



Sustainable Environment and the built Space: Integrating Ecology, Planning and Human Well-being

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**INTEGRATING HUMAN WELL-BEING INTO SUSTAINABLE CONSTRUCTION:
MODELLING STRESS-RESILIENCE RELATIONSHIPS AMONG CONSTRUCTION
PROFESSIONALS**

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Abstract

The focus in construction industry has been on environmental and economic sustainability, with limited emphasis on the social dimension, particularly the integration of human well-being and psychological sustainability into construction sustainability. Investigating human well-being in sustainable construction calls for an evaluation of construction professionals' workplace stress and their subsequent psychological and emotional resilience in response to it. The study models the relationship between workplace stress and emotional resilience of construction professionals with the aim of integrating human well-being into sustainable construction. Workplace stress was conceptualized into seven variables, namely, time stress, anticipatory stress, situational stress, encounter stress, physical stress, mental stress, and weather-related stress, while resilience was measured as emotional resilience. Questionnaires were used in eliciting information from construction professionals working on construction sites. 150 questionnaires were distributed to the respondents using a purposive sampling technique, with 117 returned and valid for analysis. Multiple linear regression analysis was employed in modelling the relationship between workplace stress and emotional resilience. The results show that time stress positively influences emotional resilience, while mental stress negatively affects emotional resilience. The study, therefore, concludes that while construction professionals may adapt positively to time-related work pressure, psychological and emotional stressors can weaken their emotional coping capacity. Construction organizations should prioritize mental health support, stress management strategies, and employee well-being programs as part of integrating human well-being into sustainable construction, thereby strengthening emotional resilience and promoting a healthier and more productive workplace.

Keywords: construction professionals, emotional resilience, human well-being, workplace stress, sustainability

1. INTRODUCTION

Achieving sustainability in construction requires environmentally, economically, and socially sustainable practices that minimise environmental impacts, improve economic efficiency, and promote social and human well-being. Modern sustainable construction goes beyond environmental concerns; it encompasses

the well-being of workers in terms of safe working environments, mental health support, ergonomic practices, and stress reduction initiatives. Construction professionals operate in highly demanding work environments characterized by tight project schedules (Firose et al., 2025; Tijani et al., 2021; Bowen et al., 2021), long working hours (Dong et al., 2025; Jepson et al., 2017), safety risks (Rahman et al., 2025; Gómez-Salgado et al., 2023), role conflicts (Jepson et al., 2017; Tijani et al., 2021; Bowen et al., 2021), workload pressure (Firose et al., 2025), economic uncertainty (Dong et al., 2025; Kotera et al., 2020), and complex stakeholder interactions (Greiner et al., 2022; Jaymin-Sanchaniya et al., 2024; Kotera et al., 2020). These stressors significantly affect their psychological functioning, emotional stability, and overall well-being, thereby posing challenges to sustainable workforce performance within the construction industry (Langdon & Sawang, 2018; Tijani et al., 2021; Noopur, 2023).

Stress is the body's psychological and physiological response to environmental pressure (Lisowski & Grajek, 2023), it is a product of inappropriate coping with the challenges of everyday life (Lisowski & Grajek, 2023). Although stress is inevitable among construction professionals because of the nature of work, their emotional response to it can significantly affect the project outcome. According to Ivancevich and Matteson (2014), stress can manifest physiologically, emotionally, or behaviorally, impacting workplace performance and health. Thus, it is important to investigate construction professionals' responses to stress. Generally, responses to workplace stress are coping, adapting, withstanding, maintaining, and recovering; these processes are referred to as resilience process (Duchek, 2019; Maunder et al., 2023; Bui et al., 2023; Hollaar et al., 2025). Resilience is viewed as a multidimensional concept; thus, different authors identified different types of resilience (Den Hartigh & Hill, 2022; Denckla et al., 2020; Sisto et al., 2019; Chmitorz et al., 2018). Although the different types of resilience are important in workplace stress, Reivich and Shatté (2002) echo that emotional resilience is particularly relevant in high-stress professions and during prolonged exposure to emotionally demanding situations. The construction industry is a highly stressful industry with prolonged hours of work; hence, it is expedient that the emotional resilience of construction professionals and the relationship between workplace stress and emotional resilience of construction professionals be investigated.

