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Exploring The Impact of Depression Among C&S Engineer at Construction Industry

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Abstract

This study investigates the prevalence, contributing factors, and impact of depression among civil and structural (C&S) engineers within Sarawak's construction industry. Depression, a critical mental health concern, is closely associated with diminished workplace safety performance, productivity, and overall well-being. Data were collected from 220 respondents through structured surveys, incorporating instruments such as the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) and Likert-scale assessments. The data were analyzed using descriptive statistics, correlation analysis, and regression techniques. The results indicate that multitasking demands, tight project deadlines, and physical fatigue are major contributors to depression, which was primarily reported at mild to moderate levels. Regression analysis revealed a strong relationship between depression and safety performance, with depression accounting for 95.9% of the observed variability. Additionally, symptoms like mental fatigue and musculoskeletal discomfort compound workplace challenges. These findings underscore the urgent need for targeted mental health support, ergonomic interventions, and policy reforms to enhance both employee well-being and safety outcomes in the construction sector.

1. Introduction

The construction industry is pivotal to economic development, yet its workforce often faces significant mental health challenges. C&S engineers are critical players in translating designs into tangible structures, operating within environments fraught with physical hazards, tight deadlines, and organizational pressures. Depression among these professionals compromises not only their well-being but also project safety and efficiency. Addressing this issue is crucial for sustaining workforce productivity and enhancing safety standards.

C&S engineers frequently encounter demanding workloads, high stress, and inadequate mental healthsupport, leading to depression, a condition that exacerbates absenteeism, reduces productivity, and increases workplace accidents. Despite its prevalence, mental health support tailored for engineers in Sarawak's construction industry remains scarce, perpetuating stigma and unaddressed challenges [1]. Depression has been linked to increased absenteeism, reduced productivity, and compromised safety performance [2]. Addressing these issues is critical for sustaining workforce productivity and enhancing safety standards [3].

This study aims to identify factors contributing to depression among C&S engineers, assess the prevalence and impact of depression within this demographic, and examine the relationship between depression and safety performance. By revealing the prevalence and relevance of depression among engineers, targeted interventions can be developed to address these critical issues and improve mental health within the construction industry.

2. Literature Review

C&S engineers endure high-stress environments characterized by complex projects, tight deadlines, and role ambiguities, significantly elevating depression risks. [4] and [5] highlight the prevalence of depression and anxiety within this profession, emphasizing the need for targeted mental health interventions. These findings align with studies by [6] and [7], which report high rates of depressive symptoms among construction professionals globally. Key contributors to depression include job demands, job insecurity, and organizational stress. [8] identified sustained physical, cognitive, and emotional demands as major stressors. Engineers often face ergonomic challenges, such as heavy lifting and improper work postures, that lead to musculoskeletal disorders and chronic stress [7], [9]. The cyclical nature of the construction industry compounds these challenges, like job uncertainty exacerbates financial and psychological strain [10].

Depression undermines workplace safety by impairing cognitive functions essential for hazard identification and decision-making. [6] reported that depression increases safety risks through reduced alertness and compromised adherence to protocols. Moreover, studies by [11] and [12] emphasize that organizational stress, including insufficient support and long working hours, magnifies the risks of depression and safety lapses. Depression also impacts productivity and organizational costs, leading to absenteeism, presenteeism, and high turnover rates [13].

The prevalence of depression among engineers often intersects physical ailments. For instance, [14] highlights the significant overlap between musculoskeletal disorders and mental health issues, underscoring the importance of ergonomic interventions. [15] further suggest that addressing both physical and emotional stressors is key to fostering resilience in the workforce.

Effective interventions involve promoting work-life balance, fostering a supportive environment, and providing mental health resources. Employee Assistance Programs (EAPs) and awareness campaigns have proven effective in reducing stigma and encouraging help-seeking behavior [16]. Additionally, [17] advocate for regular mental health assessments and proactive training programs to empower engineers with coping mechanisms. Such initiatives not only improve individual well-being but also enhance safety and productivity across construction sites.

3. Methodology

This study employs a quantitative cross-sectional survey design to explore the prevalence and impact of depression among C&S engineers in Sarawak's construction industry. The methodology involves collecting data through structured questionnaires designed to capture information on work-related stressors, depression levels, and safety performance. The research adopts quantitative surveys. Structured questionnaires include validated tools such as the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) [18], [19], [20] to assess physical strain and Likert-scale items [21] to measure psychological and emotional stressors. This comprehensive approach ensures that the study captures both the prevalent and underlying causes of depression.

