



Board of Editors

Chief Editor

Dr. capt. Hesham Helal

President of AIN.

Members

Prof. Krzysztof Czaplewski

President of Polish Navigation Forum,
Poland.

Prof. Dr. Yousry El Gamal

Former Minister of Education, Egypt

Prof. Ahmed El Rabbany

Graduate Program Director, Ryerson
University, Canada.

Prof. Mohamed El Gohary

President of Borg Al Arab
Technological University.

Prof. Adel Tawfeek

Prof of Marine Engineering – Port
Saied University.

Capt. Mohamed Youssef Taha

Arab Institute of Navigation.

Dr. capt. Refaat rashad

Arab Institute of Navigation.

Dr. capt. M. Abdel El Salam

Dawood

Consultant of President for Maritime
Affairs, AASTMT, Egypt.

Ms/ Esraa Ragab Shaaban

Journal Coordinator.

Arab Institute of Navigation

Cross Road of Sebaei Street & 45 St.,
Miami, Alexandria, Egypt

Tel: (+203) 5509824

Cell: (+2) 01001610185

Fax: (+203) 5509686

E-mail: ain@aast.edu

Website: www.ainegypt.org

Journal of

The Arab Institute of Navigation

Semi Annual Scientific Journal

Volume 47 (Issue 1) Jan 2024

pISSN (2090-8202) - eISSN (2974-4768)

<https://doi.org/10.59660/47011>

INDEXED IN (EBSCO)

Contents

Editorial

English Papers

Review of Reliquefaction plant system for liquified natural and petroleum gas carriers

Capt. Mohamed H. M. Hassan

Ranking Seafarers' Duties towards Unmanned and Autonomous Ships in Prospective of STCW

Capt. Moustafa Mohamed Hosny, Capt. Eslam Abdelghany E. Mohamed

Impact of the Offshore Oil and Gas Working Environment on the Mental Health and Safety Behaviour of Workers

Hossam Eldin Gadalla, Ahmed Saad Nofal, Hesham Helal

NUMERICAL ANALYSIS OF WAVE ENERGY POINT ABSORBERS BUOY SHAPE

Mohamed Walid abd Elhamed Ahmed

Liquefied Natural and Petroleum Gas Carriers: An Analysis of the Potential Dangers, Safety Measures and Risk Factors

Capt. Mohamed H. M. Hassan, Capt. Ibrahim Ahmed Kamal Elsemmsar

Arabic Papers

The Role of The Economic and Social Environment of Fishermen on The Safety of Fishing Vessels in Egypt

Abd El-Khaliq Kamal El-Din Selmy, Hesham Mahmoud Helal, Alaa EL-Din Ahmed Kamal El-Hawet

The role of local fisheries laws and international conventions in the management of the safety of fishing vessels in Egypt

Abd El-Khaliq Kamal El-Din Selmy, Hesham Mahmoud Helal, Alaa EL-Din Ahmed Kamal El-Hawet

The effectiveness of factors affecting consumer loyalty by applying it to the sea port of Benghazi

Wessam Hasan Bozid El-Kawafy

The impact of the development of the logistics system on the competitive advantage of ports

"Comparison between the port of Rotterdam and Damietta"

El-Bedewy El-Sayed Mohamed, D. Sameh Farahat El-Sayed, D. Mokhtar Habashy Ahmed

Logistic Role of Aqaba ports in Enhancing Intra-Arab Trade

Ahmed Mohamed Khalaf Al-Fawaz, D. Hesham Mahmoud Helal, D. Khalid Sallem Ata

The Study of Impact on Converting The Alexandria port To a Green Port

Kabary Mohamed Mahmoud, D. Ibrahim Hassan, D. Alaa Morsy

The role of value-added services in supporting foreign trade in seaports (Case study of Aqaba port)

Khalid Waled Salah Al-Ghasawna, D. Alaa Mahmoud Morsy, D. Salah Ismail Hassan

Impact of the Offshore Oil and Gas Working Environment on the Mental Health and Safety Behaviour of Workers

Prepared By

Hossam Eldin Gadalla¹, Hesham Helal², Ahmed Saad Nofal³
Arab Academy for Science, Technology & Maritime Transport

DOI NO. <https://doi.org/10.59660/47119>

Received 25/09/2023, Revised 04/11/2023, Acceptance 09/11/2023, Available online and Published 01/01/2024

المستخلص

يتزايد معدل الحوادث المرتبطة بالعمل في صناعة النفط والغاز العالمية، مع الإشارة الى وجود خطأ العنصر البشري الناتج في المقام الأول عن السلوك غير الآمن في بيئة عمل خطيرة ومعزولة ومرهقة تنطوي على مزيج فريد من المخاطر النفسية والاجتماعية. ومن هذا المنطلق يمكن أن تصبح بيئة العمل هي اليد الخفية التي يمكن أن تؤثر سلباً على سلوكيات السلامة لدى العاملين مما يؤدي إلى ارتكاب الأخطاء. وللتخفيف من مخاطر الحوادث الناجمة عن السلوك غير الآمن في هذه الصناعة، تم التحقيق في التأثير المحتمل للمخاطر النفسية الاجتماعية لبيئة العمل والمتمثلة في البعد والعزلة، على الصحة النفسية للعامل، وتم تقييم التأثيرات المرتبطة والذي يمكن تفسيره بانخفاض مستويات المشاركة والتواصل في مجال السلامة بشكل ملحوظ على الرغم من التزامهم العالي بقواعد السلامة. ومن ثم يوصي الباحث بأن يقوم منظمو ومشغلو الصناعة بالبدء في تدخلات الصحة النفسية، بما في ذلك رفع وعي العمال بهذا الامر، وتخفيف العزلة، والسيطرة على أعباء العمل العالية، وتحسين الظروف المعيشية، وتوفير وسائل الاتصال الكافية، والخصوصية، والمرافق الترفيهية حيث أن اعتماد هذا النهج يمكن أن يضع الأساس للسلامة والأداء الأمثل للقوى العاملة في مجال النفط والغاز.