The aim of the study is to model the relationship between workplace stress and emotional resilience of construction professionals, with the view to integrating human well-being into sustainable construction. Firstly, the study investigated the types of workplace stress experienced by construction professionals. Secondly, the study determined whether construction professionals exhibit emotional resilience in response to workplace stressors. Thirdly, the relationship between workplace stress and emotional resilience possessed by construction professionals was investigated, with developing a model for the relationship.

Integrating human well-being into sustainable construction through modelling the relationship between workplace stress and emotional resilience among construction professionals will expand the concept of sustainable construction beyond environmental and economic concerns by integrating the human dimension of sustainability, particularly psychological well-being. Construction professionals often operate in high-stress environments, and understanding how stress interacts with emotional resilience helps position well-being as a core component of sustainability rather than an optional consideration. Furthermore, the study will assist construction firms in developing mental health and stress management programmes that will provide a supportive work environment.

2. LITERATURE REVIEW

Workplace Stress

Stress is inevitable in construction industry, majorly due to the nature of work, tight schedules, working under harsh weather, time pressure, long work hours, and excessive workload (Rahman et al., 2025; Gómez-Salgado et al., 2023; Firose et al., 2025). According to Meurs and Perrewé (2011), stress occurs when an individual perceives demand exceeds perceived ability, thereby endangering well-being.

There have been various perspectives on the definition of stress. Authors like Gunasekera and Perera (2023) defined stress from a general perspective; others defined it as occupational stress (Pich, 2018). Generally, stress is a state of mental or emotional strain due to adverse or demanding life circumstances (Gunasekera & Perera, 2023). Defining stress from the perspective of occupation, Pich (2018) defined stress as the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources, or needs of the worker. Occupational stress is a subset of stress linked specifically to occupation/work/job. In other words, occupational stress is workplace stress.

Health and Safety Executive (HSE) (2024) defined workplace stress as the adverse reaction people have to excessive pressures or other types of demand placed on them at work. According to Bowen et al. (2014), workplace stress is prevalent among construction professionals, with architects and females experiencing higher levels. Similarly, Hulls et al. (2022) conclude that workplace stress is prevalent in construction industry and usually unchallenged due to job instability, emphasizing the need for senior management intervention and informal stress relief mechanisms. The prevalence of high workplace stress has been attributed to various factors such as interpersonal conflict (Bruce et al., 2024), cost constraints, interpersonal skills, and high reporting demands (Seth et al., 2021), working conditions, such as age, work hardship, safety culture, and long hours (Gómez-Salgado et al., 2023). Others include workflow interruptions (Sarhan et al., 2024), time constraints, work volume, and inadequate compensation, with control over work type, flow, and volume (Cattel et al., 2014). Tijani et al. (2021) categorised workplace stress into five, namely, work overload, home-work conflict, poor working environment, role ambiguity, and poor working relationships. Based on various factors above, different authors identified different types of workplace stress, namely, time stress (Dodanwala & Santoso, 2022), anticipatory stress (Pulopulos et al., 2020), situational stress (Bowen et al. 2014; Chen et al., 2022), encounter stress (Sunindijo & Kamardeen, 2017; Tijani et al., 2021), physical stress (Umer et al., 2022, Boschman et al., 2011; Hans, 2024), mental stress (Umer et al., 2022; Tijani et al., 2021); and weather-related stress (Jai et al., 2017; Abdul-Rahman et al., 2025)

Time Stress is the psychological tension experienced when an individual perceives a severe deficit of time relative to the volume of tasks, deadlines, or milestones they are required to complete (Dodanwala & Santoso, 2022). Ahmed et al. (2024) examined the impact of time stress performance of project managers; it was discovered that time stress has positive impact on project managers' performance. Dodanwala and Santoso (2022) investigated how compressed project timelines and rushing to meet rigid baseline schedules are associated with high turnover intentions among construction managers.

Anticipatory Stress is associated with the feeling that future tasks are overwhelming. It is chronic anxiety, dread, or psychological strain directed toward future and unproven workplace events (Pulopulos et al., 2020). Loosemore and Waters (2004) focused on pervasive anxiety surrounding impending job insecurity, routine corporate restructuring, and the dread of major on-site accidents between male and female professionals in the construction industry. It highlights how the project-based nature of construction leaves workers in a chronic state of anticipating their next period of unemployment.

