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Structure of Causes, Effects and Mitigations Framework of Mental Health in Construction

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ABSTRACT

In the construction industry, mental health has grown in importance as a human resource management concern. This research aims to investigate issues affecting the mental health of construction workers and develop a framework as a tool for construction organizations to better understand mental health issues. A mixed-method approach was employed consisting of two stages, namely integrative literature review (ILR) and the questionnaire survey. The ILR identified issues affecting mental health and was used to develop a questionnaire distributed to Indonesian construction workers. The data was analysed using the GSCA-SEM technique. This research identifies the causal factors, effects and mitigation strategies related to mental health disorders of construction workers in Indonesia. A structured framework was proposed to better understand mental health issues in the construction sector. It can be adopted by other countries that experience similar challenges in improving the well-being of construction workers.

1. Introduction

In the construction industry, mental health has grown in importance as a human resource management concern. The construction industry is labour-intensive in many developing nations, including Indonesia. Human resources are the primary force behind the growth of Indonesia's construction industry, as it is a labour-intensive sector. Therefore, all parties involved, including the government and construction organizations, should consider several issues pertaining to the well-being of construction workers. This is particularly true given the elevated risk of accidents and illnesses associated with construction works [1,2]. In addition, there are other pressures placed on construction workers, such as short-term projects, dynamic work activities, high workloads and the requirement to become proficient in technology [3-5]. Construction workers' physical and mental health may be impacted by these different situations [6].

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According to WHO, health is a condition of whole mental, bodily and social well-being rather than only the absence of illness [7]. Conversely, having good mental health enables one to overcome obstacles in life, identify one's abilities, learn and work effectively and give back to the community [8]. Anybody, including those employed in construction, might suffer from mental health issues. For instance, an Australian study discovered that the suicide rate among construction workers was double that of the overall population. According to Chan *et al*., [6] the suicide rate among construction workers in the United Kingdom was 3.7 times higher than the national average. This indicates that various mental health disorders significantly impact construction workers [9].

Significant attention has been given to studying mental health problems in the workplace, including in the construction sector. These various studies mostly focus on the types, causes and impacts of mental health disorders in construction workers. For example, Burke's study identified anxiety and depression as the most common types of mental health disorders in construction [10]. Similarly, Frimpong *et al*., [11] listed types of mental health disorders faced by construction workers, such as suicidal thoughts, decreased cognitive ability and concentration problems.

Many factors cause these mental health disorders. Heavy workloads, dynamic characteristics of construction work and long working hours are the three factors causing mental health disorders that are most frequently mentioned in literature [1,6,12-15]. Low income, discrimination and bullying are further reasons. According to Langdon and Sawang's research, construction workers' mental health is impacted by their concerns about covering their basic expenses [16]. Likewise, female workers have higher levels of anxiety due to the threat of assault, bullying or other forms of discrimination [17].

Various mental health disorders in construction workers can have an impact on workers' physical health [14,18,19], productivity [3,12,20], quality of work [14], safety [4,6,21], life expectancy [1,6], inter-personal relationships within a project team [22] and social and family relationships [22,23]. For instance, a study shows that poor mental health among project managers causes a decrease in productivity and performance. This economically has an impact on the emergence of extra costs for the organization [24]. Construction workers suffering from poor mental health expressed marital discontent that was detrimental to their social lives [25,26]. Likewise, Kamardeen [27] found a positive relationship between cardiovascular diseases (CVDs) and work stressors such as heavy workloads, unpredictable work hours and discrimination among Australian construction workers.

Mitigation measures to overcome construction workers' mental health disorders are a domain that is rarely discussed in the literature. However, there are at least several solutions that can be applied to overcome this mental health disorder. Efforts to encourage mental health awareness for construction workers are the most frequently mentioned solution [24]. Other efforts include conducting regular health monitoring, implementing networking programs, providing career promotions and increasing worker involvement in work activities [1,13,15].

