickness worse include:
   - ◯ anxiety
   - ◯ focus of attention
   - ◯ conditioning
   - ◯ all of the above

4. Some well known historical figures have been able to overcome seasickness without medication, using the "power of conviction" they include:
   - ◯ Charles Darwin
   - ◯ Chester A. Arthur
   - ◯ Lord Nelson
   - ◯ Both A and C
   - ◯ all of the above

5. Which of the following will not make seasickness worse:
   - ◯ drinking alcohol
   - ◯ looking at the horizon
   - ◯ chain smoking
   - ◯ paying attention to the symptoms of seasickness

6. Did this presentation keep your attention: yes ◯ no ◯
7. Did you learn anything you feel will be useful: yes ◯ no ◯
8. Do you feel this presentation provided: too much information ◯ too little ◯ just enough ◯
9. Was the presentation: too technical ◯ not technical enough ◯ about right ◯

Do's and Don'ts of Seasickness

DO:

- try to get enough sleep and stay rested, maintain good physical condition. Drink lots of water (at least eight glasses per day).
- attempt to decrease conflicting sources of information reaching the brain (ex./ looking at the horizon).
- eat healthy foods, including fruits and vegetables.
- try to take breaks to get fresh air and stretch your legs.
- keep food in your stomach. Eat smaller meals, crackers may be helpful if nauseous.
- keep your mind busy working on other things.
- avoid strong noxious or unpleasant odors (like gasoline or diesel fumes, your cabinmate's dirty socks).

DON'T:

- overeat in an effort to keep your stomach full.
- eat greasy, fatty or acidic foods (less acidic fruits include apples, bananas, pears, grapes, melons). DO eat breads, cereals and grains. Milk, juice, or water are good alternatives to soda or coffee.
- spend all your time below deck.
- drink large amount of alcohol. It's also good to avoid large amounts of caffeine. Caffeine is a diuretic and alcohol speeds dehydration.
- smoke cigarettes. Nicotine is an emetic agent (i.e. one of its effects on the body is to make you nauseous).
- move head excessively or erratically ... DO try to move your head as little as possible.
- resist feelings of vertigo, accept them, ride the waves and move on.

The Navy Hymn

Eternal Father, Strong to save,
Whose arm hath bound the restless wave,
Who bid'st the mighty Ocean deep
Its own appointed limits keep;
O hear us when we cry to thee,
for those in peril on the sea.

O Christ! Whose voice the waters heard
And hushed their raging at Thy word,
Who walked'st on the foaming deep,
and calm amidst its rage didst sleep;
Oh hear us when we cry to Thee
For those in peril on the sea!

Most Holy spirit! Who didst brood
Upon the chaos dark and rude,
And bid its angry tumult cease,
And give, for wild confusion, peace;
Oh, hear us when we cry to Thee
For those in peril on the sea!

O Trinity of love and power!
Our brethren shield in danger's hour;
From rock and tempest, fire and foe,
Protect them wheresoe'er they go;
Thus evermore shall rise to Thee,
Glad hymns of praise from land and sea.

Rev. William Whiting (1825-1878)

SEASICKNESS DEBRIEFING
LANTPATRAMID 1998

This handout is designed to provide you with a rationale for the seasickness briefings and questionnaires, and let you know what information we hope to gain from this procedure. These briefings were developed primarily by the Medical and Clinical Psychology Department of the Uniformed Services University of the Health Sciences, however this project was undertaken with the cooperation and input of the Otolaryngology/Ear Nose and Throat Clinic of the National Naval Medical Center. This project was designed to determine whether or not a short intervention aimed at increasing confidence about dealing with seasickness, would help midshipmen deal with the occurrence of seasickness. Midshipmen in the alpha squadron received a briefing designed to educate individuals on seasickness, provide adjunct methods of dealing with seasickness (adjunctive to medication), and increase confidence/self-efficacy. Midshipmen in the bravo squadron received a briefing designed to control for the effects of time and attention, and this was why they were provided with a briefing on a subject not closely related to seasickness (i.e. on USUHS). Both groups were given the same questionnaires, in order to determine if the briefings had a different effect on one group versus the other. Many of the questionnaires which you filled out, which may have seemed irrelevant, were actually designed to assess for variables which have been hypothesized to be related to seasickness, these include:

- gender & age
- anxiety (both state and trait) & sensitivity to anxiety
- hypervigilance/increased attention to internal bodily sensations
- motion sickness history
- coping style (people who use active coping strategies experience less seasickness)
- self-efficacy (a personality trait which assess the person's belief that they can deal with stressful situations), in this study, efficacy beliefs specific for seasickness.
- self-control (a personality trait associated with active coping and high self-efficacy)

The rationale for these briefings came from a number of empirical studies on motion sickness. For example, one study conducted in the Israeli Navy found that cadets who received a briefing, similar to the one you received, experienced fewer seasickness symptoms and performed better than cadets who did not receive the briefing. Other earlier studies done using motion simulators have underscored the importance of cognitive variables and their effect on seasickness. These studies done in the mid to late 1980s, reported that individuals receiving confidence training were able to tolerate motion simulators longer than individuals receiving other interventions like desensitization (repeated exposure to motion) and biofeedback.

This project was unique in that a large number of individuals participated. Furthermore, the YP program allowed us to examine seasickness while people were actually on a ship (versus with simulated motion). At this point we do not yet have all the data we need to know the results of the study, however our goals are to help improve the Navy's current prevention protocol for seasickness. We thank you for your participation in this project. If you have any questions regarding this project, or would like further information please call (301) 295-3522. This is the general number for the

Medical and Clinical Psychology Department so please state that the message is for LTJG Koselka. Questions can also be sent via e-mail to: mkoselka@usuhs.mil

Thanks again, and have a great summer!

APPENDIX E: Variables Regressed Upon Daily Average Seasickness Ratings

Variables Regressed Upon Daily Average Seasickness Ratings

Variable		Beta weight	t score	significance * p<.05
Demographics				
	age	-.032	-.542	.588
	gender	.090	1.474	.142
SCS	Pre intvtn	-.012	-.110	.912
	Post intvtn	-.020	-.175	.862
	Post cruise	.157	2.347	.020*
SSE	Pre intvtn	.065	.641	.522
	Post intvtn	.037	.362	.717
	Post cruise	-.485	-8.029	.000*
Other Psychosocial				
	BVS	..086	1.427	.155
	ASI 1	.088	1.336	.183
	2	-.091	-1.408	.161
	Active coping	-.077	-1.271	.205
	Relgs coping	.012	.204	.838
	Compliance	-.145	-2.496	.013*
	Underreporting	-.007	-.117	.907
Intervention condition		.203	3.461	.001*

SCS = self-control schedule, SSE = Seasickness Self-Efficacy Evaluation, BVS = Body vigilance scale, ASI = Anxiety Sensitivity Index, Relgs = Religious, Intvtn = Intervention

*** While the Active Coping scale evidenced a trend for significance, the overall r squared change value in the regression equation associated with this effect was not significant. Therefore, this finding was not considered in the results.