Impacts of Commitment and Goal Setting on Pro-Environmental Behaviors (PEBs) Toward Ocean Conservation: An Exploratory Study

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ABSTRACT

Some estimates claim that by 2050, there will be as much plastic in the ocean as fish [1]. While plastics pollution in our oceans is largely a land-sourced problem [2], public scrutiny of the shipping community persists. This study examines how seafarer pro-environmental attitudes and behaviors can be influenced. Using between-subject experimental design, current (and future) seafarers were surveyed through the IAMU members' networks. The survey measured ocean literacy [3], culture [4], and seafarer attitudes and behaviors about plastics pollution [5]. 202 complete and usable responses were received (representative of seafarers worldwide). 98 respondents participated in pre- and post-test surveys, where each respondent was randomly assigned to a control or treatment group. Descriptive statistical, mediational, and gain-score analyses were performed. As in previous shipping safety studies, analysis confirmed group- and future-oriented (and not self- or now-oriented) people are positively disposed to pro-compliance attitudes and behaviors. There was no evidence of the treatments mediating the relationship between awareness and behaviors. Analysis supported that treatments (commitment pledges [6] and goal setting) had positively influenced pro-environmental behaviors. On average, there was an 8.5% gain in attitude and a 10.4% gain in behavior. This study shows how a small, carefully planned intervention may have a desired impact on PEBs and potentially MARPOL compliance behaviors. Furthermore, this has implications on how the IMO model course on personal safety and social responsibilities [7] might be altered to shift from awareness and knowledge transfer to behavior change [8] and even introduce desirable behavioral spill-over effects [9].

1. INTRODUCTION

We rely on our high seas and oceans for food and natural resources, trade and commerce, recreation and tourism, biodiversity and clean water, as well as carbon storage and climate regulation, among many other critical life-sustaining and enriching functions. While our high seas and oceans are unusually resilient and in relatively reasonable health according to some measures [10], our high seas are also in a state of decline (e.g., [11], [12], [13]). Some of this is due to naturally occurring changes and some is due to man's behaviors. As one of our last global commons, the high seas and oceans are subject to a well-known economic effect known as the "tragedy of the commons" [14]. In such a case, shared finite resources (such as fisheries in the high seas and oceans) become depleted and diminished when rational individuals who have rights to the commons exploit the resource out of self-interest rather than to benefit the common [15]. It is particularly difficult to manage or regulate such situations. However, just as behaviors are what create a "tragedy of the commons," it is quite possible that solutions will be found by examining how to change those behaviors.

Only several decades ago, global concern for the environment varied by geography and demography – concern was higher among people in developed nations than in developing nations. More recently, at the turn of the millennium, global concern for environmental issues and support for environmental protection was at a high level uniformly across geo/demography [16]. In 2013, again based on an international survey, global concern for the environment waned to a 20-year low [17]. On the surface, you might expect environmental conservation behaviors to vary as awareness and concern increases or decreases. However, conservation behaviors did not change dramatically during fluctuations in awareness of and concern for environmental issues [18], [19]. This provides some evidence that awareness alone does not alter behavior sufficiently to affect the environmental concern. In a global survey of experts' evaluation of progress toward achieving the seventeen UN sustainable development goals, the goal for protecting our high seas and oceans ranked second from the bottom [20].

So, rather than awareness campaigns or training and educational programs, a more potentially beneficial approach to ocean conservation may be through behavior modification. While pollution of the oceans mainly occurs from land-based sources [2], [21], [22], [23]; maritime interests are always looking for ways in which to improve their records at protecting the oceans. Seafarers are required to possess personal safety and social responsibilities according to the *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)*, 1978 (as amended). The validated model training course on *Personal Safety and Social Responsibility* (Model Course 1.21) [7] indicates that students should demonstrate competence in "taking precautions to prevent pollution of the marine environment" through approximately three hours of instruction. Given the fact that students must develop knowledge, understanding, and proficiency in ten topics (including a brief introduction to *International Convention for the Prevention of Pollution from Ships (MARPOL)*), it is likely that this material is presented through straight lecture. As a result, it is unlikely that such training might be effective at altering compliance behaviors. As became evident from the literature, education and awareness alone are not effective in promoting behavior change [24], [25], [26].