On the other hand, although there has been much research conducted regarding the mental health of construction workers, high rates of poor mental health among construction workers are still being reported by the industry [28,29]. Previous studies have shown the significance of mental health problems, so more studies are needed considering the social and economic implications they cause [24]. Moyo *et al*., [30] highlight the importance of mental health being considered by construction organizations as a sustainability learning objective for construction workers.

Despite a considerable amount of mental health studies, the construction industry involves multiple organizations, which makes it highly complex and dynamic [29,31]. Managing construction projects has various characteristics according to the environmental context, which depends on the resources and culture at the project location [31]. Therefore, a context-specific study is required that

does not aim to generalize extant studies on mental health in the construction industry [29] but provides an accurate and reliable finding [32,33].

In Indonesia, there is a dearth of studies focused on the mental health aspects of Indonesian construction workers. As the largest construction market in Southeast Asia, there is a need to conduct a mental health analysis that focuses on construction workers to determine the root causes and impact of mental health issues in the Indonesian construction industry. This is reinforced by Golzad *et al*., [5], who have conducted a systematic review study regarding mental health in the construction industry. They argue that a comprehensive model is needed that can identify crucial factors to mitigate mental health disorders within construction organizations. Hence, this research aims to investigate various issues affecting the mental health of construction workers and develop a framework for construction organizations to understand mental health issues better. The findings will be useful for construction organizations to address mental health issues and raise mental health awareness in the construction work environment.

2. Methodology

In this study, a mixed-method approach was employed. The first step in this process is an integrative literature review (ILR), which looks at, evaluates and synthesizes a variety of literature that is relevant to a research topic (in this case, the mental health of construction workers) in an integrated way to obtain new insights [34]. This methodical approach has been used in several previous studies [2,35]. The targeted literature sources include journal databases pertaining to civil engineering, including Elsevier, the American Society of Civil Engineers (ASCE) virtual library and Indonesian engineering journal sites. Apart from that, there are also publications originating from the current laws and regulations in Indonesia. Construction, workers and mental health are the keywords utilized. Subsequently, extant literature was reviewed to identify pertinent elements for the research topic. These factors were then categorized into three clusters: factors contributing to mental health problems, effects/impacts and mitigation strategies. The results of the ILR are presented in Table 1 and used to develop the questionnaire.

Table 1
Identified mental health factors

Code	Factors	References	Code	Factors	References
X	Causes of mental health disorders		Y	Effects of mental health disorders	
X1	Physical health	[2,6,13,15,36]	Y1	Physical health	[4,14,18,19]
X2	The nature of construction work that continues to demand mental readiness (dynamic/constant changes)	[1-6,10,13-15,36]	Y2	Worker productivity	[1,3,4,14,19]
X3	Long working hours	[1-6,13-15,36]	Y3	Work quality	[14]
X4	Low income	[1,2,6,14,19,36,37]	Y4	Work safety	[4,14,21]
X5	Heavy workload	[1-6,10,13-15,19,21,22,36]	Y5	Worker life expectancy	[1,4,6]
X6	There are times when work pressure increases (paced work/time pressure)	[2-6,13-15,22]	Y6	Project team relationship	[22]
X7	Limited opportunity to make decisions	[1,6,10,13,15]	Y7	Social relationship	[1,19,22]
X8	Limited social and mental supports from colleagues	[1,2,6]	Z	Mitigation strategies	
X9	Limited work environment and relationship	[6,22]	Z1	Appropriate working hours	[13]