Table 1 *Likert scale*

Scale	Level of Agreement
1	Strongly Disagree
2	Disagree
3	Moderate
4	Agree
5	Strongly Agree

A simple random sampling technique was used to ensure a representative sample of C&S engineers working in various construction firms across Sarawak. Based on Andrew Fisher's formula, a minimum of 164 participants was targeted to achieve statistically significant results [22], [23]. The sample included engineers across different levels of experience, roles, and project types, providing a diverse dataset for analysis.

$$Sample\ size = \frac{(z-score)^2 * StdDev * (1-StdDev)}{(confidence\ interval)^2} \quad (1)$$

Data was collected using online platforms, such as Google Forms, distributed via email and professional networks. The questionnaire consisted of three main sections:

- Demographics: Age, gender, years of experience, and job role.
- Work-Related Stressors: Questions addressing workload, deadlines, job insecurity, and organizational support.

- Depression and Safety Performance: Measures assessing the impact of depression on error rates, hazard identification, and overall safety behavior.

The collected data were analyzed using Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics provided insights into the demographic distribution and prevalence of depression. Inferential statistics, including regression and correlation analyses, were employed to identify relationships between depression, work-related stressors, and safety performance. Ethical approval was obtained prior to data collection. Participants were informed about the purpose of the study, and their consent was obtained through a formal agreement. Confidentiality and anonymity were maintained throughout the research process, ensuring participants' trust and compliance with ethical standards.

4. Results and Discussion

This section presents the results of the statistical analysis conducted to examine the relationships between work-related stressors, depression, and safety performance among C&S engineers in Sarawak. Data was collected from 220 respondents using structured surveys, and key statistical methods such as descriptive statistics, correlation, and regression analysis were employed to achieve the study objectives.

Table 2 shows the majority being male 85.5% and minority female 14.5%. Most participants had aged between 30 and 39 years 47.7% and years of experience in between 5 and 10 in the construction industry, working in roles related to project management and structural design.

Table 2 *Demographic of the respondents*

Item	Description	Percentage %
Gender	Male	85.5
	Female	14.5
Age	20-29	42.7
	30-39	47.7
	40-49	5.5
	50 and above	4.1
Year of Experiences	Less than 5 years	10.9
	5-10 years	46.4
	11-15 years	35.5
	More than 5 years	7.3
Job Scope	Both	41.4
	Civil engineer	32.7
	Structure engineer	25.9
Work Environment	Office and Site based	79.5
	Site based	20.5

The descriptive statistics provided an overview of the respondents' experiences with work-related stressors, depression, and safety performance. The mean depression score was 2.81 (SD = 1.11), indicating mild to moderate depression levels among the participants. Common symptoms included mental exhaustion (mean = 3.47, SD = 1.37) and emotional strain (mean = 3.42, SD = 1.32). Among work-related stressors (Table 3), multitasking had the highest mean score (4.22, SD = 0.79), followed by tight deadlines (mean = 3.99, SD = 0.98) and physical exhaustion (mean = 3.81, SD = 1.06). These stressors were identified as significant contributors to mental health challenges. Table 4 shows the safety performance indicators revealed that fatigue increased safety risk (mean = 3.44, SD = 1.27), reduced hazard identification (mean = 3.75, SD = 1.19), and errors during depressive episodes (mean = 3.48, SD = 1.42) were key issues.

