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The Impact of Coping Strategies and Individual Resilience on Anxiety and Depression among Construction Supervisors

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Abstract: Psychosocial working conditions such as long work hours, low job control, and work–life imbalance faced by construction professionals in site management positions subject them to elevated work stress and poor mental health. This study explored the protective ability of resilience and coping strategies in mitigating mental ill-health among construction supervisors in Nigeria. By adopting a mixed methodology, validated psychometric instruments were used to collect data from 174 construction supervisors, and semi-structured interviews involving 13 participants were used to understand better how supervisors cope with stress. The quantitative data were analysed using mean and univariate logistic regression, while qualitative data were thematically analysed. Univariate logistic regression revealed that individual resilience and problem-focused coping (PFC) strategies related to planful problem-solving, positive reappraisal, and seeking social support reduced anxiety symptoms. Aside from the coping skill considered in the quantitative survey, two additional skills adopted by the supervisors were deduced following thematic analysis. On average, the respondents' depression, anxiety, and resilience levels were within the mild, minimal, and normal range, respectively. Resilience moderated the relationship between coping skills and anxiety by showing that a stronger relationship between the coping strategy and anxiety will be observed among people with a high level of resilience. Resilience, planful problem-solving, positive reappraisal, and seeking social support coping behaviours are significant predictors of mental health. This study highlights the need for resilience-building as an integral part of stress-reduction and management interventions aimed at construction supervisors in the construction industry.

Keywords: stress; coping strategies; coping resources; mental health; construction industry

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1. Introduction

Construction professionals in site management positions are subjected to heightened work stress and related mental ill-health symptoms due to the industry's demanding nature [1,2]. When left unmanaged, stress could become excessive, posing a severe risk to individuals and organisations [3–5]. The impact at the individual level includes safety incompliance, reduced performance, and psychological and physiological health consequences [2]. The organisation's risk includes lower productivity, increased sick leave, lost work hours, and compensations [6,7]. The source of stress includes long working hours, poor physical work environment, little social support [1,8,9], work-family/life imbalance [10], financial insecurity [11], job insecurity [2], interpersonal conflict [12], and bullying and harassment [13]. Irrespective of the intensity of stress experienced, employees are affected differently because some cope better than others [2]. The variation results from each individual's adopted coping strategy and inherent coping resources (such as resilience).

Coping is a stress control and adaptation process that involves an individual employing cognitive and behavioural strategies to control a situation and its related emotions [14]. Behavioural coping consists of overt physical or verbal activities such as drinking, and

escapism skills, whereas cognitive efforts involve using strategies to intentionally manage one's thoughts or emotions, such as positive reappraisal [15]. Resilience is a coping resource because it helps a person realise that he can adjust to positive and negative events when his internal strengths and abilities are utilised [14]. Over the years, to alleviate stress, attention has focused on stress-coping behaviours employed to manage poor mental health problems among construction professionals [2,16]. Considering cognitive coping, Haynes and Love [2] found that site managers in Australia who adopt emotion-focused strategies experienced increased depression and anxiety, while problem-focused strategies reduced anxiety and depression.

A review of existing literature revealed that studies relating to stress-coping behaviours and mental ill-health among construction professionals have neither considered the role of resilience nor been conducted in Nigeria. The studies did not also consider the role of demographic characteristics such as years of experience or gender in predicting stress-coping behaviours and mental ill-health among supervisors. However, literature in other fields, such as nursing [17], shows that demographic characteristics can influence anxiety, depression and resilience.

In Nigeria, the construction sector strategically alleviates unemployment and increases Gross Domestic Product [GDP] [18]. However, the prevalence of work factors that causes stress and adverse psychological outcomes among site-based construction personnel may deter the industry's contribution to the Nigerian economy [19–21]. Thus, studying stress coping in relation to individual resilience and mental health becomes imperative for the construction industry, especially in Nigeria, where the prevalence of mental ill-health is high [22]. According to the World Health Organization [23], the prevalence rate of depression and anxiety in Nigeria is 3.9% and 2.7%, respectively. With approximately 7 million and 4 million cases of depression and anxiety, Nigeria has the highest rate of mental ill-health in Africa, about 1.6 times higher than the closest country.