X10	Poor work conditions (space constraint, unsafe condition)	[4-6,13,15,22]	Z2	Appreciation and motivation	[10]
X11	High accident risks	[3,6,13,14]	Z3	Team-building	[24]
X12	Limited opportunity for competency improvement	[6,13,15]	Z4	Improvement mechanism	[10,24]
X13	Job insecurity	[1,2,6,13-15,36]	Z5	Stress management program	[14,24]
X14	Physical demand and fatigue	[1-6,15]	Z6	Job security	[10,13]
X15	Mental demand and fatigue	[1,4,6,15]	Z7	Safe and hygiene environment	[10,13]
X16	Limited time off/holiday	[1,6]	Z8	Facilitating worker involvement	[15]
X17	Low social status of construction workers	[3,6,13]	Z9	Career promotion	[1,19]
X18	Lots of complaints and critics due to work	[3,6,15,22]	Z10	Fair pay	[10]
X19	Limited career promotion/option	[1,3,6,15,19]	Z11	Competency trainings	[10,13]
X20	Lack of improvement mechanism	[6,15]	Z12	Enforcing regulations on site	[24]
X21	Fear of project failure	[6]	Z13	Networking and social event programs	[10,24]
X22	Unclear authority and responsibility/the tasks do not match your skills	[1,6,10,13,15,19,36]	Z14	Mental health awareness	[10,13,24]
X23	Interpersonal conflicts (inadequate communications, social isolation, poor relationships)	[1,3,6,10,13-15,19,22]	Z15	Healthy life style	[10,13]
X24	Violence and discrimination in work environment	[1-3,6,15,22]	Z16	Regular health monitoring	[10,13]
X25	Excessive drug, alcohol and cigarette consumption	[3,6,10,13,37]	Z17	Providing personal protective equipment (PPE) and safe working conditions	[10]
X26	Work-related illness and injury	[6,15]			
X27	Poor work environment (dirty and polluted work environment, extreme weather, excessive noise)	[1,6,15,19]			
X28	Lack of respect/appreciation (undervaluing skills)	[1,6,15]			
X29	Work-life imbalance (work-home conflicts, low support at home)	[1,6,13,15,19]			
X30	Male dominated sector	[3,6,13]			

A questionnaire (stage 2) was carried out to measure the opinions of Indonesian construction workers (with at least one-year of working experience) regarding the mental health factors that had been previously identified. The questionnaire was presented in Indonesian and consisted of three parts, namely:

i. An introduction
ii. Respondent profiles
iii. An assessment of issues affecting the mental health of construction workers

The validity of the questionnaire was obtained by applying methodological triangulation. The process of employing multiple data-gathering techniques. By doing this, study results are protected from researcher bias and objective analysis is ensured. Purposive sampling was employed to collect information from the respondents, as done in similar studies [38]. Because the targeted respondents were Indonesians, a four-point Likert Scale (with 1 as strongly disagree to 4 as strongly agree) was employed to avoid bias by choosing the mid-point [39].

The questionnaire was distributed from October 6 to November 22, 2022 and received 100 valid responses. The background of respondents is 90% male and 10% female, with a distribution of working experience of less than 5 years, 5 to 10 years and more than 10 years 76%, 12% and 12%, respectively. As many as 58% of respondents had a senior high school or lower education background, 37% had a diploma/bachelor degree, 3% had a master's degree and 2% had a doctoral degree. Meanwhile, the distribution of job positions is 21% as construction helpers, 31% as coolies, 20% as engineers, 4% as quantity surveyors, 4% as project managers and 20% as others.

To test the suitability of the data obtained, it is necessary to test the validity and reliability of the research variables. SPSS v25 was used as a tool to carry out these tests by looking at the Corrected Item-Total Correlation and Cronbach's Alpha values. By considering the degree of freedom of 98 (DF=N-2; N=100 responses) and probability of 0.05, the R table value is 0.1966. A variable is considered valid if R count > R table. Likewise, a variable is considered reliable if the Cronbach Alpha value is > 0.7 [40].

Figure 1 presents the conceptual model of causes, effects and mitigations (CEM) framework. It is based on the relationship of cause, effect and mitigation in identifying and sorting possible causes and effects of a specific problem, as well as appropriate mitigation strategies to prevent the emergence of causes and reduce the consequences they cause [41]. The relationship between causes, effects and mitigations has been widely studied, especially in environmental and climate change studies [42,43], engineering studies [44] and construction management [41].