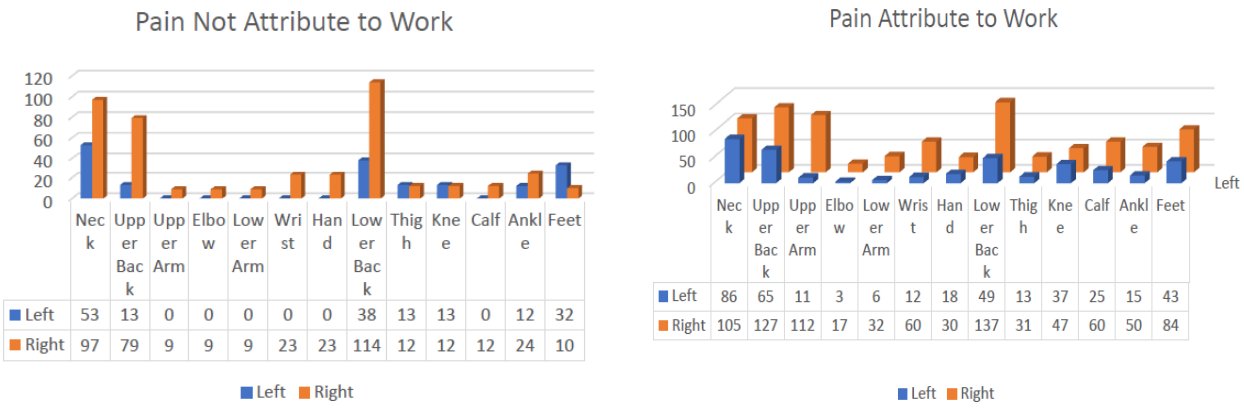
Table 3 *Work-related stressors*

Description	Mean	Std. Deviation	N
1. I frequently work long hours.	3.39	1.331	220
2. I frequently face tight deadlines.	3.99	0.981	220
3. I have a hard time trying to balance over my workload.	3.17	1.134	220
4. My job requires managing multiple tasks simultaneously.	4.22	0.787	220
5. I frequently work overtime.	3.80	1.098	220
6. I feel physically exhausted due to job demands.	3.81	1.060	220
7. My work responsibilities frequently interfere with my personal life.	3.45	1.171	220
8. My job responsibilities contribute to my stress.	3.71	1.079	220
9. I experience job insecurity.	3.13	1.274	220
10. I feel overwhelmed by the complexity of my tasks.	3.22	1.142	220
11. My workload is often unpredictable.	3.93	1.201	220
12. I face pressure to deliver high-quality work within short time frames.	4.06	0.904	220
13. I feel my work environment lacks support for managing stress.	3.29	1.165	220
14. I believe my mental health is negatively impacted by job demands.	3.70	1.253	220
15. I feel a lack of control over work-related decisions.	2.83	1.343	220

Table 4 *Impact of depression on safety performance*

	Mean	Std. Deviation	N
1. Depression affects my ability to follow safety protocols.	2.56	1.135	220
2. I am more likely to make errors when feeling depressed.	3.48	1.422	220
3. Depression impacts my focus on safety tasks.	2.66	1.316	220
4. My mental state has contributed to safety incidents.	2.40	1.325	220
5. I find it hard to maintain situational awareness due to depression.	2.41	1.333	220
6. My work safety performance decreases when I am emotionally drained.	3.08	1.234	220
7. Depression affects my motivation to adhere to safety standards.	2.87	1.360	220
9. I have witnessed colleagues being affected by depression at work.	3.28	1.225	220
10. Depression-related fatigue increases safety risks.	3.44	1.265	220
11. I am more prone to accidents when feeling mentally stressed.	2.94	1.295	220
12. Safety risks in the workplace increase due to unmanaged depression.	3.31	1.195	220
13. I believe improving mental health support would enhance workplace safety.	3.70	1.214	220
14. I feel that my emotional state impacts my ability to identify workplace hazards effectively.	3.75	1.193	220
15. My depression reduces my attention to detail in hazardous environments.	2.76	1.260	220

The CMDQ data revealed high incidences of musculoskeletal discomfort, particularly in the lower back, neck, and upper back. For non-work-related discomfort (a), the lower back was the most reported area (114 cases on the right side, 38 on the left side), followed by the neck (97 cases on the right side, 53 on the left side). Work-related discomfort (b) showed even higher incidences, with 137 cases of lower back pain on the right side and 49 on the left side, and 127 cases of upper back pain on the right side and 65 on the left side. Feet discomfort was also significant, with 84 cases reported for the right side and 43 for the left. These physical discomforts were strongly linked to prolonged working hours, awkward postures, and physical strain.



(a) **(b)**

Fig. 1 *CMDQ Graph (a) Pain does not attribute to work; (b) Pain attribute to work*

Correlation analysis (Table 5) showed strong positive relationships between the variables. Work-related stressors were strongly correlated with depression ($r = 0.859$, $p < 0.01$), highlighting that increased stressors are associated with higher depression levels. Depression was also found to have a very strong positive correlation with safety performance issues ($r = 0.979$, $p < 0.01$), emphasizing its critical impact on workplace safety. Theseresults demonstrate the interconnectedness of workplace stress, mental health, and safety outcomes.

Table 5 *Correlations of depression on safety performance*

		Work-Related Stressors Contributing to Depression	Prevalence and Impact of Depression	Impact of Depression on Safety Performance
Work-Related Stressors Contributing to Depression	Pearson Correlation	1	.859**	.891**
	Sig. (2-tailed)		0.000	0.000
	N	220	220	220
Prevalence and Impact of Depression	Pearson Correlation	.859**	1	.979**
	Sig. (2-tailed)	0.000		0.000
	N	220	220	220
Impact of Depression on Safety Performance	Pearson Correlation	.891**	.979**	1
	Sig. (2-tailed)	0.000	0.000	
	N	220	220	220

Regression analysis quantified the impact of depression and work-related stressors on safety performance. Depression alone explained 95.9% of the variability in safety performance ($R^2 = 0.959$) in Figure 3.1 or Table 6, making it the dominant factor affecting safety outcomes. The combined model in Table 7 which included both depression and work-related stressors, explained 96.9% of the variability in safety performance ($R^2 = 0.969$). Depression emerged as a stronger predictor ($\beta = 0.816$) compared to work-related stressors ($\beta = 0.190$) in Table 8, further underscoring its significance in influencing safety performance.