Oladinrin, Adeniyi and Udi [21] and Ojo, Adeyeye, Opawole and Kajimo-Shakantu [20] found that strategies adopted to manage stress among construction professionals in Nigeria were mainly behavioural coping strategies. Additionally, Ojo, Adeyeye, Opawole and Kajimo-Shakantu [20] and Oladinrin, Adeniyi and Udi [21] did not consider resilience a coping resource or mental ill-health symptoms. The coping strategy that a construction (site) supervisor would implement depends on his or her resilience level and how he or she appraises the stressor, resulting in enhanced or decreased mental health [24]. This is because the response or coping strategy adopted by someone is determined by the resources available to them when the problem or stressor arises [25]. One resource inherent to individuals is resilience [26]. Therefore, it is imperative to understand how site supervisors cope with stress to alleviate its negative impact on mental health.

This study aims to identify the role of resilience and coping strategies as protective factors against mental ill-health among construction site supervisors. To achieve this aim, the objectives are to determine: (i) coping strategies employed among supervisors and their effects on depression and anxiety; (ii) the effect of resilience on the likelihood of developing mental ill-health symptoms; (iii) the effect of resilience on coping strategies among site supervisors. The result of this study would benefit the construction industry on two levels. The individual-level benefit includes improved safety compliance, increased performance, and improved psychological and physiological health. Whereas increased productivity, reduced lost work hours, and compensation at the benefits at the organisation level.

1.1. Literature Review

1.1.1. Coping

In this study, the definition of the term "stress" and "stressors" follows Wu et al. [27] "stressor refers to the actual or perceived threat to an organism, and stress refers to the effects of the stressor when it seriously threatens homeostasis". According to Lazarus and Folkman's transactional theory of stress, coping is process-oriented and involves intentionally employing cognitive and behavioural actions to manage demands that a person

appraises as stressful [28]. Coping strategies consist of two broad categories: problem-focused (PFC) and emotion-focused (EFC) strategies. Emotion-focused behaviours include accepting responsibility, avoidance, self-controlling, and distancing, while problem-focused behaviours consist of plan problem solving, positive reappraisal, seeking social support, and confrontive coping [29]. Although there is inconsistency in the effectiveness of the strategies, negative effects (e.g., poorer psychological well-being and job dissatisfaction) have been associated with EFC, while positive effects (e.g., improved psychological well-being) are linked to PFC [28,30]. PFC strategies involve deliberate actions taken to change the situation. In contrast, EFC strategies include actions that reduce emotional distress caused when someone responds to the stressor, thus regarded as maladaptive [31].

1.1.2. Resilience

Resilience is the capacity to recover or bounce back in the face of a stressful situation [32,33]. There are three types of resilience: individual, community, and national resilience, with the last two levels being regarded as social resilience [34]. Most research on resilience relates to individual resilience because a person's level of resilience is significant in buffering the negative psychological effect of stressful events [34]. Similarly, this study focuses only on individual resilience as a coping resource in the stress-coping process, as the coping strategies considered have an aspect that relates to social support, which is an aspect of social resilience. Individual resilience is an essential coping resource that helps individuals maintain physical and mental well-being when exposed to a stressor [24,27,35]. Resilience can minimise the likelihood of developing mental ill-health, such as anxiety, depression, and post-traumatic stress disorder (PTSD) [36] and facilitate safety-focused behaviours [37].

Resilience has been found to improve job satisfaction among several working populations, e.g., nurses [38,39]. Thus, building resilience is essential in helping employees remain on their job [36]. During adverse events, resilience influences how an individual appraises the stressor, whereas coping (or coping strategies) refers to the skills employed after appraising the stressor [32]. High resilience has been associated with the use of positive coping skills [37]. For instance, evidence shows that high resilience hampers the use of emotion-focused coping strategies and predicts the use of problem-focused coping strategies for good mental health [24,32,33,40,41]. Resilience mediates and moderates the relationship between coping strategies and psychological outcomes [33,35,42]. Figure 1 shows the mediating and moderating ability of resilience.

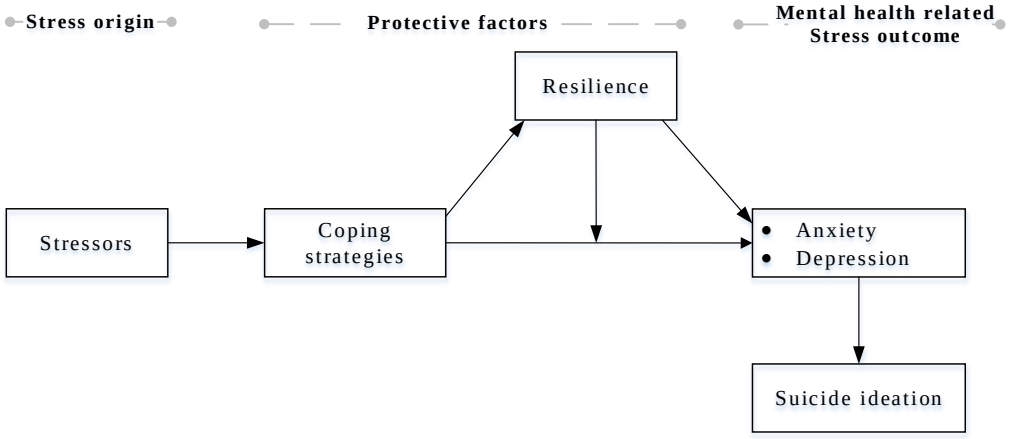

Figure 1. The Stress-Coping-Resilience framework (Adapted from Nwaogu [43]).