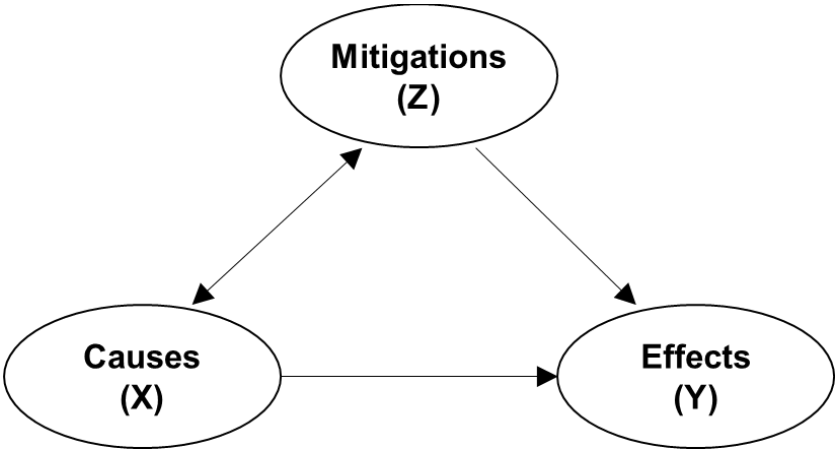

Fig. 1. Conceptual CEM framework of mental health in construction

The GSCA-SEM (Generalized Structured Component Analysis Structural Equation Modelling) technique was applied using GSCA Pro software. It provides a statistical model to examine the relationships between factors [45]. The conceptual model begins by identifying factors that cause mental health disorders in construction workers, which can have various impacts on both individuals and organizations. This causal factor also becomes an obstacle in implementing mitigation strategies. Apart from that, various mitigation strategies are needed to prevent the emergence of causes of mental health disorders and reduce the impacts that occur.

3. Results

3.1 CEM Framework of Mental Health in Construction

Based on the SPSS results obtained, variables Z3, Z5, Z7, Z10 and Z15 were declared invalid so they were removed from the input for GSCA. Next, the GSCA results present the model fit measures (Table 2). In this study, the FIT value was 0.333, indicating that 33.3% of the total variance is explained by the model. The GFI (goodness of fit index) value of 0.899 and the SRMR (standardized root mean squared residual) value of 0.092 meet the criteria set by Cho *et al*., [46] and hence are satisfactory.

Table 2
Model fit measures

FIT	AFIT	FITs	FITm	GFI	SRMR	OPE	OPEs	OPEm
0.333	0.318	0.21	0.34	0.899	0.092	0.701	0.852	0.691

Table 3 displays the loadings estimate, while Table 4 presents the alpha value, which is above 0.7, indicating that the constructs in this study are reliable. It also presents the heterotrait-monotrait (HTMT) correlation ratio, which is used to determine construct discriminant validity [47]. The analysis results show that the HTMT values are below 0.9, so they are satisfactory valid.

