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## **EFFECTIVENESS OF BASIC SAFETY TRAINING AMONG RATINGS**

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### **ABSTRACT**

*Human error plays a serious role in causing accidents at sea. The human factor should be emphasized more than automation and technology with quality and effective training. In order to maintain the safety culture on board, it is necessary to standardize the effectiveness of the trainings. The aim of this study is to determine the effectiveness of the training of seafarers and prospective seafarers who take part in basic safety training. The participants in the study are 275 seafarers or prospective seafarers. It was used to evaluate the effectiveness of basic safety training in relation to the response of the Kirkpatrick Training Evaluation Model. The data obtained from the scale results were analyzed using non-parametric tests (Mann Whitney U test and Kruskal Wallis H test) on SPSS package program. As a result of the study, it was concluded that basic safety training at a high level was effective. The perceptions of effectiveness of seafarers who received training for the first time were higher than those of seafarers who received training to renew their certificates.*

**Keywords:** *Human Error, Basic Safety Training, Effectiveness of Trainings, Seafarers.*

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## TAYFA SINIFI GEMİ ADAMLARI ARASINDA TEMEL EMNİYET EĞİTİMİNİN ETKİNLİĞİ

### ÖZ

*Deniz kazalarının meydana gelmesinde insan hataları ciddi bir rol oynamaktadır. Kaliteli ve etkin eğitim ile otomasyon ve teknoloji yerine insan faktörüne daha fazla önem verilmelidir. Emniyet kültürünün gemide yaşatılabilmesi için eğitimlerin etkinliğinin standart hale getirilmesi gerekmektedir. Bu çalışmanın amacı, temel emniyet eğitimine katılan gemiadamlarına ve gemiadamı adaylarına verilen eğitimin etkililiğini belirlemektir. Araştırmanın katılımcıları 275 gemiadamı veya gemiadamı adaydır. Temel emniyet eğitiminin etkinliğinin değerlendirilmesi için Kirkpatrick Eğitim Değerlendirme Modeli'nin reaksiyon bölümü kullanılmıştır. Ölçek sonuçlarından elde edilen veriler, SPSS paket programında parametrik olmayan testler (Mann Whitney U testi ve Kruskal Wallis H testi) kullanılarak analiz edilmiştir. Çalışma sonucunda temel emniyet eğitimlerinin üst düzeyde etkili olduğu sonucuna varılmıştır. Eğitime ilk kez katılan gemiadamlarının etkinlik algısının, sertifika yenilemek için eğitime katılan gemiadamlarına göre daha yüksek olduğu sonucuna ulaşılmıştır.*

**Anahtar Kelimeler:** *İnsan Hatası, Temel Emniyet Eğitimleri, Eğitimlerin Etkinliği, Gemiadamları*

### 1. INTRODUCTION

Today, maritime is multicultural, technological, profitable transportation system brought about by globalization and a very preferred method of transportation due to its low cost (Gekara, 2008: 3; Ljung, 2010: 121; Hanzu-Pazara et al. 2010: 299; Manuel, 2011: 39; Berg et al. 2013: 7). Seafarers, who are at the heart of the maritime system, are the most important element of the sector (Asyalı et al. 2004: 68). Seafarers, the maritime environment, external environment entities and marine technology are the control mechanism of this system (Rothblum, 2006: 3; Aşkın et al. 2013: 10). Studies have shown that human error plays a major role in causing maritime casualties. It is often repeated that the human factor causes about 80% of all marine accidents (Asyalı et al. 2004: 68; Rothblum, 2006: 1; Albayrak and Ziarati, 2012: 2; Berg et al. 2013: 7; Poyraz, 1995: 3). Since the hinterland of maritime trade is very wide accidents at sea seriously harm the world economy and the environment.