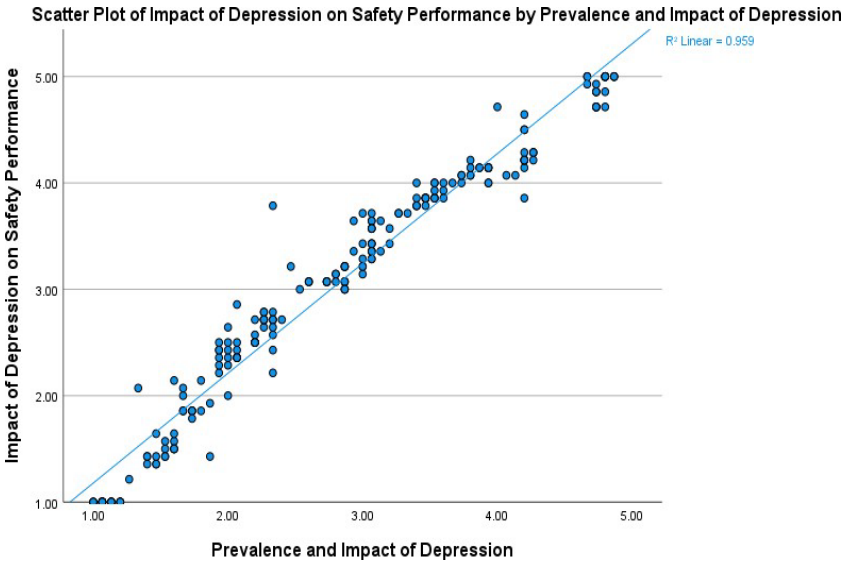


Fig. 2 *Regression graph*

Table 6 *Single predictor*

Model	R	R Square	Adjusted R Square	Std. Error ofthe Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.979[a]	0.959	0.959	0.23719	0.959	5107.132	1	218	0.000

a. Predictors: (Constant), Prevalence and Impact of Depression

Table 7 *Multiple predictors*

Model	R	R Square	Adjusted R Square	Std. Error ofthe Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.984[a]	0.969	0.968	0.20835	0.969	3342.202	2	217	0.000

a. Predictors: (Constant), Prevalence and Impact of Depression, Work-Related Stressors Contributing to Depression

Table 8 *Coefficients*[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-0.289	0.066		-4.377	0.000
	Work-Related Stressors Contributing to Depression	0.257	0.032	0.190	8.095	0.000
	Prevalence and Impact of Depression	0.860	0.025	0.816	34.693	0.000

a. Dependent Variable: Impact of Depression on Safety Performance

To ensure the reliability of the instruments used in the study, Cronbach's Alpha was calculated for each scale. The depression scale had an excellent reliability score of 0.988 (Table 9), while the work-related stressors scale scored 0.948 (Table 10), and the safety performance scale scored 0.986 (Table 11). These results confirm that the survey instruments provided consistent and reliable measurements of the key variables.

Table 9 *Prevalence and impact of depression reliability statistics*

Cronbach's Alpha	N of Items
0.988	15

Table 10 W*ork-related stressors reliability statistics*

Cronbach's Alpha	N of Items
0.948	15

Table 11 *Safety performance reliability statistics*

Cronbach's Alpha	N of Items
0.986	14

Conclusion

This study provides valuable insights into the significant relationship between depression and safety performance among C&S engineers in Sarawak's construction industry. The findings underscore the urgent need to address workplace stressors such as multitasking, tight deadlines, and physical exhaustion, which contribute to both mental and physical strain.

The strong correlation between depression and safety performance highlights the critical role of mental health in maintaining a safe and efficient work environment. Strategies such as enhancing ergonomic conditions,fostering mental health awareness, and implementing supportive organizational policies can help mitigate the adverse effects of depression on workplace safety.

Ultimately, creating a workplace culture that prioritizes mental health, and safety is essential for fostering a resilient workforce. By addressing the identified challenges and implementing targeted interventions, the construction industry can improve both individual well-being and overall project outcomes.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors are responsible for the study conception, research design, data collection, data analysis, result interpretation and manuscript drafting.

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