Table 3
Loading estimate

	Est.	SE	95%CI			Est.	SE	95%CI			Est.	SE	95%CI	
Causes					X21	0.531	0.087	0.362	0.711	Mitigations				
X1	0.362	0.127	0.102	0.583	X22	0.526	0.097	0.301	0.658	Z1	0.27	0.197	-0.182	0.554
X2	0.324	0.123	0.019	0.54	X23	0.626	0.063	0.502	0.749	Z2	0.469	0.099	0.255	0.673
X3	0.395	0.12	0.067	0.585	X24	0.598	0.054	0.492	0.702	Z4	0.693	0.063	0.531	0.8
X4	0.54	0.097	0.33	0.714	X25	0.54	0.087	0.363	0.707	Z6	0.386	0.136	0.133	0.631
X5	0.426	0.124	0.168	0.656	X26	0.666	0.081	0.438	0.8	Z8	0.551	0.096	0.327	0.703
X6	0.469	0.103	0.21	0.611	X27	0.648	0.078	0.483	0.771	Z9	0.689	0.102	0.425	0.817
X7	0.577	0.078	0.399	0.726	X28	0.59	0.07	0.451	0.771	Z11	0.627	0.067	0.494	0.758
X8	0.571	0.081	0.391	0.702	X29	0.347	0.109	0.072	0.506	Z12	0.614	0.071	0.487	0.751
X9	0.653	0.063	0.506	0.754	X30	0.307	0.099	0.052	0.469	Z13	0.665	0.066	0.547	0.807
X10	0.544	0.106	0.255	0.651	Effects					Z14	0.587	0.099	0.351	0.726
X11	0.581	0.082	0.404	0.743	Y1	0.745	0.089	0.499	0.861	Z16	0.54	0.119	0.229	0.715
X12	0.722	0.056	0.604	0.815	Y2	0.66	0.083	0.485	0.782	Z17	0.712	0.066	0.584	0.816
X13	0.384	0.114	0.104	0.571	Y3	0.754	0.087	0.539	0.859					
X14	0.62	0.079	0.448	0.751	Y4	0.737	0.069	0.56	0.834					
X15	0.375	0.141	0.003	0.599	Y5	0.745	0.049	0.622	0.828					
X16	0.406	0.127	0.178	0.651	Y6	0.668	0.071	0.545	0.775					
X17	0.683	0.075	0.52	0.806	Y7	0.742	0.06	0.606	0.822					
X18	0.729	0.058	0.603	0.819										
X19	0.661	0.057	0.53	0.753										
X20	0.579	0.082	0.384	0.72										

Table 4
Construct quality measures and HTMT

Construct quality measures	Causes	Effects	Mitigations	
PVE	0.299	0.522	0.338	
Alpha	0.915	0.847	0.81	
Rho	0.924	0.884	0.853	
Dimensionality	7.0	2.0	3.0	
HTMT	Value	SE	95%CI	
Causes ↔ Effects	0.673	0.078	0.505	0.779
Causes ↔ Mitigations	0.319	0.099	0.124	0.492
Effects ↔ Mitigations	0.475	0.109	0.265	0.698

Table 5 presents the path coefficients estimate, the bootstrap standard errors (SE) and 95% confidence intervals (95%CI). Based on these findings, the path coefficient of causes to effects was 0.528, meaning that the perception of causes of mental health disorders had a positive influence on the effects of mental health disorders. Similarly, the path coefficient of causes to mitigations was positive 0.333 and mitigations to effects was positive 0.226.

Table 5
Path coefficients

	Estimate	SE	95%CI	
Mitigations ↔ Causes	0.333	0.129	0.039	0.594
Causes ↔ Effects	0.528	0.114	0.27	0.713
Mitigations ↔ Effects	0.226	0.111	0.068	0.496
Causes ↔ Mitigations	0.333	0.129	0.039	0.594

Based on the findings above, this research developed a structured model to better understand the mental health issues of construction workers in the Indonesian context. Through a systematic approach starting from identifying the causes, effects and mitigation strategies related to mental health in the construction sector in stage 1 (integrative literature review) and examining the perception of construction workers in stage 2 (questionnaire), which was analysed using GSCA-SEM, key determinants were addressed in the CEM framework of mental health in construction (Figure 2). In general, this framework assumes three groups of mental health issues affecting construction workers, namely causes, effects and mitigations.