Situational Stress is an acute, short-term stress response triggered by sudden, unpredictable, or highly disruptive workplace emergencies or crisis events over which the employee has little to no personal control (Chen et al., 2022). Rashnoudi et al. (2025) discovered that unexpected site emergencies cause massive spikes in stress, leading directly to higher human error and on-site physical injury rates.

Encounter stress is stress resulting from feeling overwhelmed when meeting new clients or too many people. Sunindijo and Kamardeen (2017) examined how high confrontation, machismo site cultures, and emotional labor trigger severe cognitive exhaustion among contractors, subcontractors, inspectors, and clients.

Physical stress is the physiological strain placed on the human body by immediate workplace ergonomic and environmental conditions, such as heavy lifting, excessive noise, or repetitive manual tasks (Umer et al., 2022; Boschman et al., 2011; Hans, 2024). Umer et al. (2022) discovered that cognitive task -led mental stress led to an increase in physical stress.

Mental stress is the cognitive overload and psychological fatigue resulting from complex decision-making, information processing demands, and constant administrative or technical problem-solving. (Umer et al., 2022; Tijani et al., 2020)

Weather-related stress is the thermal, physiological, and environmental strain imposed on workers due to exposure to ambient climate variations, such as extreme heat, freezing temperatures, or high humidity (Jai et al., 2017; Abdul-Rahman et al., 2025)

The prevalence of workplace stress among construction professionals often leads to negative effects. According to Blair Winkler (2024), workplace stress negatively impacts personal and professional wellbeing, with office-based workers facing job complexity and organizational pressures, while on-site workers face physical health and safety concerns. Nwaogu et al. (2021) observed that workplace stress among construction personnel leads to excessive sympathetic nervous activity and disrupted sleep, increasing their vulnerability to cardiovascular risk factors and adverse health outcomes.

Despite the negative impacts of workplace stress on construction workers, Firose et al. (2025) concluded that the mental well-being of professionals remains only moderately affected, due to their consistent use of positive coping strategies. Furthermore, Qi et al. (2018) found that construction workers exhibit more emotion-based coping behaviours than problem-based. Hence, it is pertinent to investigate emotional resilience among construction workers.

Emotional Resilience

Resilience describes an individual's response to crisis. It is the ability of an individual to adapt and bounce back after experiencing a crisis, in this context, stress. There are various classifications of resilience in literature. Basheer (2022) establishes a four-pillar framework for human coping mechanisms. Physical resilience relates to somatic recovery; psychological resilience relates to mental ability to cope with or adapt to difficulties; emotional resilience refers to how an individual manages his emotional responses to challenges; and social resilience refers to a community's capacity to respond to crises and bounce back. In construction, Hu et al. (2025) review literature on safety resilience and establish three streams based on existing literature: structural resilience, psychological resilience and managerial resilience.

The construction industry is a physically and emotionally demanding industry, resulting in stress and mental issues among workers. The ability of construction workers to respond and adapt, especially to stress, emotionally and psychologically, acts as a defensive buffer. Hence, emotional resilience refers to an individual's capacity to maintain stable psychological functioning, regulate negative emotions, and actively

recover when facing acute workplace stress or systemic adversity. Empirically, Zhu et al. (2025) concluded that workers who possess strong emotional resilience are better at mitigating psychological problems.

Relationship between Workplace Stress and Emotional Resilience

Previous literature examined the effect of different stressors on emotional and psychological resilience of construction workers. García-Rubiano et al.'s (2023) study shows that severe workload stress and family-work imbalances have a negative effect on emotional resilience. Nwaogu et al. (2021) conclude that the combination of physical strain, tight deadlines, and poor interpersonal relationships on-site overloads the nervous system. This overload diminishes the worker's capacity for emotional positivity, often driving them toward maladaptive coping strategies like substance abuse. Hence, it is important that the relationship between types of workplace stress and emotional resilience be investigated and a model predicting the relationship be developed. The study therefore proposes that “there is no relationship between types of workplace stress and emotional resilience. The Framework of the relationship is presented in Figure 1.