Abstract

The rate of work-related accidents is rising in the global Oil and Gas industry, with a significant contribution of human error driven primarily by unsafe behaviour in a hazardous and isolated work environment involving a unique mix of psychological and social risks. From this standpoint, the working environment could be the hidden hand that can negatively affect workers' behaviour, leading to errors. To mitigate the risks of accidents and incidents caused by unsafe behaviour, the potential impact of the working environment's psychosocial hazards, represented by remoteness and isolation, on workers' mental health, was investigated, and the associated influences on safety behaviour were assessed. The study proposed a research model in which characteristics of the offshore working environment negatively affect workers' mental health and safety behaviour. Stress, Anxiety and Depression were chosen to represent mental health disorders due to their significant prevalence among work-related mental illnesses as per recent reports of the International Labour Organization (ILO) and multiple other studies. The methods used included a review of relevant literature and the quantitative research approach, where data was obtained from a survey involving a sample of (409) Egyptian workers in the oil and gas industry. The descriptive analysis was employed, and the results, according to the study sample, indicated a "high" level of

psychosocial hazards in the work environment. The results also revealed a "moderate" level of worker safety behaviour, which can be explained by significantly lower safety engagement and communication levels despite their high adherence to safety rules. Hence, the researcher recommends that industry regulators and operators initiate mental health interventions, including raising worker awareness, alleviating isolation, controlling high workloads, improving living conditions, providing adequate means of communication, reasonable privacy, and recreational facilities as the adoption of The approach can lay the foundation for safety and optimal performance for the oil and gas workforce.

Key Words: Offshore, Safety, Working Environment, Hazards, Behaviour, Workforce

1. Introduction

Workers in the Oil & Gas industry are vulnerable to specific stressful work conditions with the highly demanding nature of their work environments that involve multiple psychosocial hazards. In this regard, the European Agency for Safety and Health at Work demonstrated that the adverse characteristics of the working environment induce various effects on workers' mental health (EU-OSHA, 2014). Similarly, the ILO revealed that offshore oil and gas exploration and production operations entail remote and isolated locations of most offshore installations, imposing physical and psychological barriers between workers and their social support network (ILO, 2022).

Furthermore, working in an oil and gas field entails long working hours with less time for rest, a high load of work, and stressful day and night shift schedules when rotation patterns are affected or constrained by transport schedules. Additionally, several other perceived risks associated with the nature of offshore jobs, such as the proximity of the living and working environments, do not offer privacy nor separation from the characteristics of the working environments. The problem is that such a working environment might harm the worker's mental well-being, while research has proved that mental illness negatively affects people's behaviour at work.

The investigation outcomes of the Allianz Group pointed to Human Element Errors as the primary causes contributing to the majority of accidents and incidents (Allianz, 2019). Therefore, there is increased attention toward investigating the factors causing human element error. In this regard, unsafe human behaviour was the main factor behind workplace injuries and accidents (Zhang et al., 2020). This is consistent with previous studies of Choudhry (2014), who revealed that worker poor safety behaviour is the primary cause of workplace accidents.

Given these concerns, this study aimed to provide a comprehensive understanding of the potential causes behind human behaviour, the primary leading factor to most of the industry's incidents and accidents. The contribution is that it can form the basis for decision-makers in the Oil & Gas industry in developing counter-measures that can effectively contribute to boosting the workers' safety behaviour, thus eliminating or at least mitigating the risk of those causes in the future.

This study presented two hypotheses as follows;

H₁. The psychosocial hazards of the Oil & Gas working environment have an effect on the presence of workers' mental health disorders.

H₂. The workers' Mental Health Disorders have an effect on the worker's safety behaviour

2. Literature Review

2.1 Incidents & Accidents in the Oil & Gas Industry

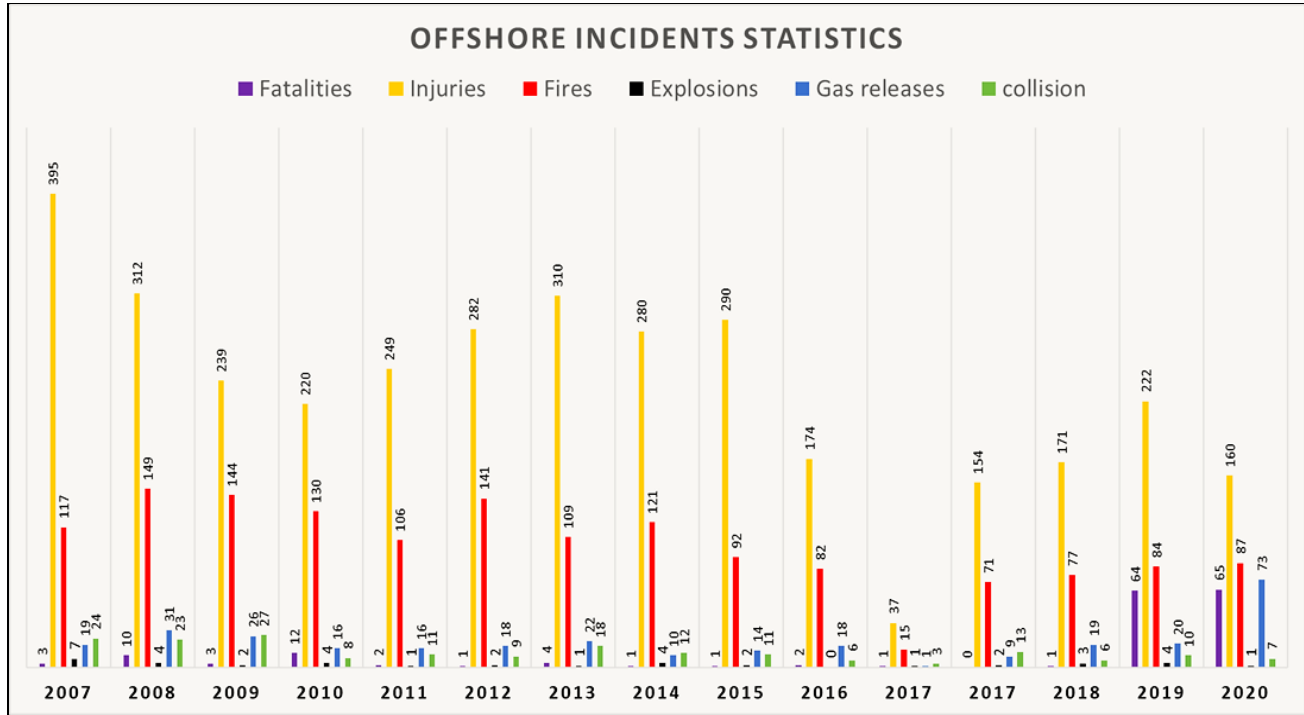
In the oil and gas industry, "Safety" is widely defined as a secure setting where workers are maintained safely on their work tasks and where the likelihood of accidents or incidents is eliminated while limiting the potential consequences of administrative retribution (Fernandez-Muniz et al., 2014). Okoye (2016) asserted that safety is simply the combination of behaviour intended to either increase or decrease the risk of harm, where the term "Safe" denotes the absence of danger and "Unsafe" implies the presence of a high probability of danger.