1.1.3. Coping with Stress in the Construction Industry

There have been several studies on coping and stress among professionals in the construction industry [2,16,20,21,31,44,45]. However, only a few have shown that coping strategies help minimise the outcomes of stress related to psychological health [2,16]. On the

contrary, more recent studies on coping in the construction industry focus on construction frontline workers [6,29,46].

In Australia, Sunindijo and Kamardeen [16] found that depression and anxiety correlated negatively with active coping while positively correlating with emotion-focused strategy (e.g., denial or distancing). Overall, the coping strategy that a construction site supervisor will adopt in the face of stress would rely on his or her level of resilience. However, the construction industry has not considered the role of individual resilience in the coping process among construction supervisors. In the industry, Chen, McCabe and Hyatt [37] and Chen, McCabe and Hyatt [12], considering the role of individual resilience in the stress-safety process among construction workers in Ontario, found that resilience is negatively correlated with interpersonal conflict at work and psychological stress. They recommended that safety training include improving coping abilities and individual resilience to reduce workplace interpersonal conflict. Although the studies were not related to stress-coping, they highlighted the need to study individual resilience to inform intervention channels.

Liang, Leung and Ahmed [6] deduced that among construction frontline workers in Hong Kong, emotional and physical stress were escalated by adopting confrontive coping skills, while proactive coping (i.e., seeking social support) reduced them. However, Liang, Leung and Ahmed [6] did not determine the impact of those coping forms on common mental ill-health conditions such as anxiety and depression. Nwaogu, Chan and Tetteh [29] deduced that among construction frontline workers in Nigeria, adopting emotion-focused coping forms, e.g., avoidance, self-controlling and distancing, increased anxiety, while confrontive coping increased depression. Palaniappan et al. [46] evaluated the effectiveness of support, specifically peer support, in reducing depression, anxiety and stress among construction workers in Singapore. Among these studies on frontline workers, only Nwaogu, Chan and Tetteh [29] studied the impact of resilience on coping and mental health. However, the study did not evaluate the moderating and mediating possibilities of resilience in the coping process. However, the coping mechanisms adopted by construction frontline workers may differ from those construction professionals would engage due to their educational background and hierarchy in the construction organisation. Construction frontline workers are placed at the lowest level of the organisational hierarchy [6]; thus, they work as subordinates to construction supervisors.

Studying stress coping in relation to individual resilience and mental health is imperative in the construction industry, especially in Nigeria, where economic conditions are worsening and the prevalence of mental ill-health is high [22]. According to the World Health Organization [23], the prevalence rate of depression and anxiety in Nigeria is 3.9% and 2.7%. Likewise, Oladinrin, Adeniyi and Udi [21] deduced depression as the third-ranking stress response among construction professionals in the Nigerian construction industry. Since resilience and coping strategies offer protective factors for mental health among other populations [32,33], it becomes imperative to understand the predominantly utilised coping strategies, their impact, and the level of individual resilience among construction (site) supervisors. The information is crucial for developing an effective secondary intervention to enhance improved health, well-being, safety, and performance within the construction industry.

1.1.4. Hypothesis of the Study

Based on the preceding literature, research objectives, and the framework (see Figure 1), this study hypothesises that:

H1: *PFC strategies will negatively relate to anxiety or depression, while EFC strategies will positively relate to anxiety or depression.*

H2: *Resilience will negatively relate to anxiety or depression.*

H3: *Resilience will be positively related to PFC strategies and negatively related to EFC strategies.*

H4: *Resilience will mediate the effect of coping strategies on anxiety or depression.*

H5: *Resilience will moderate the effect of coping strategies on anxiety or depression.*

According to Secades et al. [47], resilience influences the stress process at several stages, starting with how a person appraises an event, followed by the coping strategy used to respond to the event. In contrast, coping strategies are behaviours, skills, or strategies employed after the appraisal of the stressful event. Secades, Molinero, Salguero, Barquín, de la Vega and Márquez [47] further noted that resilience has a positive effect and influences the evaluation before the coping response while coping strategy is characterised by having a varying effect in resolving the event, and it is a specific response. Coping strategies depend on the situation; thus, changes per situation and how it is evaluated. According to the meta-model of stress, emotions, and performance, resilience determines how stressors are appraised and the selection of coping strategies [47].