In an effort to understand how to influence pro-environmental (or pro-compliance) behaviors more effectively than education and awareness alone, this study explores other methods to motivate altered behavior. In specific, this study looks at current and future mariners and examines how *commitment* and *goal setting* influence their attitudes about and behaviors concerning plastics pollution and *MARPOL V* compliance.

2. THEORETICAL BACKGROUND

In figure 1, the overarching framework for this study design is presented, each of the constructs are described (represented as ovals in figure 1), the measurement of those constructs are explained (represented as boxes in figure 1), and the research hypotheses are presented.

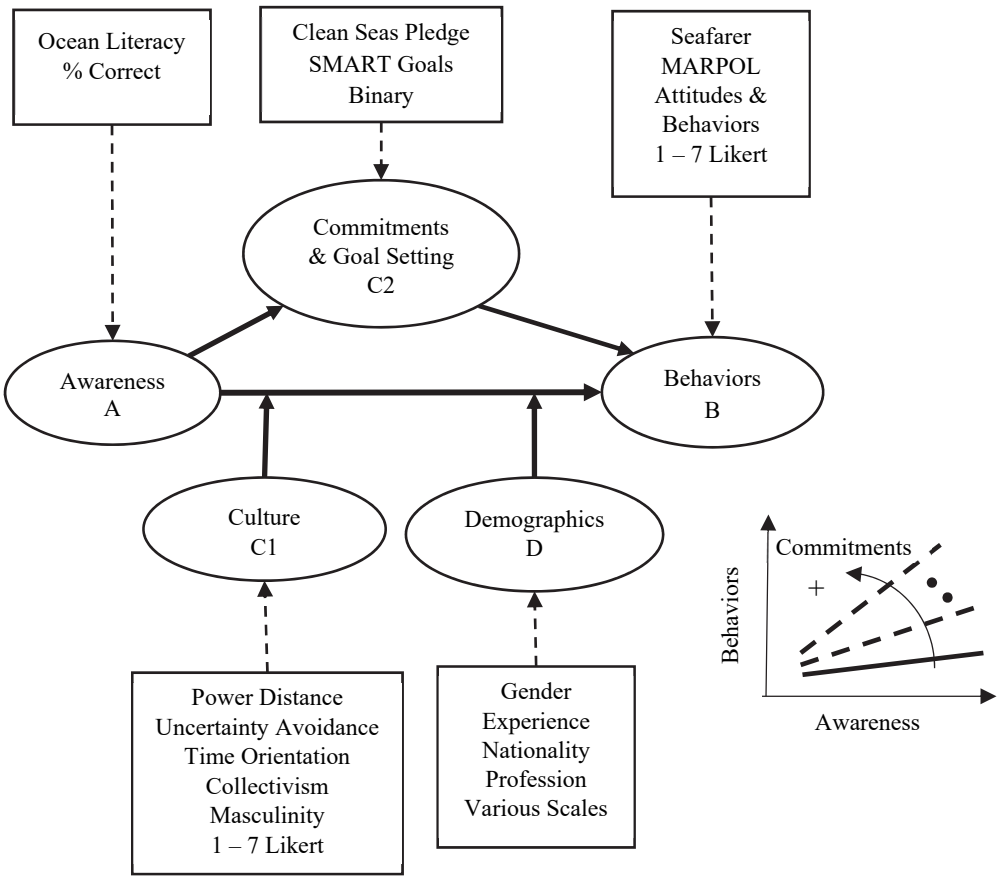

Figure 1: Research design for this study

2.1. THEORIES OF BEHAVIOR (OVERARCHING FRAMEWORK)

Ocean conservation requires behavior change [8], [27], [28], [29], [30], [31]. Many theories have explored the antecedents and influences of behavior change. For example, the seminal theory of planned behavior [32], [33], [34], which was extended by the theory of reasoned action [35], has been demonstrated through empirical evidence [36] to reasonably predict actual behavior based upon attitudes, subjective norms, perceived behavioral control, and behavioral intent. The theories of planned behavior and reasoned action are general in nature, so the theory of norm-activated theory [37] was developed to focus on a specific type of behavior – altruism