This concern is essential in managing work activities in hazardous working environments, such as the oil and gas industry, where accidents and incidents could have disastrous consequences. This was agreed by Mearns & Yule (2009), who asserted the importance of safety in the oil and gas industry and referred to it as a crucial operational requirement since the industry is regarded as a high-risk domain due to its associated hazardous nature and challenging work conditions.

Incidents and accidents confront all industries with multiple complications and generate community concerns, commonly leading to additional regulations to reshape the parameters under which those requirements are implemented. Regarding the oil and gas industry, hazards pose significant challenges in managing the safety of such complicated operational activities. According to Almeida & Vinnem, (2020), the complex operations of the Oil and Gas industry, which involves various exploration and production processes, entail a significant potential of enormous risks involving fires, explosions, and releasing toxic gases. Those unfavourable events could escalate, due to several factors, into significant incidents and accidents, leading to a substantial number of injuries and fatalities in the workforce.

The United States BSEE, (2021) revealed that the offshore oil and gas sector is significantly demanding and stressful due to its high potential risks and work-related accidents. Figure (1) illustrates the annual records of incidents across the USA offshore oil and gas sector based on data collected relevant to all reported fatalities and injuries, in addition to all incidents involving fire, explosions, gas release and collision from 2007 to 2020. Although the graph demonstrates a drop in injuries, collisions, fires and explosions over the last few years, a single significant incident in this industry could be greatly catastrophic, and its consequences could seriously impact lives, the environment and property.

Figure (1): Incidents in Offshore Oil & Gas Industry (USA)



Source: BSEE, (2021)

The annual number of fatalities, as illustrated in Figure (1), shows a recent increase, which poses serious concerns regarding the safety of operation and management of risks and hazards in the industry. A high rate of fatalities associated with incidents could be viewed as the worst-case scenario; therefore, all potential causes should be considered when performing risk analysis for the daily drilling and production processes (BSEE, 2021).

Intending to gain a better understanding of how accidents and incidents have been caused in the offshore oil and gas industry, Ismail et al. (2014) examined 219 case studies of accidents and incidents which took place over 56 years and involved several offshore installations, such as drilling ships, jack-up rigs, semi-submersible rigs, and production platforms. Based on collected data, the study findings revealed that all the studied accidents and incidents were mainly caused or escalated by the integration of adverse factors, including human error, incompetence, and equipment failures. Nevertheless, human error was found to be the most contributing factor among all other causes. This argument was backed up by Allianz Global Corporate & Specialty, which investigated all the potential causes of accidents and incidents related to a recorded 14,828 cases of liability insurance claims raised between 2011 and 2016 (Allianz, 2019). The Allianz's report findings indicated that among all identified causes of accidents and incidents, human error was found to be the primary factor with a significantly high contribution ratio of up to 75% of the studied cases, followed by other causes, including accidental nature that was up to 18%.

Figure (2): Causes of Accidents & Incidents



Source: Allianz, (2019)

While the safety criteria for regulating the oil and gas industry are mainly known for their comprehensive approach towards risk analysis, it could be noted that the scope of accident investigation is commonly identifying physical and apparent reasons while giving less attention to hidden risks such as the involvement of mental health disorders in shaping the worker's behaviour. Multiple factors were indicated as potential reasons behind the human failure in 34 accidents and incidents that occurred during the period from 2011 to 2013. Several factors, including non-compliance with the procedures, poor competency and low management commitment, excessing environmental factors like heat stress, skill-based mistakes and errors, defective equipment and instruments, poor planning and communication issues, overload and fatigue, were identified as factors contributing to human failure causing accidents (UK Essays, 2018).

2.2 Workers' Safety Behaviour

Safety behaviour is the absence of an undesirable act involving an accidental and unacceptable loss (Dartey & Addo, 2018). According to Frazier et al. (2013), safe and unsafe behaviour could fluctuate depending on the company, its administration, and its workforce, as well as the difficulty level and conditions of work activities. Furthermore, Kvalheim and Dahl (2016) revealed that safety behaviour depends on how workers perceive their performance in terms of safety, keeping in view all acts and specific actions that improve the application of safety regulations and policies.

In a study investigating the relationship between the organizational safety culture and individual safety behaviour, Uryan (2010) emphasized the significance of positive safety behaviour at work and stated that employees' attitudes toward safety might influence how they conform to the safety standards. As a result, when workers exhibit a positive mentality toward safety, they maintain a safe work system, minimizing workplace risks (Wallace, 2016). Evidence from several previous research has demonstrated that enhancing the safety behaviour of individuals at work requires integrating safety involvement, safety compliance, and safety mindfulness into account as essential components of safety behaviour (Dahl & Kongsvik, 2018). Workers' safety commitment, engagement, and communications are the main components in assessing safety behaviour in the workplace (Saedi et al., 2021).

