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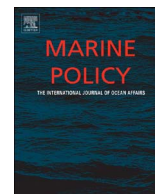
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# The long-term impact of maritime piracy on seafarers' behavioral health and work decisions

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## ABSTRACT

More than 6000 seafarers have been held hostage by pirates in the last ten years. There is a small but developing body of research showing that these seafarers may face lasting challenges in recovery. However, current studies on this question have been limited by a lack of comparison groups, a lack of statistical power, and other methodological challenges. This study contributes to this body of research through a survey of 101 former hostages and 363 seafarers not known to be exposed to piracy from India, the Philippines, and Ukraine. Using clinically validated scales for tracking lasting impact, this research finds that 25.77% of former hostages show symptoms consistent with PTSD, and that hostage experiences and other maritime traumas can have impacts on seafarer wellbeing and decisions about their career through the impact these traumas have on post-traumatic stress symptoms.

## 1. Introduction

A developing body of research has suggested that seafarers may suffer lasting distress following pirate attacks or being held hostage [16,4,45]. Existing research on post-traumatic stress suggests that this distress may come with significant impacts on work performance and other social costs [37]. To date there has been no study of sufficiently large size to effectively estimate the risk of lasting distress in seafarer hostages, identify predictors of resilience or distress following pirate attack, or specifically examine the impacts on seafarer workplace behavior. The current study is intended to fill this gap in the literature and accomplish three primary objectives. First, to explore the rates of lasting distress in seafarers held hostage by pirates through the use of validated psychological scales. Secondly, to identify predictors of resilience or risk in the face of piracy to assist in the development of policies that promote effective prevention of distress. Finally, to identify whether seafarers exposed to piracy showed any measurable impacts in workplace behavior or their decisions to continue working as a seafarer as a result of piracy.

## 2. Existing research linking maritime piracy and seafarers' health

A large number of seafarers have been exposed to pirate attack. The IMB reports that since 2006 more there have been more than 3000

pirate attacks [18,19]. This estimate is likely to be an underestimation: in the case of West Africa, the IMB has suggested that only one third of attacks are reported [6], and dataset of attacks built from public data found that indeed only 42% of the attacks found were in IMB reports ([22], note 88).

There is a developing body of research showing that piracy can have a significant impact on seafarers. Transiting the high-risk area can cause stress and worry in seafarers. Attacks expose seafarers to risk of death or injury and can be terrifying. When seafarers are held hostage for ransom, abuse is frequent and often severe [17]. There is good evidence that these kinds of stress can have lasting impacts on psychological health and wellbeing. A 2016 analysis of the experience of Filipino former hostages (Simon & Fernandez, 2016) showed high rates of conditions found to predict lasting problems including subjective fear and distress and loss of control over their lives [12,13]. Experiences causing these reactions have been linked to a number of negative psychological impacts including Post-Traumatic Stress Disorder (PTSD) [10], depression [24,34], substance abuse [7], and poorer physical health and wellbeing [15,32]. Current research on the mental health impacts of piracy has documented some of these effects in some seafarers. Antonio Ziello has documented diagnosable PTSD in three of four Italian seafarers held by pirates that he interviewed, as well as other impacts [45]. Interviews with seven Bulgarian seafarers held hostage showed significant emotional impact twenty days after release [4], but short-term

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**Table 1**  
Sample demographics.

	Country	N	Age mean and SD	Age range	Pct male	Years in industry mean and SD
Not held hostage	India	103	29.46 (7.16)	20–62	100%	5.66 (4.97)
	Philippines	144	39.49 (11.51)	21–68	99%	11.92 (9.22)
	Ukraine	127	34.85 (11.02)	20–80	87%	10.33 (10.31)
Held hostage	India	44	37.41 (11.73)	23–60	100%	11.49 (10.64)
	Philippines	31	40.34 (11.66)	21–61	100%	14.03 (10.24)
	Ukraine	26	42.88 (11.82)	25–65	96%	17.94 (11.30)

impacts of traumatic events are fairly common and not necessarily predictive of long-term impact [44]. Two descriptive studies have shown varying kinds of lasting emotional disruption after return from piracy without directly assessing clinical mental health [16,27]. In addition, two previous articles based on data collected as a part of the current research project have documented the phenomenology of Filipino seafarers' thinking about the impact of piracy on their overall emotional wellbeing [35] and the difficulty that affected seafarers in the Philippines had accessing mental health supports [2].