or helping behavior (of which ocean conservation may be considered [38], [39]). Even more specifically, the value-belief-norm theory [40] adapts the norm-activated theory to environmental movements and norm-activation promotes pro-environmental behaviors [41]. From that, a general model of individual (as opposed to movement) pro-environmental behavior [42] was developed. Similarly, there has been extensive study of specific variables that promote the pro-environmental behaviors [31], [43] , [44]. Rather than attempting to be a comprehensive model of each of these behavioral theories and predictors of pro-environmental behaviors, this study was limited to an (over)simplified model of behavior and specific treatments which may influence pro-environmental behavior (see figure 1), as modified from [45].

2.2. OCEAN LITERACY (AWARENESS – INDEPENDENT VARIABLE)

Ocean literacy is defined as "understanding the oceans' influence on you – and your influence on the ocean." [3]. Scientists and educators worked collaboratively together to develop a set of principles and a framework for fostering ocean literacy [46], [47], [48]. Studies have examined ocean literacy around the world – [49] in Ireland; [50] and [51] in the UK; [52] in Finland, Lithuania, and Sweden; [53] in Canada; and [54] in the United States. These studies demonstrated ocean literacy was an effective measurement of individual's perception of and knowledge about (or awareness of) the ocean. In this study, we used a sample of concepts from each of the seven principles to create a short ocean literacy instrument, where each item on the instrument was a multiple-choice factual question about oceans.

2.3. SEAFARER MARPOL ATTITUDES AND BEHAVIORS (BEHAVIOR – DEPENDENT VARIABLE)

Since this study focused on examining treatments that could affect seafarer behaviors regarding protecting the marine environment, we focused on seafarers' attitudes and behaviors regarding MARPOL V compliance. Since this construct was not previously measured based upon available literature, an equivalent construct was selected – safety culture. Safety culture has been studied extensively in the maritime domain [55], [5], [56], [57], [58], [59], [60]. An instrument to measure seafarer MARPOL compliance attitudes and behaviors was adapted from existing safety culture scales that had been previously validated [5], [61], [62]. Thus, in this study, we used a 15-item instrument where the prompts were adapted to pollution prevention (MARPOL) compliance from safety culture (attitudes and behaviors). Each response used a five-point Likert scale of agreement/disagreement [63].

2.4. HOFSTEDE'S DIMENSIONS OF NATIONAL CULTURE (CULTURE – MODERATOR VARIABLE)

As has been common in many maritime studies (see e.g., [64]), national culture was also included as a potential determinant of behavior. Based on the seminal studies of Hofstede [65], [66], [4], national culture consists of five dimensions, namely power distance, individualism/ collectivism, uncertainty avoidance, masculinity/femininity, and long-term orientation (or Confucian dynamism). Power distance is defined as the degree to which people accept inequality in power in organizational institutions. Collectivism refers to the degree to which people are oriented towards acting as part of a group within an organization (and the opposite

is individualism where people act on their own regardless of the collective interests). Uncertainty avoidance has to with people's tolerance for ambiguity. Masculinity refers to a preference for achievement, heroism, assertiveness, and material success (whereas femininity stands for a preference for relationships, modesty, caring for the weak groups, and quality of life). Long-term orientation is a focus on the future.

2.5. COMMITMENT AND GOAL SETTING (TREATMENTS – MEDIATOR VARIABLE)

There have been several meta-analyses about what influences pro-environmental behaviors (see e.g., [67], [68], [69]). One comprehensive beta-analysis by Osbaldiston and Schott [68] described ten basic types of treatments, which they sorted into four categories (i.e., convenience, information, monitoring, and social-psychological processes). They noted that goal setting had the second largest effect size among the studies and that when goal setting was combined with commitments, it was among the top strongest effect sizes among the studies, and considerably stronger than goal setting alone [69], [70], [71]. Additional studies examined antecedents to pro-environmental behavior in specific professional settings [71], [70]. Therefore, in concurrence with the literature, we applied a combination treatment of commitment and goal setting to a random selection of respondents to this study. The measurement of this treatment was binary for this study – either there was the presence of a commitment pledge and goals or there was not.