The failure to adequately respond to stress leads to reduced performance. Therefore, to meet job expectations and improve performance, it is important to use psychological abilities and effective coping strategies [47]. Hence, studying resilience, coping strategies, and their relationship is essential in order to understand if construction supervisors will withstand the stressful situation that their job duties present and maintain good health and performance. Additionally, determining the relationship between resilience and coping strategies will help establish how coping strategies are inherent in a resilient person, highlighting the protective mechanism of resilience in health [48].

2. Methodology

A mixed methodology involving the use of questionnaires and semi-structured interviews was adopted. A quantitative survey through validated psychometric instruments was used to elicit information on mental health and its protective factors from site supervisors. Semi-structured interviews were used in the qualitative phase to explore the result of coping skills determined from the quantitative phase.

2.1. Research Instruments

The self-administered questionnaire had four sections: demographics, mental health status, coping strategies, and resilience. Validated psychometric tools, namely PHQ-9, GAD-2, WCQ, and BRS, were employed for this study. The psychometric instruments have been popular among the Nigerian population and have shown good psychometric properties [49–52].

2.1.1. Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 is a brief psychometric measure containing only nine questions to diagnose depression and its severity [53]. The last question of the PHQ-9 probes thoughts about suicidal ideation, offering an understanding of suicide ideation [54]. The PHQ-9 has shown good psychometric properties among the Nigerian population. For instance, the sensitivity and specificity of the PHQ among students were within the 0.87 to 0.98 and 0.80 to 0.92 range, respectively, deduced in western countries for hospital patients [49]. Similar to other contexts, the PHQ-9 was deduced with an optimal cut-off score of 5 for minor depression and 10 for clinically significant depression among the Nigerian population [49].

The PHQ-9 uses a recall period of two weeks on a four-point Likert scale which includes: 0 = "not at all", 1 = "several days", 2 = "more than half the days" and 3 = "nearly every day". The score ranges from 0 to 27, with a higher score indicating greater self-reported depression. It uses cut-off points: $\leq$4 (minimal), 5 (mild), 10 (moderate), 15 (moderately severe), and 20 (severe depression) [55]. A score ranging from 5 to 9 (5–9) indicates minor depression, and scores $\geq$10 indicate major depression [56]. Minor depression and major depression are clinically significant depression that requires the attention of professional healthcare providers [57]. However, minor depression represents a less severe form of illness. The Cronbach's alpha for the PHQ-9 was 0.78 among the supervisors.

2.1.2. Generalised Anxiety Disorder-2 (GAD-2)

GAD-2 is a psychometric measure containing only two questions for assessing clinically significant anxiety symptoms [58]. Similar to the PHQ, the GAD-2 uses a recall period of two weeks on a four-point Likert scale which includes: 0 = "not at all", 1 = "several days", 2 = "more than half the days", and 3 = "nearly every day". The GAD-2 scores range from 0 to 6, where a higher score indicates greater self-reported anxiety; a total score of $\geq$3 indicates clinically significant anxiety [58]. Among the respondents, the GAD-2 had a Cronbach's alpha of 0.72.

2.1.3. Brief Resilience Scale (BRS)

The BRS is a psychometric instrument that measures individual resilience. The scale shows excellent reliability and an intraclass correlation coefficient [59]. As shown in Table A1 in Appendix A, BRS contains six items, three of the questions, items two, four, and, are reverse coded to indicate pessimism, while the remaining questions, items one, three, and five, are positively coded, indicating positivism. The BRS response options are on a 5-point Likert scale with 1 = "strongly disagree", 2 = "disagree", 3 = "neutral agree", 4 = "strongly", 5 = "agree". The BRS scale employs cut-off points with 1.00 to 2.99 indicating low resilience, 3.00–4.30 = normal resilience, and 4.31–5.00 = high resilience [60]. The Cronbach's alpha for the BRS was 0.81 among the supervisors.

2.1.4. Coping Strategies Instrument

The coping instrument was adapted from the Ways of Coping Questionnaire (WCQ) based on items adapted from previous literature [2,44,61,62] and a pilot study. The WCQ measures the techniques employed to deal with stress [63]. Similar to the PHQ and GAD, Coping behaviour was measured on a four-point Likert scale with 0 indicating "never", 1 = "very little", 2 = "moderately", and 3 = "very great". The Cronbach's alpha for the coping instrument was 0.74, with Cronbach's alpha for six of the seven categories ranging between 0.69 and 0.77.