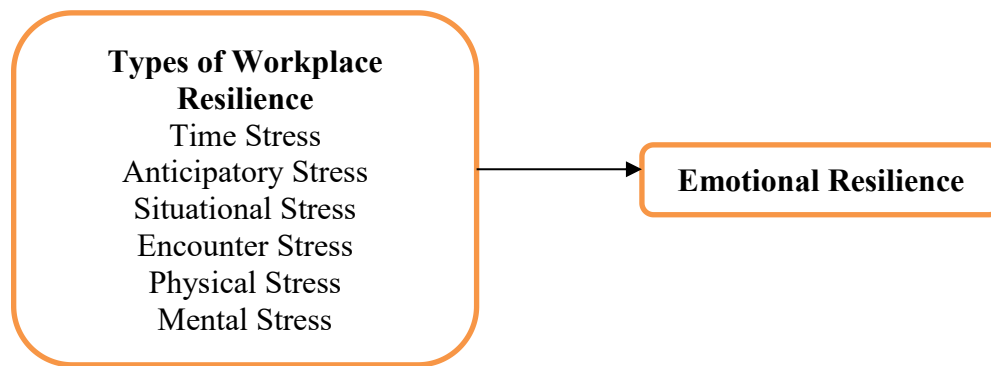


Figure 1: Relationship between Workplace Stress and Emotional Resilience

3. METHODOLOGY

The research design adopted in this study is quantitative, while the research approach is a survey. A quantitative research design was adopted because the study requires quantitative data to model the relationship. Furthermore, a survey research approach was employed because data was obtained once from respondents. The respondents of the study were construction professionals working on construction sites, while the instrument of data collection was a structured questionnaire. The questionnaires were electronically distributed to construction professionals using a purposive sampling technique. Construction professionals who have experienced workplace stress on construction sites were voluntarily recruited into the study, links were sent to them via their WhatsApp number and they were required to answer questions on workplace stress and resilience. A total of 150 questionnaires were sent to construction professionals, 117 were returned and valid for analysis, hence the response rate was 78%.

The independent variable in this study was workplace stress and the dependent variable was emotional resilience. Workplace stress was divided into seven types, namely: time stress, anticipatory stress, situational stress, encounter stress, physical stress, mental stress, and weather-related stress. Statements describing the different types of stress were used to describe the stresses while respondents were asked to state whether ‘Yes’ or ‘No’ if they had experienced such stress. Emotional resilience was conceptualised as

a latent variable with 3 observable variables. Respondents were asked to tick ‘Yes’ or ‘No’ to statements describing emotional resilience.

The scales of measurement for workplace stress and emotional resilience were dichotomous. To analyse workplace stress, frequency was employed, while for emotional resilience, a composite mean score. Composite mean score was used because emotional resilience was measured with multiple indicators. To model the relationship, a multiple regression analysis was used. This was because the independent variable is binary, whereas the dependent variable is continuous.

Strict ethical standards were considered in this study. Informed consent was obtained from participants, stating that participation in the research was voluntary and that they could opt out at any time. Furthermore, confidentiality and anonymity of respondents were given utmost consideration, as participants' personal identifiers were not included in the research instrument.

4. DATA ANALYSIS

Characteristics of Respondents

The profession and years of experience of construction professionals are depicted in Table 1.

Table 1: Characteristics of Respondents

Characteristics of Respondents	Frequency	Percent	Characteristics of Respondents	Frequency	Percent
Profession			Years of experience		
Architect	10	8.5	below 5 years	56	47.9
Builder	81	69.2	6-10 years	29	24.8
Civil engineer	12	10.3	11-15 years	14	12
Quantity surveyor	4	3.4	16-20 years	7	6
Mechanical engineer	3	2.6	above 20 years	11	9.4
Electrical engineer	7	6	Total	117	100
Total	117	100			

In terms of profession, Figure 1 shows that all the major professions in the construction industry are well represented in the study, hence giving credence to the findings of the study. Regarding years of experience, nearly half of the respondents, 47.9% (56 respondents), had below 5 years of experience, indicating that many respondents were relatively new in the industry. Respondents with 6–10 years of experience accounted for 24.8% (29 respondents), while those with 11–15 years represented 12% (14 respondents). Respondents with 16–20 years of experience constituted 6% (7 respondents), while those with above 20 years of experience accounted for 9.4% (11 respondents). This suggests that the study captured views from both early-career and experienced professionals.

Types of Stress Experienced by Construction Professionals

The types of stress experienced by construction professionals were measured using categorical variables and were analysed using frequency and percentage. The result is presented in Table 2.