It would be difficult to address MARPOL compliance directly with actual seafarers due to the potential for self-preservation bias and also that future seafarers (i.e., maritime cadets and students) may not have direct experience with MARPOL compliance behaviors even if they possess MARPOL compliance attitudes. Therefore, a commitment treatment using an existing pledge about personal use of plastics was selected as being a close proxy to uncover commitments toward compliance behaviors. The UN Clean Seas Pledge [6] is a commitment treatment (or intervention) that describes seven commitment statements, which individuals, companies, governments, or non-governmental organizations can participate. As framed in this study, these are individual in nature and not specific to an organizational or maritime setting [71]. Two specific goal statements were selected for the treatment to pair with the commitment pledge. In alignment with the individual proxy nature of the UN Clean Seas Pledge, the two goal statements were derived to support the reduction of plastics.

A detailed description of the instruments used in this study can be found in the IAMU report for the Ocean Conservation Experiment and Networks (OCEAN) project [72].

2.6. RESEARCH HYPOTHESES

The primary relationship in the model described in figure 1 is that increased awareness leads to increased ocean conservation behaviors. It was expected that a weak positive or negligible relationship between these two variables [8], [53] exists. If the later were to be the case, then there would likely not be sufficient evidence to support the null hypothesis therefore the alternative hypothesis (i.e., that there is no relationship between awareness and behavior) should be adopted. This would be support of the concurrence in most of the theories of behavior

in that awareness (alone) does not in and of itself determine behavior. Based on this, we postulate our first hypotheses.

H1: There is a positive relationship between ocean literacy and seafarer attitudes and behaviors regarding MARPOL compliance.

Of all the dimensions of culture, long-term orientation (degree to which a culture values the future) [73] seemed to be the strongest indicator of safety attitudes and behavior – this could have potential relevance to pro-environmental behaviors. Next, again from the safety culture literature, we believe long-term orientation will have a strong positive effect. Finally, we suspect masculinity will have a negative effect on pro-environmental (compliance) attitudes and behaviors. Based upon that literature, we form our next set of hypotheses.

H2: Long-term orientation is positively related to seafarer attitudes and behaviors regarding MARPOL compliance.
H3: Collectivism is positively related to seafarer attitudes and behaviors regarding MARPOL compliance.
H4: Masculinity is negatively related to seafarer attitudes and behaviors regarding MARPOL compliance.

Finally, based upon the pro-environmental behavior literature previously described, we expect the treatments (commitment and goal setting) will mediate the relationship between awareness (as measured by ocean literacy) and seafarers' attitudes and behaviors toward MARPOL compliance.

In order to test the potential mediational relationship of the conservation treatment (or intervention), a between-subject experimental design [74], [75] was created as shown in figure 2.

N1:	A	(B)		B
N2:	A	(B)	C2	B

Figure 2: Sequence of surveying and treatments in experiment
for control group (N1) and experimental group (N2)

In the between-subject experimental design, there are two groups (N1 and N2). These are either intact groups (e.g., from the Maritime Environmental Protection Associations) and thus non-randomly assigned or assembled groups randomly assigned (particularly where an equivalent group is needed). N1 is the control group and N2 is the treatment group (that receives treatment between the pre- and post-testing). Both groups were subjected to the same pre-testing. In this case, since we were examining awareness and behavioral action, we were interested in assessing participants *awareness* (A), or ocean literacy as measured [76], [77]. Likewise, since these groups are being drawn from a global population, we will also want to assess contextual factors [78] such as *demographics* (D) or *culture* (C1) as measured using Hofstede's cultural

dimensions [79], [80]. Treatments were *commitments* using the UN Clean Seas Pledge and *goal setting* using a pair of SMART goals – taken together as a unified treatment called *commitment* (C2). Once the treatment, noted as C2 was applied to the treatment group, then after prescribed period of time, both groups were subjected to post-testing to measure seafarer attitudes and *behaviors* (B) toward MARPOL compliance, a form of compliance behavior, which would equivalent to the pro-environmental behaviors of the literature.