There is therefore good evidence that piracy leads to some impacts in seafarers, but the scope and risk factors associated with this impact is less clear. The nature of the seafaring profession may impact seafarers' vulnerability to developing post-traumatic impacts from piracy in both positive and negative ways. On the more positive side, there is an increasing proliferation of pre-departure training aimed specifically at giving seafarers skills to manage pirate attacks. This training may provide seafarers with a sense of control and efficacy when reacting to a pirate attack, elements which have been debated as potentially important predictors of recovery following a traumatic event [13,20]. On the more negative side, one predictor of increased risk of lasting impact from a traumatic event is previous exposure to other traumatic events [9]. Seafaring is risky, and there is good evidence that seafarers have fairly high rates of exposure to traumatic events aboard ship [23,31]. This may sensitize seafarers to more lasting distress following attack.

It is also possible that in addition to behavioral health, there may be related impacts on seafarer work decisions. There is strong evidence that psychological distress will lead to reduced workplace efficiency, performance, and employment [3,36,37]. In the case of seafarers, the contract-driven nature of seafarer work means that seafarers have many opportunities to make decisions about whether to continue to pursue work at sea. Past research has documented a decision to leave seafaring in some seafarers held hostage by pirates [17], but to date there has been no large-scale examination of how frequent this is or the scale of the impact of piracy on seafarer work behavior.

Collectively, then, the research on piracy and seafarer wellbeing suggests that there are some lasting impacts of piracy. The frequency of such impact, the relative predictors of resilience or vulnerability, and the associated impacts on seafarer work decisions have not been studied in detail. The current study is an attempt to close this gap.

### 3. Methods

This study was designed to identify the lasting impact of piracy on seafarers through a comparison of former hostages with a group of seafarers not known to be exposed to piracy. Independent variables assessed included demographic variables, prior exposure to trauma and piracy, and exposure to pre-departure training on piracy. Dependent variables included measures of psychological distress and workplace decision making.

#### 3.1. Participants

Participants were recruited from the Philippines, Ukraine, and India. As of 2003, these three countries collectively provided 40.8% of seafarers for merchant shipping, with the majority of that coming from

the Philippines [14]. In each of these three countries, a list of returned hostages provided by partner organizations was contacted by phone and email and asked to participate. Average participation rate for former hostages was 44.9%. Non-hostage participants were approached through partnerships with manning and training agencies or training centers, seafarer welfare centers, and unions. Seafarers were approached through a mixture of emails sent through the contact lists of these organizations and convenience sampling of seafarers physically present at the locations. Initial targets were for 150 non-affected seafarers and 50 affected seafarers, but in no country were those targets reached before participation rates dropped. Power calculations were executed for the collected sample sizes, and found per-sample power estimates of  $\pi=0.958$  for Ukraine, .993 for India, and 0.979 for the Philippines at the  $p < 0.05$  level. This was deemed acceptably high, and data collection was stopped at this point (Table 1).

#### 3.2. Independent variables

Independent variables assessed were age, gender, religiosity, years in the maritime industry, exposure to prior traumatic events aboard ship, exposure to pre-departure training on piracy, and exposure to piracy. Exposure to prior traumatic events aboard ship was assessed using the event categories identified by Menon [23]. Exposure to pre-departure training was assessed by the item "Have you received any pre-departure training on piracy?" and (if they answered yes) "How helpful did you think this training was?" answered on a scale of 1–5. Exposure to different forms of pirate attack was assessed by asking participants to indicate which of eight different types of experiences they may have had. See Table 3 below.

#### 3.3. Dependent variables

Dependent variables included post-traumatic stress symptoms, depression, and overall wellbeing. Post-traumatic stress (PTS) was assessed with the Posttraumatic Stress Checklist-Civilian scale (PCL-C, [42]), depressive symptoms with the Center for Epidemiological Studies Depression scale (CES-D, [29]), and overall wellbeing using the Duke Health Profile (DUKE, [26]). In addition, three items about the overall impact of piracy on work decisions were asked: "When considering whether to take a job or not, how much do you think about the risk of piracy?" answered on a Likert scale running from 1 to 5, and "Have you ever turned down a job because of the risk of piracy?" and "Have you ever specifically looked for a higher-risk job to get higher pay?" answered yes/no.