Table 2: Types of Workplace Stress

S/N	Types of Workplace Stress	Yes		No		Total	
		Freq	%	Freq	%	Freq	%
1	Time stress	109	93.2	8	6.8	117	100
2	Weather-related stress	83	70.9	34	29.1	117	100
3	Mental stress	76	65	41	35	117	100
4	Physical stress	75	64.1	42	35.9	117	100
5	Anticipatory stress	74	63.2	43	36.8	117	100
6	Situational stress	72	61.5	45	38.5	117	100
7	Encounter stress	60	51.3	57	48.7	117	100

The results in Table 2 indicate that construction professionals experience different types of workplace stress at varying levels, suggesting that stress is a common feature of the construction work environment. Time stress has the highest percentage of stress among respondents. This shows that construction professionals experience stress associated with deadlines, tight schedules, and pressure to complete tasks within limited time frames. This suggests that construction projects are highly schedule-driven, often requiring professionals to work under intense time constraints.

65% of the respondents experience mental stress, which is a stress as a result of events in the external and internal surroundings, which leads to psychological distress and worry. This indicates that there is a high prevalence of mental stress among construction professionals. This suggests that a majority of construction professionals are exposed to psychological or emotional strain in their work or daily activities.

Encounter stress had the lowest percentage, though still significant, with 60 respondents (51.3%) reporting stress of having a sense of feeling of being overwhelmed by meeting new client or too many people. This suggests that interpersonal relationships and communication challenges exist within the industry. The implication is that poor workplace interactions may reduce teamwork, collaboration, and job satisfaction. Construction organizations may therefore benefit from leadership development, conflict resolution mechanisms, and improved communication practices.

Emotional Resilience of Construction Professionals

The emotional resilience of construction professionals was measured as a latent variable with three observable variables. The emotional resilience of construction professionals was assessed using a composite mean score. The result is presented in Table 3.

Table 3: Emotional Resilience of Construction Professionals

S/N	Emotional Resilience	Yes	No	Total	Mean
1	I can quiet my racing mind following a traumatic incident at work	94	23	117	1.20
2	I can respond to difficult or unexpected conditions at work	110	7	117	1.06
3	I can bounce back from a stressful situation at work without allowing it to affect my internal provocation	105	12	117	1.10
	Composite Mean Score	103	14	117	1.12

The results in Table 3 show the emotional resilience of construction professionals in the workplace. Generally, respondents demonstrated emotional resilience, with a high frequency of 'Yes' (103) responses and a composite mean score of 1.12, indicating that most construction professionals possess the psychological capacity to manage stressful and unexpected work conditions effectively, recover quickly from workplace challenges, and maintain emotional stability despite demanding project environments.

Workplace Stress-Resilience Relationship

To determine the relationship between workplace stress and emotional resilience, multiple regression was employed to assess the relationship. The results are presented in Table 3,4,5.

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.348a	0.121	0.065	0.17688	0.121	2.147	7	109	0.045

a Predictors: (Constant), Weather-related stress, Anticipatory stress, Time stress, Physical stress, Situational stress, Mental stress, Encounter stress

b Dependent Variable: Emotional Resilience

The model summary in Table 4 shows an $R = 0.348$, indicating a weak positive relationship between workplace stress types and emotional resilience. The coefficient of determination ($R^2 = 0.121$) indicates that the stress variables explained 12.1% of the variation in emotional resilience among construction professionals, while the remaining 87.9% may be attributed to other factors not included in the study.

Table 5: Analysis of Variance Table for Emotional Resilience

ANOVAa		Sum of Squares	df	Mean Square	F	Sig.
Model						
1	Regression	0.47	7	0.067	2.147	.045b
	Residual	3.41	109	0.031		
	Total	3.88	116			

The ANOVA result in Table 4 revealed that the regression model is statistically significant ($F = 2.147$, $p = 0.045$). Since the p-value is less than 0.05, the combined workplace stress variables can be said to predict emotional resilience accurately. Furthermore, the combined workplace stress significantly influences emotional resilience among construction professionals. This means that workplace stress has a significant relationship with emotional resilience.