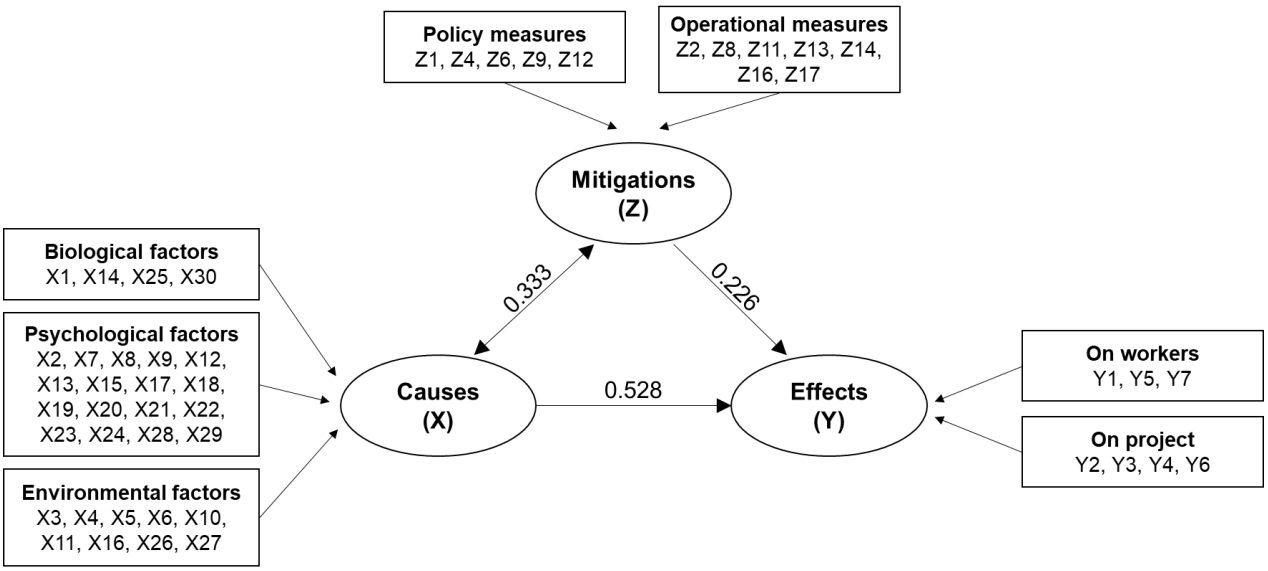

Fig. 2. Developed CEM framework of mental health in construction

3.2 Causes of Mental Health Disorders

This research succeeded in identifying 30 causes of mental health disorders in construction workers, which can be classified into three groups, namely biological factors, psychological factors and environmental factors. This grouping is based on the dominant nature of these factors and is flexible so that it can be adapted to different research contexts. Biological factors refer to factors that cause mental health disorders in construction workers that are related to a person's biological condition. This group includes physical health conditions (X1), physical fatigue (X14), excessive drug, alcohol and cigarette consumption (X25) and male-dominated sector (X30).

Psychological factors refer to factors that cause mental health disorders in construction workers, which are related to their mental and emotional state. It is the dominant group in studies related to mental health and includes the dynamic nature of construction work (X2), limited opportunity to make decisions (X7), limited social and mental supports (X8), limited work relationship (X9), limited competency improvement (X12), job insecurity (X13), mental fatigue (X15), low social status (X17), lots of complaints (X18), limited career promotion (X19), lack of improvement mechanism (X20), fear of project failures (X21), unclear authority and responsibility (X22), interpersonal conflicts (X23), violence and discrimination (X24), lack of respect and appreciation (X28) and work-life imbalance (X29).

Meanwhile, environmental factors refer to factors that cause mental health disorders in construction workers, which are related to the environmental conditions of construction work. This includes long working hours (X3), low income (X4), heavy workload (X5), paced work (X6), poor working conditions (X10), high accident risks (X11), limited time off (X16), work-related illness and injury (X26) and poor working environment (X27).