Given this between-subject experimental design, we can test whether the treatment, as an independent variable, has a direct influence on behavior. The following hypotheses arise from that potential relationship:

H5: There is a positive relationship between the presence of commitment statements and seafarer attitudes and behaviors regarding MARPOL compliance.

H6: There is a positive relationship between the presence of goal setting and seafarer attitudes and behaviors regarding MARPOL compliance.

This can be determined by examining the differences between the randomly assigned control group and the randomly assigned treatment group and how they respectively perform in the pre- and post-tests without and with the treatments of commitment and goal setting. Another opportunity is to explore the potential mediator effect of the two treatment (C2) on the influence of *awareness* (A) on *behaviors* (B).

3. METHODOLOGY

Data were obtained for the study by administering a questionnaire survey to current seafarers and future seafarers from around the world. The survey was first deployed through the professional networks of the research team and then through the networks of the International Association of Maritime Universities. Of the 284 responses, 202 were usable for the pre-test survey. The International Chamber of Shipping (ICS) estimates the worldwide population of seafarers serving on internationally trading merchant ships is 1,647,500 (of which 774,000 are officers and 873,500 are ratings) [81]. Using an online sample calculator, such a sample size is sufficient to support an 85% confidence interval with a 5% margin of error. Alternatively, if a 95% confidence interval (often considered an industry standard) is desired, the sample size would be sufficient to support a 6.9% margin of error.

Due to nature of the survey design and administration, block-randomization was not possible. A time-based randomization technique was used to determine whether or not to apply the *commitment* and *goal setting* treatments. This randomization technique satisfied the two key criteria: 1. Respondents were equally likely to be assigned to either control or treatment group, and 2. Assignments were independent of other respondents (due to different start times and completion times). Of the 202 who completed the pre-test survey, 98 respondents voluntarily agree to participate in the post-test survey; 66 of which were complete and usable for this research. Of the 66 complete and usable matched pairs of pre-test and post-test surveys, 28 had the *commitment* and *goal setting* treatments applied due to random "selection" and the

remaining 38 had no treatment and were considered the control group. In psychological research, such a randomization technique is often used and will result in unequal sample sizes in different conditions, but recent texts [82] state "Unequal sample sizes are generally not a serious problem, and you should never throw away data you have already collected to achieve equal sample sizes."

From a *demographic* perspective, the respondents overwhelmingly male (84.6%), predominantly from two nationalities (34.5% Japanese and 47.7% American), with a median seafaring experience of less than one year of experience, and predominantly from the deck side professional specialties (42.1%). This is overrepresented of women, which represent only 2% of the world's maritime workforce according to the International Trade Workers Federation [83]. However, this gender breakdown varies by sector and is generally higher at maritime education and training institutions (when surveying mariners of the future). The two predominant nationalities are due to the fact that the researchers actively obtained survey participation at their home and neighboring institutions. Other nationalities were so low as not to be worthy of further analysis due to the small sample sizes. While the vast majority of the respondents (82.8%) had little or no experience (indicating that they were students, or future seafarers), 9.8% had two to five years of experience, 5.2% had six to ten years of experience, and the remaining 2.2% were roughly evenly split between eleven to twenty years of experience and more than twenty years of experience. Additionally, ocean literacy levels among the seafarers sampled was roughly equivalent to that of the general population as found in similar studies [53], [52], [49], [84], [85], [86].

An attempt was made to gather input from more actual seafarers, and agreements were made with shipping organizations, but the survey was not administered due to labor contractual issues.

The survey was initial pre-test survey administered between October 2018 and January 2019. The follow-up post-test survey was administered in batches four to six weeks after the pre-test survey was administered.

4. RESULTS

Table 1 presents the correlations of key variables measured in this study. Even though it would be mathematically possible to provide means, standard deviations, and ordinal ranks for the dimensions of culture (i.e., power distance, uncertainty avoidance, time orientation, collectivism, and masculinity), those statistics would be beyond the ordinal level of measurement [87]. Regardless, we are principally interested in these correlations.