Table 5: Coefficient of Workplace Stress on Emotional Resilience

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.035	0.07		14.713	0
	Time stress	0.145	0.066	0.201	2.184	0.031
	Anticipatory stress	0.033	0.036	0.087	0.901	0.37
	Situational stress	-0.063	0.036	-0.167	-1.735	0.085
	Encounter stress	0.017	0.038	0.047	0.445	0.657
	Physical stress	0.021	0.037	0.056	0.577	0.565
	Mental stress	-0.1	0.04	-0.263	-2.512	0.013
	Weather-related stress	0.014	0.04	0.034	0.347	0.73

From Table 5, two stress variables significantly influenced emotional resilience: time stress and mental stress. Thus, the study rejects the hypothesis for the two stress types. Time stress ($B = 0.145$, $p = 0.031$) had a significant positive effect on emotional resilience. This implies that construction professionals experiencing pressure from limited time to complete tasks may develop stronger emotional resilience, possibly due to adaptation to demanding project conditions. Mental stress ($B = -0.100$, $p = 0.013$) had a significant negative effect on emotional resilience. This indicates that psychological distress, worry, and mental pressure reduce the emotional resilience of construction professionals.

Other stress variables, namely, anticipatory stress, situational stress, encounter stress, physical stress, and weather-related stress, did not significantly influence emotional resilience because their p-values were greater than 0.05.

The Predictive Model

$$ER = 1.04 + 0.15(TS) - 0.10(MS)$$

Where ER = Emotional Resilience

TS = Time Stress

MS = Mental Stress

5. DISCUSSION OF FINDINGS

This study investigated the relationship between workplace stress and emotional resilience with the aim of integrating human well-being into sustainable construction. Firstly, the types of stress experienced by construction professionals were determined. The results show that the highest stress experienced by construction professionals is time stress. This suggests that construction professionals experience stress due to long hours, tight schedules, and work overload. This supports the findings of Cattell et al. (2016), in which critical time constraints and volume of work were identified as top stressors. Furthermore, Zhang et al. (2023) concluded that design professionals face unrealistic time and cost pressures, frequent overtime, and tight schedules as critical job stressors. The finding also supports those of Firose et al. (2025), in which professionals report stress mainly from time pressure, long work hours, and excessive workload. The implication is that excessive time pressure may contribute to fatigue, reduced productivity, burnout, poor

decision-making, and increased likelihood of errors and accidents on construction sites. It also indicates the need for better project scheduling, workload distribution, and realistic timelines to support employee well-being.

Secondly, the study examined construction professionals' emotional resilience. The result shows that on average, construction professionals exhibit high emotional resilience. This implies that construction professionals can quiet their racing mind following a traumatic incident at work and can bounce back from a stressful situation at work without allowing it to affect their internal provocation. The finding differs from Zhang et al. (2026), in which a low level of psychological resilience was discovered among construction professionals. The difference could be due to the study area and the perception of the respondents.

The result of the relationship between workplace stress and emotional resilience shows a positive and significant relationship. This means that workplace stress influences emotional resilience of construction professionals. The implication is that the more construction professionals experience stress of not having enough time to finish a task, the more they possess the ability to manage emotions positively and remain mentally strong under pressure. This indicates that construction professionals emotionally adapt positively to time stress. This may be due to their years of experience in the construction industry, as seen in the respondent profile, where 52.2% had experience of 6 years and above. The finding is in contrast to previous studies, in which time stress negatively influences emotional well-being, raising depression, anxiety, and emotional exhaustion (Gärling et al., 2016; Ogden et al., 2025).

In addition, a significant but negative relationship was discovered between mental stress and emotional resilience. This means that mental stress negatively influences emotional resilience. The implication is that the more construction professionals experience mental stress, the less their ability to withstand and manage their emotions positively and remain stable. This aligns with previous studies in which a higher level of stress reduces psychological and emotional resilience (Chen et al., 2025; Zhang et al., 2026).

6. CONCLUSION

The influence of types of workplace stress on emotional resilience of construction professionals was investigated. It was discovered that time stress and mental stress have a significant influence on emotional resilience, though the influence differ, thus a model for predicting the relationship of workplace stress and emotional resilience was developed. Time stress had a significant positive influence on emotional resilience, thus the study concludes that time stress positively enhances emotional resilience of construction professionals by strengthening their adaptability and coping capacity under work pressure. Mental stress had a significant negative influence on emotional resilience, hence the conclusion is that mental stress significantly weakens emotional resilience by reducing psychological stability and the ability of professionals to effectively manage workplace challenges.

Hence, construction organisations should encourage psychological and emotional stability of construction professionals by developing structured stress management and emotional well-being programmes that will assist professionals to cope effectively with workplace stress. Furthermore, stakeholders in the construction industry should integrate human well-being into sustainable construction policies by prioritizing the psychological health, emotional stability, and overall welfare of workers alongside economic and environmental sustainability goals

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