Human error has been examined from different perspectives in marine casualty studies. Hetherington et al. (2006: 401), Chauvin and

Lardjane (2008: 259) categorize the human factor leading to accidents at sea. Errors in decision-making are one of the reasons for accidents. Special training of seafarers is necessary to improve situational awareness and decision-making (Türkistanlı and Kuleyin, 2019: 10). Horck (2006: 23) states that in reducing the impact of the human factor, more emphasis should be placed on the human factor than on automation and technology. Training seafarers with high quality standards will improve safety at sea (Demirel and Bayer, 2015: 56). It has been found that the health, safety and awareness training of seafarers who perceive a greater risk than they experience of having an occupational accident in any operation they will be carrying out on the ship, and thus the risk of experiencing an accident, decreased (Yılmaz and İlhan 2018: 25). Efficient education plays a crucial role in reducing accidents at sea. Studies have found that training seafarers ashore is not enough (Yılmaz, 2018: 211). Well-trained seafarers are needed to provide better service and find solutions to safety-related problems in maritime transport, which due to its economic nature attracts transport elements (Asyalı et al. 2004: 68; Aşkın et al. 2013: 10). Competitive seafarers are well-trained and low-risk people. The training ensures that the ship maintains a high standard of operation and improves the safety culture on board (Barsan et al. 2012: 91). The increase in technology on ships has increased the need for training, particularly on modern vessels. A country with a maritime profile and a serious desire to have its own national fleet should have facilities that provide training according to international rules and regulations (Horck, 2006: 91). Global needs should be considered in maritime education. Seafarers should receive adequate foreign language and vocational training and be trained in a program suitable for work on multinational ships (Muslu, 2018: 300). The efficient and balanced functioning, development and growth of the international maritime trade sector depend on the study and development of maritime education (Poyraz, 1995: 2).

A study examining the effectiveness of basic safety training examined and ranked the effectiveness of four subject IMO-identified issues (Personal Safety and Social Responsibility, Elementary First Aid, Crowd and Crisis Management, and Fire Prevention and Fire Fighting). According to the results of the research conducted on Filipino students, the effectiveness of basic maritime education was rated as moderate, and there are still training needs that need to be improved. In addition, it is suggested that trainers should be experienced and knowledgeable in communication and teaching techniques (Bolaños et al. 2016: 8,12). A study investigating basic safety training using the Kirkpatrick Evaluation Training Model at an institution in the Philippines examined the training delivered at the institution in terms of response, behavior, learning and

outcome. Although some problems have been encountered, it has been concluded that the training is efficient (Buted et al. 2014: 161,168). Previous studies on the efficiency of basic safety training show that the training offered was specifically examined institutionally.

To ensure that crews are competent and receive appropriate training for ships navigating in international waters, the IMO (International Maritime Organization) has established qualification standards for seafarers on merchant ships. The criteria according to which the sea personnel are trained are specified in the contract STCW (Standards of Training Certification and Watchkeeping) 78/95 issued by the IMO. STCW defines the basic requirements for training and certification. The convention has 164 signatory countries representing 99.2 percent of the world shipping tonnage (Bounou, 2020: 6). According to this contract, personnel who will work at sea must receive training in safety issues. The main purpose of the practical part of the training is to develop safety and risk awareness on board, to familiarize students with the most appropriate techniques and procedures, and the use and maintenance of protective equipment on board (Walliser et al. 2016: 6144). Basic safety training provides hands-on training experience using safety equipment combined with classroom instruction and is intended for all seafarers with a proven role in safety or pollution prevention. It is a requirement to become a full seaman in today's marine industry.

If a seafarer candidate wishes to work on merchant ships, he or she must attend STCW training courses organized by authorized institutions. There are doubts as to whether the quality of training provided by maritime training organizations is sufficient (Nemlioğlu Koca, 2016: 379; Özdemir et al. 2017: 166). Although there are doubts about the quality of maritime education, there is a lack of research on these questions in the domestic and foreign literature. This study focused on STCW training courses organized by authorized institutions. Given the many and serious negative consequences of marine casualties, it becomes important to research and develop marine safety training, which is a factor in preventing marine accidents. Most of the people who take these courses are new to maritime training, it is important to determine the effectiveness of the course for them. The authors explored this topic to understand the extent to which the learning objectives of maritime safety training were met. The purpose is to determine the importance and priority of the training provided in the institution, the reason for the training for what it must go through, the benefit to the trainees and the problems encountered during the training.

## **2. METHOD**

### **2.1. The Goal of the Present Research**

The aim of this study is to determine the effectiveness of the training of seafarers and prospective seafarers who take part in basic safety training.