Table 1: Basic regression results for seafarer *MARPOL attitudes* and *behaviors*

	PD	***UA***	***TO***	***C***	***M***	***MA***	***MB***
Power Distance (PD)	1.000	--	--	--	--	--	--
Uncertainty Avoidance (UA)	0.301**	1.000	--	--	--	--	--
Time Orientation (TA)	0.185**	0.547**	1.000	--	--	--	--
Collectivism (C)	0.249**	0.589**	0.544*	1.000	--	--	--
Masculinity (M)	0.011	0.125*	-0.223*	0.090**	1.000	--	--
MARPOL Attitudes (MA)	0.129**	0.177*	0.321*	0.297***	-0.119*	1.000	--
MARPOL Behaviors (MB)	0.319*	0.436**	0.555	0.573**	-0.202*	0.243**	1.000

Standard errors reported in parentheses. *, **, *** indicates significance at the 90%, 95%, and 99% respectively.

This basic regression analysis indicates there is evidence to support the hypothesis (H3) that *collectivism* is positively correlated to both *MARPOL attitudes* and *behaviors* of seafarers. This basic regression analysis also indicates evidence to support the hypothesis (H2) that *time-*

orientation is positively correlated to *MARPOL attitudes*, but not *MARPOL behaviors* of seafarers (resulting in a mixed finding). As noted in previous studies (e.g., [64]), this would tend to make intuitive sense in that individuals with collective (as opposed to individualistic) and long-term (as opposed to short-term) orientations would be more inclined to exhibit outward-oriented, future-focused pro-environmental attitudes and behaviors. Further, there is also evidence to support the hypotheses that *masculinity* is negatively correlated with seafarer *MARPOL attitudes* and *behaviors*. This also makes intuitive sense in that individuals who exhibit masculine (as opposed to feminine or nurturing) orientations (characterized by assertiveness, aggression, competition, etc.) might disrupt team dynamics and weaken pro-environmental culture, again as noted in [64], but toward safety culture.

Baron and Kenney [88] proposed a four-step approach in which several regression analyses are conducted and the significance of the coefficients is examined at each step. In this case, the following regression analyses were conducted:

1. Simple regression with *ocean literacy* predicting *MARPOL attitudes* and *behaviors*
2. Simple regression with *ocean literacy* predicting treatments (i.e., *commitments* and g*oal setting*)
3. Simple regression with treatments (i.e., *commitments* and *goal setting*) predicting *MARPOL attitudes and behaviors*
4. Multiple regression with *ocean literacy* and treatments predicting *MARPOL attitudes* and *behaviors*

Table 2: Mediation regression results for seafarer *MARPOL attitudes* and *behaviors*

	Ocean Literacy	***MARPOL Attitudes***	***MARPOL Behaviors***
Ocean Literacy	1.000	-	-
MARPOL Attitudes	0.437** (0.039) $R^2_{adjusted}$ = 0.29	1.000	-
MARPOL Behaviors	0.231* (0.062) $R^2_{adjusted}$ = 0.15	0.503*** (0.037) $R^2_{adjusted}$ = 0.45	1.000

Standard errors reported in parentheses. *, **, *** indicates significance at the 90%, 95%, and 99% respectively.

As long as there are statistically significant relationships in each of the first three steps, then step four is performed. However, in this study, as illustrated in table 2, while there was a statistically significant relationship between *ocean literacy* and *MARPOL attitudes* and *behaviors*, there were non-significant relationships in each of the second and third steps, and thus, mediation is not likely or possible, even when considering exceptions or alternative

explanations [89], [90]. Therefore, in other words, it is unlikely that the treatments are mediators to the relationship between *ocean literacy* and *MARPOL attitudes* and *behaviors* of seafarers. As indicated in table 2, the only significant relationship is that *ocean literacy* has weak to moderate predictive power on *MARPOL attitudes* and *behaviors* of seafarers.

Therefore, there is evidence to support the hypothesis (H1) that there is a positive relationship between *ocean literacy* and *MARPOL attitudes* and *behaviors* of seafarers. In this case, one could conclude awareness does enhance pro-environmental attitudes and behaviors. However, even though there is statistically significant positive correlations between *ocean literacy* and *MARPOL attitudes and behaviors*, this is a weak to moderate explanatory power for social sciences.