2.2.1 Safety Commitment

Safety commitment is significantly related to employees' safety behaviour and is regarded as a means of promoting a safe workplace. This is supported by Ehiaguina & Moda (2020), who revealed the value of safety commitment as a constructively vital component of workers' safety behaviour that reduces workplace accidents and injuries within hazardous industries.

2.2.2 Safety Engagement

An essential component of positive safety behaviour at any workplace is the worker's effective engagement in safety. Thus, when it comes to workplace safety, workers need to get vigorously involved (Tear et al., 2020). The workers' engagement in safety enables the development of practical approaches and methods for resolving safety concerns. It is confirmed that the workers' high level of safety engagement would help decrease potentially unsafe behaviour that leads to workplace incidents (Bayram, 2019). In line with this view, safety engagement is vital for enhancing the workers' ability to respond to work threats or emergencies and significantly contributes to positive and safe behaviour (Freitas et al., 2019).

2.2.3 Safety Communication

Safety management depends on workers reporting accidents, compliance with policies, awareness of possible risks, and safe work practices. In this regard, workers cannot enhance safety by themselves. They need management to define priorities, create guiding safety rules and procedures, provide funding for essential resources, and carry out necessary corrective measures. Thus, communication is a crucial component of safety behaviour, which could be enhanced when workers view safety as a group interaction where each of them plays a vital role as a team member with the same aim of achieving success (Schwatka et al., 2019). Effective communication must be purpose-driven, simple, dependable, and advantageous to both management and the workforce to motivate workers to report incidents and near misses and perform their responsibilities toward safety (Verroen et al., 2013).

2.3 Role of Mental Health in Shaping Human Behaviour

The significant role of mental health has gained widespread awareness worldwide. In this context, the implications of work on mental health and how it impacts workers' performance and safety is becoming a global public health concern. Researchers are still investigating mental health and frequently debate the significance of its role in interpersonal and practical aspects. In this regard, psychological and physical health are remarkably consistent. This was revealed by Palumbo et al. (2020), who also explained that being able to think, feel, and behave according to one's desired lifestyle is often a sign of good mental health. However, when a person goes through a period of poor mental health, it could be challenging or even unachievable for him to confront everyday thoughts, feelings, or reactions, resulting in emotional distress and physical illness.

Furthermore, Galderisi et al. (2017) indicated that the environment, culture, and social and economic factors contribute to the paradigm that determines how healthy an individual might become. As a result, each person's health reflects their capacity to face and overcome social and

environmental challenges. Therefore, ensuring a person's mental well-being should be emphasized for achieving the highest level of functional ability.

2.3.1 Definition of Mental Health

Literature provides multiple definitions describing mental health, yet most of which are based on a foundational component which is beyond being just free of mental illnesses; instead, it is a state of mental well-being that promotes the ability of a person to deal with everything in his life and manage its demands properly. Such capacity enables the individual to accomplish his assigned duties and enhances the achievement of his tasks to better results (Galderisi et al., 2017).

As a globally recognized definition, the World Health Organization (WHO) officially described mental health as: *"The state of well-being in which people realize their potential, and can cope with common life stresses; learn well; work productively and fruitfully, and are capable of contributing to the community"* (WHO, 2022a).

2.3.2 Mental Health Components in the Working Environment

The term "working environment" refers to integrating internal and external factors of the surroundings and circumstances associated with the workplace in which a person carries on his work activities. The workplace encompasses the working environment where workers execute their duties (Ajala, 2012). In the context of work, mental health can be analyzed based on considering two fundamental components; the first is associated with the individuals themselves and is referred to as the "Personal Factors", while the second is related to the work aspects they perform and is described as the "Organizational Factors". This was revealed by Ouellet & Gratton (2013), who further explained that personal factors involve the distinctive characteristics of each person, such as personality and social life. Some people have coping mechanisms that enable them to manage Stress, gain self-awareness, and overcome obstacles to adaptation. At the same time, their positive emotions reduce their likelihood of experiencing mental issues.

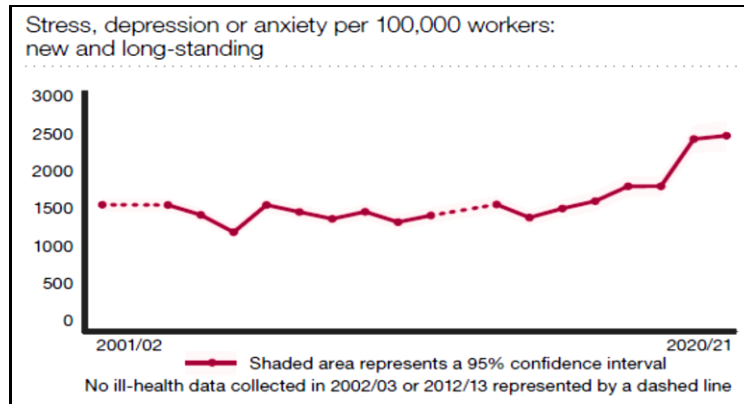
2.3.3 Mental Health Issues in the Oil & Gas Industry

The presence of mental health disorders in the Oil & Gas working environment presents a fundamental challenge to managing this hazardous industry. A workplace accident, severe injury, and even fatality can result from an offshore worker's inability to manage daily job stress due to the risky nature of his work environment. The offshore workers endure hazardous and challenging living and working conditions with prolonged separation from their friends and family, considerable lack of socialization, living in enclosed spaces, and spending days with minimum time for resting, which can eventually lead to emotions of isolation, loneliness, frustration, and dissatisfaction. Such feelings would induce mental health disorders (Xiu-li et al., 2020).

This finding is supported by the Health and Safety Executive (HSE), the UK's national occupational health and safety authority. The resulting figures derived from the Labour Force Survey (LFS) showed increased work-related Stress, Depression, and Anxiety among workers, with 822000 cases and a prevalence rate of 2480 cases per 100,000 workers (HSE, 2021). According to the HSE report, there has been a notable increase in annual rates of occupational

Stress, Depression and Anxiety among workers in Great Britain from 2001/02 to 2020/21, as illustrated in Figure (2.4). The rate in 2020/21 was substantially higher than estimated in 2018/19 by an additional number of 451000 new cases.