### **2.2. Participants**

The participants in the study were 275 seafarers and seafarer candidates attending basic safety training between 2018 and 2020. At the end of the training, the questionnaires were filled out by hand by the participants and the data was entered into the SPSS program by the authors.

### **2.3. Instrument**

The first part of the questionnaire includes gender, type of training (re-certification or initial training in the sector), duty on board, experience time at sea. It was used in the second part of the questionnaire evaluating the effectiveness of basic safety training in relation to the response of the *Kirkpatrick Training Evaluation Model - Level 1* (10 items) (Kirkpatrick, 1994). In the present study, the overall Cronbach's internal consistency reliability estimate of the questionnaire is 0.959 (n=275) ( $r \geq 0.70$ ).

### **2.4. Analyses**

The data collected through the questionnaire were analysed using the SPSS 25.0 program.

Frequency analyses of the participants' responses to the questions were conducted, aimed at revealing their demographic characteristics. Also, Kolmogorov Smirnov tests of these variables were used to determine whether or not the distribution of variables was parametric.

In Mann Whitney U test 'r' value was used to measure effect size. The effect size is small when the r value is less than 0.1, medium when the r value is between 0.1 and 0.3, and large when the r value is greater than 0.5 (Cohen, 1988).

Participant perceptions ranged from 1.00 to 2.39 as low, from 2.40 to 3.39 as moderate, and from 3.40 to 5.00 as high.

### 3. FINDINGS

#### 3.1. Frequency Analysis

The frequency analyses of the demographic characteristics of the students participating in the study are presented in Table 1.

**Table 1:** Frequency Analysis

<b>Gender</b>		<b>Training Type</b>			
	<b>N</b>	<b>%</b>		<b>N</b>	<b>%</b>
Male	255	93	Renewal	160	58
Female	20	7	First Time	115	42
<b>Total</b>	275	100	<b>Total</b>	275	100
<b>Duty on board</b>		<b>Experienced or not</b>			
	<b>N</b>	<b>%</b>		<b>N</b>	<b>%</b>
Seaman	166	60	Experienced	30	11
Able seaman	7	3	Unexperienced	243	88
Cook	37	14	Missing	2	1
Steward	34	12			
Oiler	28	10			
Missing	3	1			
<b>Total</b>	275	100	<b>Total</b>	275	100

#### 3.2. Distributions of Participants' Responses to Statements About the Effectiveness of Basic Safety Training

The distributions of participants' responses to statements about the effectiveness of basic safety training are shown in Table 2 below. Looking at the distribution of answers, it becomes clear that the perception of the participants with regard to the effectiveness of the basic safety training scores high for every question in the questionnaire. The mean score of the participants' perception was  $4.343 \pm 1.074$  high-level expressions.

**Table 2:** Distributions of Participants' Responses to Statements About Effectiveness of Basic Safety Training

St.	Strongly disagree		Disagree		Undecided		Agree		Strongly agree		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
1	8	2.9	9	3.3	16	5.8	68	24.7	174	63.3	4.4218	0.95342
2	21	7.6	8	2.9	21	7.6	67	24.4	158	57.5	4.2109	1.18963
3	12	4.4	12	4.4	21	7.6	65	23.6	165	60.0	4.3055	1.07449
4	9	3.3	6	2.2	16	5.8	62	22.5	182	66.2	4.4618	0.94434
5	10	3.6	8	2.9	19	6.9	69	25.1	169	61.5	4.3782	0.99390
6	33	12.0	13	4.7	22	8.0	59	21.5	148	53.8	4.0036	1.37628
7	18	6.5	8	2.9	28	10.2	51	18.5	170	61.8	4.2618	1.16699
8	16	5.8	3	1.1	12	4.4	61	22.2	183	66.5	4.4255	1.04850
9	13	4.7	3	1.1	16	5.8	53	19.3	190	69.1	4.4691	1.00089
10	13	4.7	2	0.7	18	6.5	45	16.4	197	71.6	4.4945	0.99770
<i>Average score</i>											4.343	1.074

### 3.3. Hypothesis Testing Results on Training Effectiveness based on Profile Information

Research hypothesis tests are:

- a- The trainees' perceptions of the effectiveness of the training differ with regard to the variable gender.
- b- Depending on the type of training, trainees' perceptions of the effectiveness of the training differ.
- c- Trainee perceptions of the effectiveness of training in relation to duty on board vary.
- d- Trainees' perceptions of training effectiveness differ in terms of what is experienced and what is not.