In this study, 93 respondents voluntarily participated in both the pre-test survey and the post-test survey (which occurred four to six weeks after the pre-test survey). Of those who participated, 66 provided complete and useful responses to both the pre-test survey and the follow-up post-test survey administered between four and six weeks after the initial survey. Twenty-eight "randomly selected" respondents were given the *commitment* and *goal setting* treatments as part of the pre-test survey and 38 of the respondents were given no treatment, the control condition. There are many ways in which to examine pre-test to post-test differences. In this study, a gain score was calculated as the difference between post-test results and pre-test results. Positive gains indicated an increase in *MARPOL attitudes* and *behaviors* from the pre-test to the post-test. Negative gains, or decrements, indicated a decrease in *MARPOL attitudes* and *behaviors* from the pre-test to the post-test.

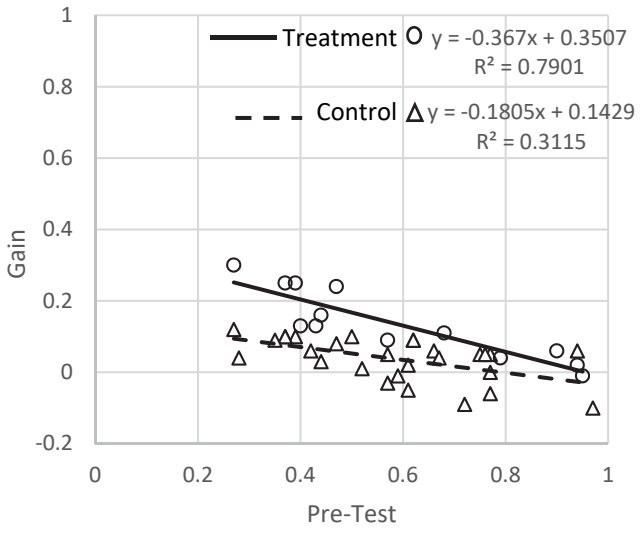

Figure 3: Comparison of (pre-test to post-test) gains in seafarers' *MARPOL attitudes* between experimental (treatment) and control groups

The survey components corresponding to seafarer *MARPOL attitudes* were aggregated into a single score and non-dimensionalized on a scale from 0 to 1 for both the pre-test and post-test results, which when subtracted to obtain the gain were also normalized on a scale of 0 to 1. In

figure 3, the pre-test scores for *MARPOL attitude*s were plotted on the x-axis and the corresponding gains (post-test minus pre-test) were plotted on the y-axis. All 38 results for the control group are represented with triangular markers and a dashed regression line. All 28 results for the treatment group are represented with circular markers and a solid regression line. The dotted line (that runs horizontally downward from 0, 1 to 1,0 with a slope of -1) represents the boundary of possible scores above which it is not possible to have a pre-test, gain combination.

Figure 3 illustrates the gains in seafarers' *MARPOL attitudes*. The mean value for gain in *MARPOL attitudes* (between pre- and post-test) for the 38 respondents in the control group is 3.8% (with a standard deviation of 6.0%). The mean value for the gain in *MARPOL attitudes* for the 28 respondents in the group who received commitment and goal setting treatments is 12.3% (with a standard deviation of 9.7%). This represents a difference of 8.5% in gain. In other words, on average, respondents subject to treatment increased their *MARPOL attitude* by almost third of an increment on the 5-point Likert scale for agreement with the *MARPOL attitude* statements.

It should also be noted that (in figure 3), in addition to this difference in slope of the regression lines between the control and treatment groups (which corresponds to the difference in gains between the two groups), almost all of the data for the treatment group dominates (or is greater than) almost all of the data for the control group. This indicates a clear and significant difference resulting from the commitment and goal setting treatments when it comes to *MARPOL attitudes* for seafarers.