The construction sector is distinct and dynamic in contrast to other industries. Numerous parties with different interests are involved in the various construction work activities. The ever-changing sequence of work and the possibility of changes during work implementation led to heavy workloads and negatively impacted construction workers' mental health. There are demands from the construction industry for workers to work long hours or work with irregular work schedules. Construction workers are also frequently required to work on weekends or overtime during projects that require accelerated work (paced work). This condition is a characteristic of the construction industry that is difficult to change to show commitment to carrying out the work [1,48]. However,

this leads to the emergence of various mental health problems as well as interpersonal and family conflicts [49].

3.3 Effects of Mental Health Disorders

This research found seven impacts of mental health disorders on construction workers classified into two groups, namely the impacts on workers and the impacts on projects. The first refers to the impact of mental health disorders that affect individual workers and includes the impact on physical health (Y1), life expectancy (Y5) and social relationships (Y7). The second refers to the impact of mental health disorders on the project level and includes impacts on productivity (Y2), quality (Y3), safety (Y4) and project team relationships (Y6).

Mental health disorders can significantly increase the risk of physical health problems. Vice versa. For example, anxiety disorders and sleeping difficulties cause construction workers to experience physical fatigue. An interesting study was conducted by Ohrnberger *et al*., [50], who found a strong correlation between mental health and physical health. Likewise, many studies have been conducted regarding the impact of mental health on the productivity of construction workers [3,4,14]. Poor mental health can cause presenteeism which can affect productivity and overall project performance [4,10,19].

Mental health disorders can also have a significant impact on work safety, life expectancy, project team relationships and social relationships outside the project. Workers who experience mental health disorders such as anxiety and concentration difficulty have the potential to experience work accidents. Workers who experience mental health disorders have the potential to commit suicide which affects workers' life expectancy [1,6]. These various mental health disorders can also have an impact on the interpersonal relationships of workers within a team and outside the project [19,20,22].

3.4 Mitigations of Mental Health Disorders

In this research, mitigation strategies can be classified into two groups, namely policy measures and operational measures. Policy measures refer to measures to mitigate mental health disorders related to policies that can be taken by the project organization and include the implementation of appropriate working hours (Z1), improvement mechanisms (Z4), job security (Z6), career promotion (Z9) and enforcement of regulations at project sites (Z12). Meanwhile, operational measures refer to steps to mitigate mental health disorders related to routine activities on construction projects and include providing appreciation and motivation (Z2), increasing worker involvement (Z8), implementing trainings (Z11), networking and social event programs (Z13), increasing mental health awareness (Z14), regular health monitoring (Z16) and providing PPE and safe working conditions (Z17).

Encouraging various mental health programs in construction projects is one way to promote mental health awareness. To enhance the mental health of construction workers, a variety of initiatives may be implemented, such as the provision of mental health services (such as counselling), training and mental health monitoring [13,24]. If implemented continuously, this may promote a healthy culture and way of life in construction project organizations [10,13].

In addition, limiting the working hours seeks to reduce mental health issues brought on by lengthy workdays on construction projects. Efforts to create a safe and clean work environment are expected to reduce sources of mental disorders resulting from dirty, noisy and unsafe project environments. The reasons of mental diseases linked to poor income and limited job advancement are frequently

the focus of career enhancement initiatives. These solutions are investments that the construction organizations can make to improve the mental health of construction workers in Indonesia. Mental health awareness programs are real steps to prevent the risk of mental health disorders [51].

3.5 Implications and Limitations

The issue of construction workers' mental health cannot be denied, especially considering that the complex and dynamic nature of construction projects has affected workers' mental health. This industry is one of the sectors with the highest rates of poor mental health among its workers [29]. Mental health disorders can occur as a consequential effect of the imbalance between the enormous demands of work in the construction industry and the availability of adequate resources [9]. Considering the potential for affected workers and the magnitude of the impact of mental health disorders, it is important for construction organizations to better understand mental health issues in order to carry out appropriate interventions.