The PCL-C was modified to ask specifically about piracy instead of a generic traumatic event, and was scored both as a sum-score for PTS symptom severity and for the presence of PTSD. The study was launched before the release of the DSM-V, and the version of the PCL-C used was validated on the basis of DSM-IV criteria. Hence, probable PTSD was coded when respondents met DSM-IV criteria [5] and had a sum score of 44 on the scale [39]. There is no cross-cultural consensus on appropriate cutoffs for coding probable depression from the CES-D [11,21,41], so CES-D was scored as a sum score for depressive symptoms. The Duke Health Profile was scored according to scoring instructions with one modification: partner agencies working on this project recommended removing two items relating to physical ability

out of concern that seafarers would be afraid of being considered unfit for duty on the basis of these items. The items “Today do you have any trouble: Walking up a flight of stairs/ Running the length of a football field” were dropped. Because of this, the physical health subscale for the DUKE was calculated on the basis of three rather than five items.

### 3.4. Statistical methods

Participants were nested within country. Because ethnicity and culture have fairly significant impacts on how traumatic stress is expressed [25], this nesting violates the assumption that observations are independent. To address this, survey results were analyzed using hierarchical linear modeling (HLM) [30]. HLM analyses explicitly incorporate intraclass correlation into estimates of effect size and account for nesting issues [1].

Using the annotation developed by Raudenbush & Bryk [30], these models were specified with the dependent variable as the outcome variable  $Y_{ij}$  at level 1, independent variables describing the individual respondent at level 1, and country-level variables at level 2. Cross-level interactions were not assessed, and the models were specified as fixed effects. The final models therefore took the form of:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij}) + \dots + \beta_{kj}(X_{ij}) \tag{1}$$

$$\beta_{0j} = \gamma_{0j} + \gamma_{1j}(W_j) \tag{2}$$

Where  $X_{ij}$  was the score on independent variable modeled and  $W_j$  was a binary measure of belonging to each of the three countries included in this sample.

Analyses were conducted in R using RStudio version 0.98.945 and the “multilevel” package. For binary outcome variables such as probable PTSD, a binomial link function was used.

## 4. Results

### 4.1. Descriptive statistics: Prior traumatic exposure, exposure to piracy, and assessment of pre-deployment training

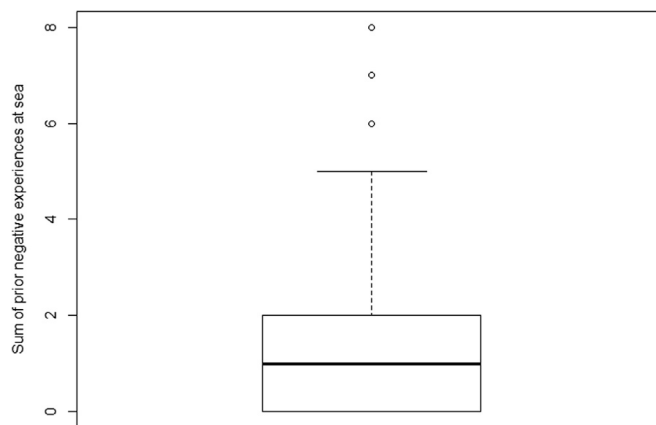
The first analysis looked at descriptive statistics for items potentially associated with resiliency or greater risk of lasting impact. Prior exposure to non-piracy traumatic events was fairly high, with an average of one experience per respondent and a fairly high rate reporting higher numbers. See Table 2 [33] and Fig. 1.

Rates of prior exposure to piracy were calculated, excluding known hostages. Rates were quite high, with 68.54% of seafarers reporting some form of exposure to piracy. For most seafarers, this took the form of transiting the High-Risk Area (HRA). Direct exposure was less common, with less than 5% of seafarers reporting experiencing attack of any kind. See Table 3 [33].

Finally, exposure to pre-departure training on piracy was assessed. Rates of pre-departure training were 80.2% in general, and 86.1% for seafarers who had passed through the HRA. For seafarers who had completed pre-departure trainings, ratings of the perceived utility of the training were extremely high (mean = 4.26, SD = 1.04, range = 1–5).