Kolmogorov Smirnov tests of these variables were used to determine whether the distribution of variables were parametric or not. According to the Kolmogorov-Smirnov normality test, the variables gender (sig:0.000), training type (sig:0.000), duty on board (sig:0.000) and experienced or not (sig:0.000) were found to be non-parametric. So nonparametric tests were used for hypothesis testing.

Hypothesis tests based on profile information showed significant differences in the variables of "gender" and "type of training". There were no significant differences in the tests according to the variables of the "duty on board" and "experienced or not". Data for variables with significant differences are presented in Table 3 below.

Perception on the question “*I felt the instructor wanted us to learn*” was higher in female participants (166.63) than in males (135.75), and this significant difference had a mean effect size ( $r=-0.12$ ).

Perception of whether “*I acquired the knowledge and skills to be learned in this course*” was higher among participants initial training (150.78) than participants with repeat training (128.82), and this significant difference had a medium effect size ( $r=-0.16$ ). Perception of the question “*The course met all of the stated course objectives*” was higher among participants receiving first-time training (149.73) than participants receiving repeat training (129.57), and this difference was significant had a mean effect size ( $r=-0.14$ ).

Perception when asked “*I clearly understood the aims of the course*” was higher among participants who received initial training (147.76) than participants who received repeat training (130.98), and this significant difference was significant had a medium effect size ( $r=-0.12$ ). The perception of the question “*The method of delivery of the course allowed me to learn effectively*” was higher among participants who received first-time training (148.46) than participants who received repeat training (130.48), and this significant difference had a medium effect size ( $r=-0.13$ ). Perception of the question “*The course content was logically arranged*” was higher among participants with initial training (151.02) than participants with repeat training (128.64), and this significant difference had a moderate effect size ( $r=-0.16$ ).

Perception of the question “*There was enough time to learn the course content*” was higher among participants with initial training (151.46) than participants with repeat training (128.33), and this significant difference had a medium effect size ( $r=-0.14$ ). Perception of the question “*I felt the instructor wanted us to learn*” was higher among participants who received first-time training (148.97) than participants who received repeat training (130.12), and this significant difference had a mean effect size ( $r=-0.14$ ).

It was found that there were significant differences in trainees’ perceptions of the effectiveness of training in relation to “Type of training”. It was the expected result of a hypothesis test on seafarer renewal and initial training. Because these two groups have different expectations of the training. In particular, seafarers who have received such training before and on-board receive renewal training, their perception of the training is lower than that of seafarers receiving initial training.



**Table 3:** Hypothesis Testing Results on Training Effectiveness based on Profile Information

Scale to detect effectiveness of STCW training	Profile variables					
	Gender (Male/Female)	Training type (Renewal/First time)		Duty on board	Experienced or not	
	Test 1 differences*	Test 1 differences*		Test 2	Test 1	
1- ... knowledge and skills ...	U:2024.00 p:0.073	U:7730.500 p: 0.008 r: -0.16	*Renewal: 128.82 First time: 150.78	H:8.372 p:0.137	U:3594.00 p:0.884	
2- Amenities and equipment ... easy.	U:2128.00 p:0.167	U:8066.00 p:0.051		H:6.358 p:0.273	U:3557.50 p:0.881	
3- ... course objectives.	U:2341.00 p:0.487	U:7851.000 p: 0.018 r: -0.14	*Renewal: 129.57 First time: 149.73	H:5.903 p:0.316	U:3620.00 p:0.994	
4- ... aims of the course.	U:2391.00 p:0.579	U:8077.500 p: 0.039 r: -0.12	*Renewal: 130.98 First time: 147.76	H:7.154 p:0.209	U:3496.00 p:0.662	
5- The method of delivery of the course ...	U:2411.00 p:0.640	U:7997.500 p: 0.033 r: -0.13	*Renewal: 130.48 First time: 148.46	H:5.779 p:0.328	U:3451.00 p:0.584	
6- The materials ... useful.	U:2022.50 p:0.091	U:8231.00 p:0.102		H:5.223 p:0.389	U:3551.50 p:0.802	
7- The course content ...	U:2481.00 p:0.817	U:7702.500 p: 0.008 r: -0.16	*Renewal: 128.64 First time: 151.02	H:9.523 p:0.090	U:3576.50 p:0.847	
8- ... enough time ... course content.	U:2293.50 p:0.369	U:7652.000 p: 0.004 r: -0.14	*Renewal: 128.33 First time: 151.46	H:9.793 p:0.081	U:3596.00 p:0.885	
9- ... instructor wanted us to learn.	U:1977.500 p: 0.04 r: -0.12	*Male: 135.75 Female: 166.63	U:7939.000 p: 0.017 r: -0.14	*Renewal: 130.12 First time: 148.97	H:7.275 p:0.201	U:3437.50 p:0.533
10- ... ask questions to the instructor.	U:2438.00 p:0.680	U:8193.00 p:0.051		H:6.248 p:0.283	U:3627.00 p:0.956	