Figure (4): Work-Related Cases of Stress, Depression and Anxiety



Source: HSE, (2021)

2.3.4 Effect of Mental Health Disorders on Safety Behaviour

The critical role of worker safety behaviour in effectively implementing safety measures within the offshore petroleum industry was investigated by Gro et al. (2022), who showed that psychosocial factors substantially impacted safety behaviour. The study demonstrated a correlation between safety behaviour and personal injury cases in the offshore oil industry and explained the framework through which work practices affect safety.

According to Kang et al. (2016), the inevitable exposure to stressors in the offshore working environment may eventually cause mental health disorders, which raise the work-related risks of accidents and incidents and substantial financial losses. This fact depicts a crucial need to develop, implement and enhance a comprehensive approach to risk analysis and safety measures besides raising awareness of workplace stressors and their impact on performance among workers and operators. Ultimately, the Det Norske Veritas (DNV), (2022) pinpointed that it is essential to understand that one of the most critical aspects of minimizing human errors and improving safety is managing the contextual elements that could influence human behaviour.

2.4 The Psychosocial Hazards of the Working Environment

Psychosocial hazards are work-related factors that can cause harm to people psychologically, socially and physically, which could be categorized into three levels: individual, job, and organization. The psychosocial hazards at each level can interact, increasing the psychosocial risks in the workplace (NOPSEMA, 2021). Recognizing the importance of this issue, the ILO has referred to the psychosocial hazards of the working environment as the interactions between the characteristics of work, its organization, management, and environmental elements on the one hand, with the needed skills and capacity of employees on the other hand. Those interactions might harm workers' health to certain degrees based on their perceptions and experiences (ILO, 2016).

Psychosocial risks refer to the probability and severity of psychological or physical harm brought by the individual's exposure to psychosocial hazards. These psychosocial risks may be related to the nature of the work undertaken and the workplace's physical, social or cultural characteristics, among other things (WHO, 2022b).

Psychosocial hazards can be found in almost all industries, but some workers get exposed to them more significantly than others because of what, where, and how they perform their work. Subsequently, those workers confront a higher risk of being impacted by various adverse events and conditions due to the characteristics of their working environment (WHO, 2022c). In this view, Oil & Gas workers are vulnerable to complex and challenging work conditions associated with various physical stressors such as extended shifts, stressful duties, and repetitive night shifts.

From an academic standpoint, the correlation between multiple psychosocial risks of the working environment and workers' mental health has been discussed in previous studies. Cox & Griffiths (2005) defined the psychosocial hazards of the workplace as: "*The aspects of work's design and management, as well as its organizational and social environment that has the potential to cause psychological or physical harm*". The psychosocial hazards in the working environment and how they might impact workers' mental health are gaining growing attention, especially for industries with isolated and stressful workplace conditions, such as the oil and gas industry.

2.4.1 Remoteness and Isolation of the Workplace

According to the Queen Land Government (QLD), (2022), the term "remote work" describes the working environment that, due to its location, timing, or nature, cannot be supported with the prompt aid of others, such as workplaces where receiving emergency assistance or attaining rapid rescue is significantly challenging. It may also include working in regions with poor access to communications resources and extended travel periods. On the other hand, work that requires workers to spend an extended period far from home or when there are few other people nearby is considered an isolated workplace. A worker may suffer physical or psychological harm due to regular, extended, or extreme emotional Stress from remote or isolated employment. While remote and isolated jobs might present a risk by themselves, it frequently occurs in conjunction with other psychological workplace risks, which may increase the risk of harm if combined (QLD, 2022).

The remote and isolated locations of most oil and gas offshore installations are among the psychosocial work risks associated with the offshore work environment. Anwar & Sherief, (2018) conducted a comprehensive study based on a literature review of all previous research studies investigating the direct or indirect effects of working in remote and considerably isolated workplaces on workers' safety behaviour.

3. Research Methodology

The researchers adopted the deductive approach to reach the research aim and employed quantitative methods to collect the data: a literature review and questionnaires. The research variables included psychosocial hazards in the Oil & Gas working environment as independent

variables, mental health disorders as mediating variables, and workers' safety behaviours as dependent variables.

The study's population included all Egyptian Oil & Gas workers. The questionnaires were available to workers at working sites or when on leave while attending mandatory safety courses at the Arab Academy for Science Technology & Maritime Transport (AASTMT) to ensure that all workers in the industry could be included in the study sample.

After selecting the sample, the measurement tools and the development of questionnaires, the statements were pretested and modified to remove any discernible flaws. In this regard, the pilot study was significantly beneficial in reconstructing and adequately reshaping the questionnaire.

The hard copies of the questionnaires were distributed to classroom participants, and the digital formatting was utilized for workers at the working sites using an online survey.

After completing the fieldwork for the survey, the researchers obtained 409 complete responses, and then the collected data were statistically analyzed after being coded, edited, and processed. The research analysis techniques included Descriptive Analysis, Correlation Analysis, and Multiple Linear Regression Analysis.

4. Results and Discussion

The descriptive statistics results showed a "high" level of isolation and remoteness, in addition to a "mild" level of Anxiety and "moderate" levels of Depression and Stress. The results indicated a "moderate" level of safety behaviour reasoned by participants' high commitment to regulations but less safety engagement and communication.

The results of utilizing the Pearson correlation coefficient to study the correlation between the Psychosocial Hazards of the Oil & Gas Working Environment and Workers' Mental Health Disorders showed a positive and statistically significant correlation between the working environment's psychosocial hazards and mental health disorders as demonstrated in Table (1)

Table (1): Correlation between the Psychosocial Hazards and Mental Health Disorders (n =409)

Variables			Worker's Mental Health (Disorders)		
			Depression	Anxiety	Stress
Working Environment (Psychosocial Hazards)	Remoteness	Pearson Correlation	0.54	0.42	0.50
		Sig.	0.00	0.00	0.00
	Isolation	Pearson Correlation	0.54	0.46	0.52
		Sig.	0.00	0.00	0.00

The Pearson correlation coefficient was used to study the correlation between mental health disorders and workers' safety behaviour, and the results in Table (2) show a negative and statistically significant correlation at the level of significance (0.01) between the level of safety behaviour and workers' mental health disorders. Correlation coefficients were (-0.54) to (-0.50) and (-0.51) for Depression, Anxiety and Stress, respectively.