**Table 2**  
Exposure to prior traumatic events in whole sample.

Prior traumatic events	Percent reporting
Fire aboard ship	30.42%
Injured from an accident	26.48%
Experienced medical emergency	21.88%
Ship grounding	17.72%
Witnessed death from accident aboard ship	13.79%
Involved in serious fight	11.60%
Fell overboard	8.10%
Witnessed suicide aboard ship	4.81%



**Fig. 1.** Boxplot showing median, quartile, 1.5 IQR, and outlier data for sum of negative experiences at sea.

**Table 3**  
Prior exposure to piracy in sample of seafarers not previously known to have been exposed.

Type of exposure	Percent of general sample
No exposure to piracy at all	31.46%
Transited piracy-risk areas	56.46%
Transited piracy-risk areas, no other exposure	32.02%
Know someone held hostage	23.31%
Know someone held hostage, no other exposure	5.34%
Witnessed an attack on another vessel	7.02%
Attacked, not held hostage	4.49%
Attacked including gunfire, but not held	2.25%
Attacked and boarded, but not held	1.97%
Attacked and sheltered in citadel, but not held	1.12%

### 4.2. Dependent variables: Posttraumatic stress symptoms and posttraumatic stress disorder (PTSD)

Base rates of PTSD were 25.77% for former hostages and 3.92% for non-hostages. To identify predictors of PTSD risk, a series of HLM models was developed, with four blocks of predictors entered sequentially with significant predictors from the previous blocks retained. The first block included each individual category of exposure to piracy described in Table 3. If multiple exposure categories were significant, a second model with non-significant items dropped was calculated. The second block entered the demographic variables of age (centered around the grand mean), self-identified religiosity (as a binary variable) and the sum of prior trauma exposure at sea. The third model retained significant predictors and added the third block of pre-departure training (as a binary variable) and the perceived utility of pre-departure training (scored 1–5 with people who did not take pre-departure training coded as 0). Finally, a dummy code for each country was added as predictor in three separate models to the significant predictors identified in the previous step. The final model was identified as the model including significant predictors remaining after these steps.

See Table 4 for predictors of post-traumatic stress disorder identified using this method. Statistically, former hostages were at significantly higher risk for PTSD, but this was mitigated by the perceived utility of pre-departure training such that people who saw more value in the training were at less risk of PTSD. No other variable was a significant predictor.

When post-traumatic stress symptoms were considered as a continuous variable, results were slightly different. Former hostages had significantly higher posttraumatic stress symptoms, and seafarers who rated pre-departure training as more useful had fewer. However, seafarers with more extensive histories of prior maritime trauma also

**Table 4**  
Final model for predictors of PTSD.

	Coefficient	se	z score	p value
Intercept ( $\gamma_{0j}$ )	-2.47	0.44	-5.619	< 0.001
Hostage ( $\beta_{1j}$ )	2.23	0.47	4.793	< 0.001
Had PD training ( $\beta_{2j}$ )	0.23	0.82	0.279	n.s.
Usefulness of PD training ( $\beta_{3j}$ )	-0.44	0.21	-2.10	< 0.05

**Table 5**  
Final model for predictors of PTS symptoms.

	coefficient	se	t value	p value
Intercept ( $\gamma_{0j}$ )	26.84	1.72	15.64	< 0.001
Hostage ( $\beta_{1j}$ )	6.16	1.59	3.88	< 0.001
Prior maritime trauma ( $\beta_{2j}$ )	1.11	0.41	2.68	< 0.01
Had PD training ( $\beta_{3j}$ )	3.44	3.41	1.01	n.s.
Usefulness of PD training ( $\beta_{4j}$ )	-1.46	0.73	-1.98	< 0.05

showed more post-traumatic stress symptoms independent of the impact of piracy See [Table 5](#).

#### 4.3. Depression symptoms

When depressive symptoms were analyzed, no piracy-related predictors were identified. Younger age and more prior traumatic events were significant predictors of increased depressive symptoms. See [Table 6](#).

#### 4.4. Wellbeing

To assess wellbeing, statistical analyses followed the same pattern as PTS and depression with one difference. To model the effects of post-traumatic stress symptoms and depression as variables mediating the potential effects of the independent variables, an additional block was added to the models. Following the addition of pre-departure training variables to the model but before the country-level variables were assessed, PCL-C and CES-D scores were added to the model. [Table 7](#) shows the final models both with and without significant predictors from those blocks.

Former hostages show poorer physical wellbeing but improved mental and social wellbeing. The primary impact of hostage-taking on wellbeing in these data is through its impact on posttraumatic stress symptoms. Seafarers with higher PTS symptoms show poorer wellbeing in all three categories. In the case of physical wellbeing, this wholly mediates the finding that hostages show poorer physical wellbeing. In the case of mental and social wellbeing, the inclusion of PCL-C scores increases the otherwise already positive relationship between hostages and increased wellbeing.