Through a mixed-method approach, this research succeeded in developing a CEM framework of mental health in construction. However, there are two limitations of this framework. First, it involves subjectivity because it is a study based on the perceptions of construction workers. This is common in survey-based studies. Second, this research targets general respondents, namely Indonesian construction workers. This research could be more robust if the survey respondents were narrowed down to construction workers who experience mental health problems so that they could provide more precise identification of causes, effects and mitigations.

Regardless of these limitations, this research contributes to the construction management knowledge by constructing a theoretical model of interaction between causes, effects and mitigations of mental health in the construction. Using the GSCA-SEM technique, this study reveals the positive relationships between causes, effects and mitigations of mental health disorders in the construction industry. The developed framework offers a new understanding of mental health issues in the construction sector by synthesizing the core concepts and visualizing them in a simple way for practical use.

In this way, construction organizations can utilize this CEM framework to map causes and effects to find the right steps to mitigate mental health disorders among their workers. According to Nikunlaakso *et al*., [51], this is a preventive intervention to reduce mental health problems. Knowledge of prevention strategies to improve mental health in the construction workplace is the most crucial sustainability learning objective [30]. The developed framework can be a reference for construction organizations to take early interventions to improve the mental health of Indonesian construction workers.

In addition, a context-specific study like this provides a clear distinction between different environmental contexts in the construction sector. Many experts have recommended conducting context-specific studies, considering that data in the construction sector is always related to their associated contexts [31,32,52]. This empirical study encourages research in various contexts, especially in developing countries where the construction industry is labour-intensive. These findings and the CEM framework can be applied across contexts or countries with labour-intensive construction dynamics. In countries with similar construction industries, as is often the case in developing countries, construction workers are vulnerable to high levels of physical and psychological stress, such as long working hours, risky working conditions and job insecurity. By adopting this framework, appropriate interventions can be implemented, such as stress management training, improving working conditions and psychosocial support to reduce the risk of mental disorders. In addition, implementing these data-driven mitigation strategies can also be tailored to each country's

local cultures and policies, aiming to create a healthier work environment and improve the well-being of workers in the construction industry worldwide.

4. Conclusions

Construction practitioners work in a dynamic and challenging work environment. The issue of mental health in the construction industry still requires attention and in-depth study, especially in Indonesia. This is true considering that construction workers continuously face the dynamic and risky characteristics of the industry. Through a mixed-method approach, this research attempts to answer these challenges and succeeds in identifying the causes, effects and mitigation strategies for construction workers' mental health disorders. A structured framework was proposed to better understand mental health issues in the construction sector and can be adopted by other countries experiencing similar challenges in im-proving their construction workers' well-being.

The findings from this research provide new insights for the Indonesian construction industry regarding the importance of maintaining the mental health of construction workers. Considering the SDGs program pushed by the United Nations and the Indonesian government, this research contributes by discussing various mental health factors included in the third sustainable development goal (SDG-3) – good health and well-being. The findings of this research provide practical benefits by becoming a reference for stakeholders, especially the government and construction organizations, to increase mental health awareness in the construction project work environment.

On the other hand, this research has two limitations. First, this research was carried out in a specific context, namely the Indonesian construction industry. This limits the generalization of findings to other context environments. However, this study can be a reference for future research in other developing countries that experience similar problems, thereby allowing for revealing differences in findings that can add new knowledge to studies related to the mental health of construction workers. The second limitation is related to the application of a cross-sectional approach in data collection. Thus, the findings of this study cannot aim to analyse changes in behaviour and perception over time. Therefore, it is recommended that further research be carried out with a longitudinal approach to establish the relationships between the variables interactively. To provide a more balanced perspective on the mental health challenges faced by construction workers, future research could benefit from including a wider range of stakeholders in the form of interviews. This aims to gather diverse viewpoints, which could lead to a more holistic understanding of mental health in construction. Apart from that, to complement subjective survey findings, further research can be carried out that incorporates objective mental health assessments such as standardized tests, clinical interviews and behavioural observations.

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