Table (2): Correlation between Mental Health Disorders and Worker's Behaviour (n =409)

Variables			Safety Behaviour
Worker's Mental Health (Disorders)	Depression	Pearson Correlation	-0.54
		Sig.	0.00
	Anxiety	Pearson Correlation	-0.50
		Sig.	0.00
	Stress	Pearson Correlation	-0.51
		Sig.	0.00

In light of previous results, multiple linear regression analysis was used to study the effect of mental health disorders on worker's behaviour, as demonstrated in Table (3).

Table (3) Regression model for the effect of Mental Health Disorders on Safety Behaviour (n=409)

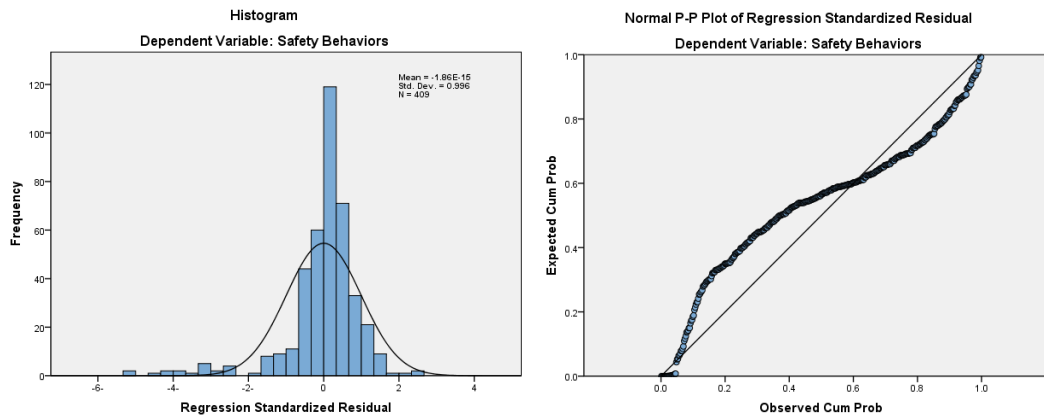
Dependent Variable	Predictors	Unstandardized Coefficients		Standardized Coefficients	t	P-value/ Sig.	F	P-value/ Sig.	R Square
		B	Std. Error	Beta					
Safety Behaviour	(Constant)	3.38	0.14	—	24.89	0.00	60.67	0.00	0.31
	Depression	-0.05	0.01	-0.34	-3.95	0.00			
	Anxiety	-0.01	0.01	-0.06	-0.69	0.49			
	Stress	-0.02	0.01	-0.19	-2.49	0.01			

Table (3) shows that the value of F is (60.67), with (P-value < 0.01), meaning that the regression model is significant at the level of significance (0.01). The coefficient of determination (R²) equals (0.31), which means that (31%) of the variance in the level of safety behaviour can be explained by the variance of mental health disorders.

It was found that Depression had the most significant impact on the level of Safety behaviour, followed by Stress, whereas the standardized regression coefficient (β) values reached (-0.34) and (-0.19), respectively, indicating the importance of the effect of these variables on safety behaviour.

In contrast, Anxiety had an insignificant impact on safety behaviour in the presence of other variables (P -value > 0.05). Figure (4) shows the distribution of the standard residuals of the regression model, where it is clear that the distribution of the standard errors of the Model is close to the normal distribution.

Figure (4): Distribution of the Standard Residuals of the Regression Model between Mental Health Disorders and Safety Behaviour



Based on these findings, neglecting the working environment's impact on workers' mental health could eventually compromise a worker's safety behaviour. Mental health disorders can become overwhelming, leading to unsafe behaviour, which puts their safety and the safety of others at risk while ultimately harming the interest and sustainability of this vital sector.

Therefore, workers' interactions with the working environment psychosocial hazards must be recognized to comprehend better the various associated health threats, including stress, anxiety and depression disorders that might result from these interactions. The main concern is that every occurrence of a responsive interaction between a worker and his working environment affects his perception and behaviour.

In this manner, addressing Stress, Anxiety and Depression in the Oil & Gas industry is critically important since such a distinct working environment could be physically, psychologically and socially stressful, adversely affecting workers' mental well-being and consequently influencing their safety behaviour and performance.

5. Conclusion

The researchers of this study argued that human error should not be entirely regarded as the root cause of incidents and accidents in the Oil & Gas industry but rather should be viewed from a broader scope as a consequence of multiple personal-environmental interactions in the working environment, which could adversely affect the workers' mental well-being leading to disrupting their safety behaviour. In this view, psychosocial hazards in the Oil & Gas working environment

could impose substantial risks by affecting the workers' behaviour, changing their ability to maintain positive safety behaviour. This could be reasoned by the hidden nature of mental health disorders since they cannot be easily diagnosed compared to other occupational safety risks. As an illustration, Stress, Anxiety and Depression, among other mental health disorders, could be unrecognized in a workplace unless reported by workers, which is unlikely to happen due to discrimination. Subsequently, the relationship between the psychosocial hazards of the working environment and the workers' mental health cannot be easily linked to the workers' behaviour unless a comprehensive investigation is carried out. These findings stipulate the necessity for corrective measures to mitigate remoteness, high workload and adverse living conditions since they significantly impact workers' mental health. Based on this argument, the industry's regulators and operators should initiate rapid interventions to address mental health disorders, including a primary framework for the Egyptian Oil & Gas sector, to raise awareness for frontline workers and management in all capacities with the significant impact of the psychosocial hazards of the working environment.