#### 4.5. Impact on maritime career choices

Seafarers were asked to indicate how much they thought about piracy when considering a job at sea. In general, seafarers reported moderate levels of concern about piracy when considering a job (mean = 2.95, SD = 1.34). Statistically, the only predictor of this item was PCL-C score such that seafarers with higher scores reported that

**Table 6**  
Final model for predictors of depressive symptoms.

	coefficient	se	t value	p value
Intercept ( $\gamma_{0j}$ )	14.23	1.02	13.98	< 0.001
Prior maritime trauma ( $\beta_{1j}$ )	0.72	0.33	2.17	< 0.05
Age ( $\beta_{2j}$ )	-0.14	0.05	-2.67	< 0.01

they thought more about piracy (Intercept = 2.21,  $t(357) = 10.77$ ,  $p < 0.001$ ; PCL-C coefficient = 0.03,  $t(357) = 5.55$ ,  $p < 0.001$ ).

Seafarers were also asked whether they had ever turned down a job because of the risk of piracy. Former hostages reported more likelihood of having turned down a job because of the risk of piracy, but this relationship was wholly mediated by PTS symptom severity. See [Table 8](#).

Looking at predictors of seeking out a job due to higher pay, there was a marginal effect such that seafarers with higher rates of prior maritime trauma were more likely to say “yes” to this item. This effect was wholly mediated by PTS symptom severity, with seafarers with higher PCL scores showing more likelihood of having said yes. Separately, Filipino seafarers were significantly more likely to have said yes to this item than other seafarers. See [Table 9](#).

## 5. Discussion

These findings demonstrate both the resilience of seafarers and the scope of the lasting impact of piracy. A rate of probable PTSD of 25.77% is consistent with what should be expected from high-intensity traumatic events [40,8]. At the same time, it suggests that 3 out of 4 returned hostages recover without lasting problems. These findings also contextualize the impact of piracy: it is only one traumatic experience that seafarers face, and the ongoing exposure to maritime trauma has an independent effect on post-traumatic stress symptoms linked to poorer wellbeing. In fact, consistently across multiple outcome variables it appears that traumatic stress symptoms more than specific experiences drive changes in wellbeing or behavior. This suggests that more effective preventive tools for building psychological assistance or more effective post-release support that reduces symptoms could mitigate the majority of the lasting impact of piracy.

The finding that higher perceived utility of pre-departure training predicts lower impacts of piracy is interesting but suspect. It is possible that this reflects greater perceived control during the chaos of the attack or hostage experience, but there is the risk that this is a retroactive explanation rather than a true finding. The very high ratings of the usefulness of pre-departure trainings may mean that this relationship is actually reflecting people with more piracy-related traumatic stress symptoms retroactively rating pre-departure training as less useful.

One unexpected finding was the positive relationship between hostage experiences and mental and social wellbeing. This may demonstrate “posttraumatic growth” on the part of former hostages, or a tendency for traumatic events to trigger re-evaluations and re-commitment to mental wellbeing and social engagement after traumatic experiences [38]. It may also reflect the positive support and social support that hostages receive following release.

The assessment of the impact of piracy on maritime career choices suggests that posttraumatic stress symptoms predict higher rates of concern and more willingness to decline jobs due to piracy. However, PTS symptoms also predict higher likelihood of having sought out jobs due to higher pay. This may reflect the fact that seafarers who did seek out high-risk transits may feel more personal culpability for the event, which could impair recovery. The finding that Filipino seafarers are more likely to have sought out riskier trips for higher pay is likely due to the 2008 Philippines Overseas Employment Administration mandate for double pay for Filipino seafarers while sailing in the HRA in the Gulf of Aden [28]. India and Ukraine lack similar laws.

The key findings of this research for policy are that piracy does have an effect on seafarers, that this effect is strongest for former hostages, and that the effects of piracy and other maritime trauma may affect seafarer career choices. Based on these key findings, there are several implications. First, this suggests that the majority of hostages recover without lasting problems, and the expectation by some seafarers that all former hostages will show impairment [17] is false. Secondly, this research suggests that there is need for a formal system of engagement and support for hostages following release. As a part of the release, many seafarers are provided with health examinations that may include