Test 1: Mann Whitney U test

Test 2: Kruskal Wallis

#### 4. DISCUSSION AND SUGGESTIONS

Basic maritime training and certification procedures are governed by each country's own maritime authority. However, there are educational standards set by the IMO in the STCW Convention. Comparing the impact of trainings on seafarers will make positive

contribution to the maritime sector. From this perspective, this study found that the basic safety trainings parallel to the studies of Bolaños et al (2016: 20) and Buted et al (2014: 168) were effective at a high level. This study confirmed that the basic safety training improves seafarers' learning and behaviour, paralleling Bolaños et al (2016) and Buted et al (2014). Also, there were no significant differences in trainees' perceptions of training effectiveness in relation to "Gender" same as Bolaños et al (2016: 20).

The perceptions of effectiveness of seafarers who received this training previously were lower than that of seafarers who received this training for the first time. Training programs should be developed separately for seafarers entering training for first time and for renewal. It is obvious that both groups have different educational expectations. It is believed that more detailed educational planning for those entering for the first time will contribute to the area.

Basic safety training is very important to maintain an appropriate safety culture on board (Lewin, 2015: 1). In order to create an international safety culture in the maritime sector, it is necessary to standardize the effectiveness of training.

Basic safety training organized by authorized institutions should be supported by on-board safety training. Safety training sessions on board are particularly valuable in order to ensure coordination between all crews on board.

In order to increase the effect of the training on people, special solutions can be created during the planning for the seafarer candidates who are receiving the training for the first time. It will be a useful contribution if the duration, subjects and practices of the training can be adjusted according to the profiles of the seafarers in training. In addition, if a pre-training test to be given to seafarers can reveal the missing or required training topics, the effectiveness of the training can be increased even further.

This study was conducted on an institutional basis like Bolaños et al (2016) and Buted et al (2014). Due to this limitation, it is not possible to disclose the universe of the study.

Future research focused on analysing safety training programs, differing expectations between ratings and officers, and regional differences.

## 5. CONCLUSION

The human factor plays a relatively large role in marine accidents. Therefore, the impact and durability of maritime safety training for seafarers under the STCW is of great importance. The aim of this study was to determine the effectiveness of the training of seafarers and prospective seafarers participating in basic safety training. The perception of effectiveness of the seafarers participating in the STCW course was rated as high on average. Based on this finding, it was concluded that the basic safety training had a positive and lasting impact on the seafarers who attended the training.

It was found that there were significant differences in the tests according to the training type variables. The perceptions of effectiveness of seafarers who received training for the first time were higher than those of seafarers who received training update. This finding demonstrated the need for basic safety training for prospective seafarers. The information provided at the training sessions was more valuable and of more interest to prospective seafarers than to existing seafarers undergoing certification renewal training. It was an expected result that seafarers who have been attending this training for years are becoming bored.

Although the effectiveness of the training in our study was high, it is believed that those seafarer candidates who are attending this training for the first time should be supported by on-board training. This will help people develop a culture of safety more quickly. The training courses can therefore go beyond pure certificate training courses.

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