Furthermore, increasing the number of workers and incorporating further automation in operation activities might seem a reasonable approach towards tackling high workloads. Also, providing a means of communication like high-speed internet to allow video calls with families could decrease workers' perceptions of isolation and remoteness, especially for offshore workers. In addition, allowing workers' privacy in accommodation, especially on offshore installations, and providing recreational and entertainment facilities are highly recommended to mitigate the perception of adverse living conditions. On the other hand, operators should demonstrate a culture of safety engagement and safety communication by listening to workers, making them feel valued for their contributions and supporting them to enhance their contextual performance. Working towards this aspiration lays the foundation for the daily delivery of safety and performance; it will enable an engaged and empowered workforce and allow the industry to gain optimal productivity.

Area for Further Research

Future research is suggested to examine the relationship between workers' educational backgrounds and safety culture dimensions for assessing attitudes and perceptions towards workplace safety climate in the Egyptian Oil & Gas sector since it might be a crucial individual component influencing workers' behaviours.

References

- Ajala, E. M. (2012). The Influence of Workplace Environment on Workers' Welfare, Performance and Productivity. *Journal of the African Educational Research Network*, 12 (1), 141-149.
- Allianz Global, (2019). Human error comes in many forms. Official website. Accessed from: <https://www.agcs.allianz.com/news-and-insights/expert-risk-articles/human-error-shipping-safety.html>

- Almeida de, A. G., & Vinnem, J. E. (2020). Major accident prevention illustrated by hydrocarbon leak case studies: A comparison between Brazilian and Norwegian offshore functional petroleum safety regulatory approaches. *Safety Science*, 121(June), 652–665. <https://doi.org/10.1016/j.ssci.2019.08.028>
- Anwar S. A. & Sherif M., (2018). Remoteness, Mental Health, and Safety Behaviour among Oil and Gas Workers. *The Tenth International Conference on Construction in the 21st Century (CITC-10) July 2nd-4th, 2018, Colombo, Sri Lanka*. Accessed from https://www.researchgate.net/publication/337622050_Remoteness_Mental_Health_and_Safety_Behaviour_among_Oil_and_Gas_Workers
- Bayram, M. (2019). Safety training and competence, employee participation and involvement, employee satisfaction, and safety performance: An empirical study on Occupational Health and Safety Management System implementing manufacturing firms. *Alphanumeric Journal*, 7(2), 301–318. doi:10.17093/alphanumeric.555154
- Bureau of Safety and Environmental Enforcement (BSEE), (2021). Offshore Incident Statistics. Official website. 2021. Accessed on 18th September 2022, from <https://www.bsee.gov/stats-facts/offshore-incident-statistics>
- Choudhry, R. M. (2014). Behaviour-Based Safety on Construction Sites: A Case Study. *Accident; Analysis and Prevention*, 70, 14–23. doi: 10.1016/j.aap.2014.03.007
- Cox, T., & Griffiths, A. (2005). The nature and measurement of work-related Stress. In *Evaluation of Human Work*, 3, 553–571. doi:10.1201/9781420055948.ch19 Accessed from: https://www.researchgate.net/publication/291834787_The_nature_and_measurement_of_work-related_stress_theory_and_practice
- Dahl, O., & Kongsvik, T. (2018). Safety climate and mindful safety practices in the oil and gas industry. *Journal of Safety Research*, 64, 29–36. doi: 10.1016/j.jsr.2017.12.009
- Dartey-Baah, K., & Addo, S. A. (2018). Charismatic and Corrective Leadership Dimensions as Antecedents of Employee Safety Behaviours. *Leadership & Organization Development Journal*, 39(2), 186–201. doi:10.1108/lodj-08-2017-0240
- Det Norske Veritas (DNV), (2022). Addressing the Human Factor in Major Accident Risk. Accessed on 18th August 2022. From <https://www.dnv.com/services/human-factors-1094>
- Ehiaguina, E. & Moda, H., (2020). Improving the Safety Performance of Workers by Assessing the Impact of Safety Culture on Workers' Safety Behaviour in Nigeria Oil and Gas Industry: A Pilot Study in the Niger Delta Region. *International Journal of Medical and Health Sciences*, 14(6), 152-156.

- European Agency for Safety and Health at Work (EU-OSHA), (2014). Calculating The Cost of Work-related Stress and Psychosocial Risks, 2014. Accessed from: <https://osha.europa.eu/en/publications/calculating-cost-work-related-stress-and-psychosocial-risks>
- Fernandez-Muniz, B., Montes-Peón, J.M. and Vázquez-Ordás, C.J., (2014). Safety Leadership, Risk Management and Safety Performance in Spanish Firms. *Safety Science*, 70, 295–307. doi:10.1016/j.ssci.2014.07.010
- Frazier, C. B., Ludwig, T. D., Whitaker, B., & Roberts, D. S. (2013). A hierarchical factor analysis of a safety culture survey. *Journal of Safety Research*, 45, 15–28. doi: 10.1016/j.jsr.2012.10.015
- Freitas, A. C., Silva, S. A., & Santos, C. M. (2019). Safety training transfer: The Roles Of Coworkers, Supervisors, Safety Professionals, And Felt Responsibility. *Journal of Occupational Health Psychology*, 24(1), 92–107. doi:10.1037/ocp0000125
- Galderisi S, Heinz A, Kastrup M, Beezhold J, & Sartorius N., (2017). A Proposed New Definition of Mental Health. *Psychiatria Polska*, 51(3), 407–411. doi: 10.12740/PP/74145.
- Gro Ellen Mathisen, Tore Tjora, Linn Iren Vestly Bergh, (2022). Speaking Up About Safety Concerns in High-Risk Industries: Correlates of Safety Voice in The Offshore Oil Rig Sector. *Journal of Safety Science*, 145(10), 54-87.
- Health and Safety Executive (HSE), (2021). Annual Report and Accounts 2020/21. ISBN 978-1-5286-2593-7 Accessed from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1018394/hse-annual-report-and-accounts-2020-2021.pdf
- International Labour Organization (ILO) (2016). *International Journal of Labour Research*. Psychosocial risks, Stress and violence in the world of work. Vol. 8, no. 1-2 (2016) Geneva: ILO. Available at https://labordoc.ilo.org/discovery/fulldisplay?vid=41ILO_INST:41ILO_V1&docid=alma995088787102676&context=L
- International Labour Organization (ILO) (2022). Oil and gas production (ILO Library). Accessed from: <https://www.ilo.org/inform/online-information-resources/research-guides/economic-and-social-sectors/energy-mining/oil-gas-production/lang--en/index.htm>
- Ismail, Z., Kong, K. K., Othman, S. Z., Law, K. H., Khoo, S. Y., Ong, Z. C., & Shirazi, S. M. (2014). Evaluating accidents in the offshore drilling of petroleum: Regional picture and reducing impact. *Journal of the International Measurement Confederation*, 51, 18–33. doi:10.1016/j.measurement.2014.01.027