**Table 7**  
Predictors of physical, mental, and social wellbeing.

	Model 1				Model 2			
	coefficient	se	t value	p value	coefficient	se	t value	p value
<b>Physical wellbeing</b>								
Intercept ( $\gamma_{0j}$ )	51.57	2.57	19.99	< 0.001	65.52	2.65	24.75	< 0.001
Hostage ( $\beta_{1j}$ )	-4.69	1.69	-2.78	< 0.01	-0.29	1.58	-0.18	n.s.
PCL-C sum( $\beta_{2j}$ )					-0.52	0.06	-8.25	< 0.001
<b>Mental wellbeing</b>								
Intercept ( $\gamma_{0j}$ )	73.4	4.4	16.7	< 0.001	94.45	4.73	19.98	< 0.001
Hostage ( $\beta_{1j}$ )	6.96	2.73	2.55	< 0.05	9.84	2.44	4.04	< 0.001
Prior maritime trauma ( $\beta_{2j}$ )	-1.77	0.72	-2.48	< 0.05	-0.88	0.64	-1.37	n.s.
Had PD training ( $\beta_{3j}$ )	-5	6.25	-0.8	n.s.	-4.18	5.52	-0.76	n.s.
Training utility ( $\beta_{4j}$ )	3.32	1.34	2.48	< 0.05	2.57	1.19	2.17	< 0.05
PCL-C sum ( $\beta_{5j}$ )					-0.78	0.1	-7.74	< 0.001
<b>Social wellbeing</b>								
Intercept ( $\gamma_{0j}$ )	58.91	5.76	10.23	< 0.001	68.77	6.5	10.58	< 0.001
Hostage ( $\beta_{1j}$ )	6.49	2.74	2.37	< 0.05	9	2.63	3.42	< 0.001
Had PD training ( $\beta_{2j}$ )	-10.45	6.16	-1.7	n.s.	-9.15	5.73	-1.6	n.s.
Training utility ( $\beta_{3j}$ )	3.93	1.33	2.96	< 0.01	3.45	1.23	2.81	< 0.01
PCL-C sum( $\beta_{4j}$ )					-0.37	0.1	-3.57	< 0.001

**Table 8**  
Binary logistic HLM models for declining job due to piracy.

	Model 1				Model 2			
	coefficient	se	z score	p value	coefficient	se	z score	p value
Intercept ( $\gamma_{0j}$ )	-2.87	0.37	-7.79	< 0.001	-3.63	0.49	-7.43	< 0.001
Hostage ( $\beta_{1j}$ )	1.08	0.36	3.00	< 0.01	0.57	0.41	1.38	n.s.
PCL-C sum( $\beta_{2j}$ )					0.04	0.01	2.56	< 0.05

**Table 9**  
Binary logistic HLM models for seeking out high-risk jobs for pay.

	Model 1				Model 2			
	coefficient	se	z score	p value	coefficient	se	z score	p value
Intercept ( $\gamma_{0j}$ )	-3.07	0.40	-7.70	< 0.001	-4.42	0.69	-6.39	< 0.001
Prior trauma ( $\beta_{1j}$ )	0.17	0.09	1.91	0.056	0.13	0.10	1.36	n.s.
PCL-C sum( $\beta_{2j}$ )					0.04	0.02	2.70	< 0.01
Filipino ( $\gamma_{1j}$ )	2.03	0.41	4.98	< 0.001	2.39	0.45	5.29	< 0.001

assessments of mental health. However, due to the fact that post-traumatic stress disorder is not really diagnosable until several months have passed [44], this is not sufficient for identifying and treating the lasting impact of piracy. Screening systems for survivors of piracy that assess wellbeing at six or twelve months after release may be necessary to identify survivors needing more detailed support.

A comprehensive approach to reducing the impact of piracy is likely to require a coordinated program that includes more developed pre-departure training, engagement with families during the hostage period, and sustained support after the release [33]. Such a system, particularly in the area of pre-departure training, can also be a platform for providing more information about coping and resilience as a way to boost recovery from other maritime trauma. There is some evidence that such “psychoeducation” in the form of coping tools and other practical recommendations can assist recovery from traumatic events [43]. Expanding the content of pre-departure training to include psychoeducation and coping may provide seafarers with tools to increase resiliency not just in the face of piracy, but the other stresses of a maritime career.

## 6. Conclusions

Maritime piracy is one of many dangers that seafarers face on a regular basis, and should be considered as part of a spectrum of

potential threats to seafarer health, happiness, and wellbeing. Institutions interested in supporting seafarer welfare should incorporate an understanding of the likely impact of traumatic events in general, and piracy specifically, into their planning and operations.

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