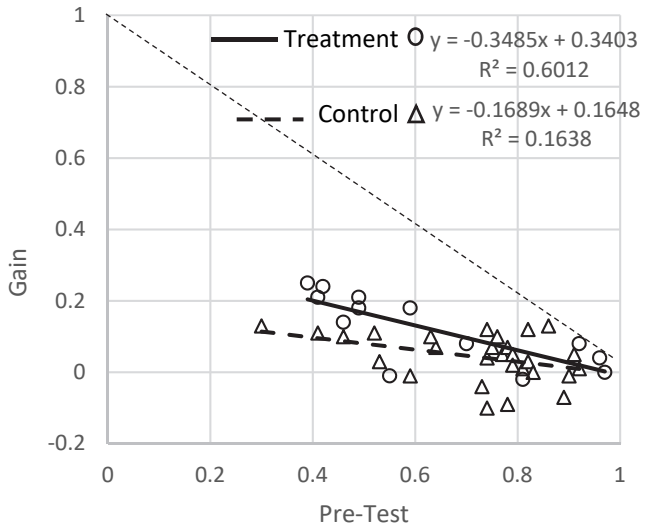

Figure 4: Comparison of (pre-test to post-test) gains in seafarers' *MARPOL attitudes* between experimental (treatment) and control groups

Figure 4 illustrates the gains in seafarers' *MARPOL behaviors*. The mean value for gain in *MARPOL behaviors* (between pre- and post-test) for the 38 respondents in the control group is 4.3% (with a standard deviation of 6.6%). The mean value for the gain in *MARPOL attitudes*

for the 28 respondents in the group who received commitment and goal setting treatments is 14.6% (with a standard deviation of 10.3%). This represents an average increase of 10.4% in gain for the treatment group as compared to the control group. In other words, on average, respondents subject to treatment increased their *MARPOL behavior* by almost half of an increment on the 5-point Likert scale for agreement with the *MARPOL behavior* statements.

However, unlike for the gain analysis regarding effects of treatments (i.e. *commitment* and go*al setting*) on *MARPOL attitudes*; in figure 4, there is considerable overlap between the data for control group and the treatment group for gains in *MARPOL behaviors* of seafarers. This tends to indicate that, while there is a significant relationship, there is less certainty (or strength) in that relationship. This is also indicated in the coefficients of determination for the regressions lines fit to control and treatment gains in both *MARPOL attitude* and *behavior* ($R^2 = 0.1638$ compared to 0.3115 and $R^2 = 0.6012$ compared to 0.7901, respectively.

5. CONCLUSION

So, in summary, as in previous maritime studies involving safety culture, the descriptive regression analysis confirmed individuals who identified as culturally group- and future-oriented (and not self- or now-oriented) are positively disposed to pro-environmental (or pro-conservation) attitudes and behaviors. There was no evidence of mediating effect from treatments on the relationship between awareness and attitudes and behavior. Finally, the gain score analysis provided support that the treatments (commitment and goal setting) had a positive influence on pro-environmental (or pro-conservation) behaviors. On average, there was an 8.5% gain in attitude and a 10.4% gain in behavior, when the treatments of commitment pledge and goal setting were applied.

It should also be noted that even though the sample size was sufficiently large enough to be representative, this study was limited by the size, diversity, and scope of the sample. Future such studies should attempt to increase the size and diversity of participation. Additionally, since the study did not observe actual behaviors (which is extremely difficult), the study was based on self-reported attitudes and behaviors and may be subject known biases. Also, future studies should be expanded to explore other treatments that promote pro-compliance behaviors in other contexts (e.g., safety, security, etc.).

Regardless, there are several potential implications of this study. First, treatments such as commitment and goal setting have a strong potential influence to positively change pro-environmental attitudes and behaviors (those by seafarers about MARPOL V and plastics pollution in this case). This has a stronger potential than education and training alone to promote the desired attitudes and behaviors. Therefore, such treatments should be adopted in conjunction with traditional maritime training and education to more effectively and completely influence seafarer behaviors. Also, there is known spillover effects in that changes of behaviors in one domain (e.g., pro-environmental behaviors) may also “spill over” into improvements in attitudes and behaviors in other domains (or enhanced pro-compliance behavior elsewhere) [9].

Additionally, it is evident that culture matters and training likely needs to be tailored to specific cultures and also to shape culture. While this study resulted in hopeful results – that pro-compliance attitudes and behaviors can be effectively *motivated*, actions taken should be tempered until such time as additional and more extensive study can be completed because this study was limited by design and sample size.

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