- Kang W., Park WJ., Jang KH. et al., (2016). Comparison of Anxiety and Depression Status Between Office and Manufacturing Job Employees in A Large Manufacturing Company: A Cross-Sectional Study. *Ann Occup Environ Med* 2016, 28-47.
- Kvalheim, S. A., & Dahl, O. (2016). Safety Compliance and Safety Climate: A Repeated Cross-Sectional Study in The Oil and Gas Industry. *Journal of Safety Research*, 59, 33–41. doi:10.1016/j.jsr.2016.10.006
- Mearns, K., & Yule, S. (2009). The Role of National Culture in Determining Safety Performance: Challenges for The Global Oil and Gas Industry. *Safety Science*, 47(6), 777–785. doi:10.1016/j.ssci.2008.01.009
- National Offshore Petroleum and Environmental Management Authority (NOPSEMA), (2021). Guidance Note: Psychosocial risk management. Document No: N-09000-GN1958 A757599. 22nd September. 2021. Accessed from <https://www.nopsema.gov.au/sites/default/files/documents/2021-09/A757599.pdf>
- Okoye, P. U. (2016). Improving the safety performance of Nigeria construction workers: A social-ecological approach. *Universal Journal of Engineering Science*, 4(2), 22–37. doi:10.13189/ujes.2016.040202
- Ouellet M. & Gratton P., (2013). Psychological health at work: The Joint Association for Occupational Health and Safety. Provincial Administration Sector. Quebec, Canada
- Palumbo, Davide, and Silvana Galderisi., (2020). Controversial Issues in Current Definitions of Mental Health. *Archives of Psychiatry and Psychotherapy*, 22(1), 7–11.
- Queen Land Government (QLD), (2022). Psychosocial hazards and factors. Official Website: Home/Safety & Prevention/Mental Health. Last updated 24th October 2022. Accessed from <https://www.worksafe.qld.gov.au/safety-and-prevention/mental-health/Psychosocial-hazards-and-factors/remote-or-isolated-work>
- Saedi, A. M., Majid, A. A., & Isa, Z. (2021). Evaluation of safety climate differences among employees' demographic variables: a cross-sectional study in two different-sized manufacturing industries in Malaysia. *International Journal of Occupational Safety and Ergonomics: JOSE*, 27(3), 714–727. doi:10.1080/10803548.2019.1623454
- Schwatka, N. V., Goldenhar, L. M., Johnson, S. K., Beldon, M. A., Tessler, J., Dennerlein, J. T., & Trieu, H. (2019). A training intervention to improve frontline construction leaders' safety leadership practices and overall job site safety climate. *Journal of Safety Research*, 70, 253–262. doi: 10.1016/j.jsr.2019.04.010

- Tear, M. J., Reader, T. W., Shorrock, S., & Kirwan, B. (2020). Safety culture and power: Interactions between perceptions of safety culture, organizational hierarchy, and national culture. *Safety Science*, 121, 550–561. doi: 10.1016/j.ssci.2018.10.014
- UK Essays, (2018). Causes of Workplace Accidents. Retrieved from <https://www.ukessays.com/essays/sciences/causes-workplace-accidents-8575.php?vref=1>
- Uryan, Y., (2010). Organisational Safety Culture and Individual Safety Behaviour: A Case Study of the Turkish National Police Aviation Department. Accessed on 18th Dec. 2022 from http://etd.fcla.edu/CF/CFE0003190/Uryan_Yildirim_201008_PhD.pdf
- Verroen, S., Gutteling, J. M., & De Vries, P. W. (2013). Enhancing self-protective behaviour: efficacy beliefs and peer feedback in risk communication. *Risk Analysis: An Official Publication of the Society for Risk Analysis*, 33(7), 1252–1264. doi:10.1111/j.1539-6924.2012.01924.x
- Wallace, J. C. (2016). Creating a Safety-Conscious Organization and Workforce. *Organizational Dynamics*, 45(4), 305–312. doi: 10.1016/j.orgdyn.2016.10.006
- World Health Organization (WHO), (2022a). Guidelines on mental health at work. 28th September 2022. Accessed from <https://www.who.int/publications/i/item/9789240053052>
- World Health Organization (WHO). (2022b) World mental health report: Transforming mental health for all. June 2022. Accessed on 18th December 2022, from <https://www.who.int/publications/i/item/9789240049338>
- World Health Organization (WHO), (2022c). WHO guidelines on mental health at work: executive summary. ISBN 978-92-4-005776-0 (electronic version). WHO 2022. Accessed from <https://apps.who.int/iris/bitstream/handle/10665/363156/9789240057760-eng.pdf>
- Xiu-li Z., Guo-sheng S., Juan Z., Dong-lu Z., & Lin-Han G., (2020). Investigation of occupational Stress of oil field work people and analysis of influencing factors of psychological disorders. *Adv Mod Biomed*, 20, 2524–2527. doi 10.13241/j.cnki.PMB.2020.13.026
- Zhang, J., Fu, J., Hao, H., Fu, G., Nie, F., & Zhang, W. (2020). Root causes of coal mine accidents: Characteristics of safety culture deficiencies based on accident statistics. *Process Safety and Environmental Protection: Transactions of the Institution of Chemical Engineers, Part B*, 136, 78–91. doi: 10.1016/j.psep.2020.01.024.