2.1.5. Semi-Structured Interviews

Semi-structured interviews were conducted to explore how the supervisors respond to stressors. Post-survey interview invitations were sent to supervisors who partook in the quantitative aspect of the research. The invitation includes a summary of the result obtained from the first phase. Only supervisors who indicated a willingness to engage in the interview were interviewed. The interview questions included: (i) if you are comfortable disclosing your age, how old are you? (ii) how long have you been practising in the construction industry? (iii) are you married, single or engaged? (iv) on average, how do you respond to the stressors you face daily to alleviate their mental health impact? The interview was conducted for approximately 30 min over the zoom platform and WhatsApp voice call until saturation was achieved.

2.1.6. Face and Content Validity

The face and content validity began by sending the draft questionnaire to two occupational health psychologists and construction professionals. The professionals serve as Associate Professor and Professor and have numerous publications in the field of study. An initial draft of the questionnaire was sent to the construction professionals, and their feedback was used to improve it. The improved draft was sent to the occupational health psychologists. Following the review process, the approved questionnaire was pilot tested among fifteen site-based construction personnel who are registered members of the Nigerian Institute of Quantity Surveyors (NIQS), Nigerian Institute of Building (NIOB), Nigerian Institute of Civil Engineering (NICE) and Nigerian Institute of Architects (NIA). The personnel were asked to comment on the questions' appropriateness and understanding. The participants indicated their understanding of the content and the time spent responding to the questions. Their response was used to modify the questionnaire.

2.2. Sample Size

The formula for sample size given by Cochran [64], cited in Sunindijo and Kamardeen [16], was used to arrive at a sample size since the number of supervisors is unknown.

Sample size,

$$n = \frac{(t)^2 \times (s)^2}{d^2} \quad (1)$$

$$n = \frac{(1.96)^2 \times (1)^2}{(4 \times 0.05)^2} = 96 \quad (2)$$

where: "n" is the sample size, "t" is the confidence level based on the value of the selected alpha level in each tail, "s" is an estimate of variance deviation of the 4-point Likert scale used, "d" is the margin of error for the estimated mean (i.e., number of points on the Likert scale multiplied by the acceptable margin of error). Upon substitution, it was deduced that a minimum of 96 supervisors should be sampled (see Equation (2)).

The respondents for this were purposively recruited from NICE, NIOB, NIA, and NIQS. Only NIQS and NIA members study engaged in on-site building production and management positions were recruited. Purposive sampling was adopted to preserve the quality of the data collected and findings. The sampling method was employed to ensure that only professionals engaged in on-site building production and who worked with construction firms registered with the Federation of Construction Industry (FOCI), Nigeria, were surveyed.

2.3. Data Collection

A total of 550 questionnaires were administered to construction supervisors on 65 sites in two megacities (Abuja and Lagos) belonging to construction firms identified from FOCI. Some supervisors responded immediately, while follow-up was required in some cases. A total of 176 questionnaires were retrieved, out of which two respondents did not complete the resilience and coping strategies questions. Therefore, the missing cases were eliminated from the analysis. For the qualitative aspect, 13 supervisors participated in the interview.

2.4. Statistical Analysis

2.4.1. Quantitative Data Analysis

Descriptive and inferential statistics were used to analyse the quantitative data in Statistical Package for Social Sciences (SPSS) version 26.0. The descriptive statistics include mean score, and chi-square analysis, while the inferential statistics are univariate logistic regression analysis and conditional process analysis. The univariate logistic regression was used to achieve hypotheses 1, 2, and 3, while the conditional process analysis was used to test hypotheses 4 and 5. The respondents were classified into two groups each to analyse the mental ill-health symptoms, as shown by Li, Luo, Ke, Dai, Zheng, Zhang, Cassidy, Soares, Zhang and Ning [55]:

- No depression or depression—a supervisor is categorised as "depression" if they had PHQ-9 scores ≥ 5.
- No anxiety or anxiety—a supervisor is categorised as having "anxiety" if he or she has GAD-2 scores ≥ 3.
- No suicidal ideation or suicidal ideation—a supervisor is categorised as having "suicidal ideation" if they ticked option two or above on item 9 of the PHQ-9, which indicates "a suicidal ideation experience".
- Supervisors were categorised as "high resilience" if they had BRS score ≥ 4.31, "normal resilience", and "low resilience" if their BRS score was 3.00–4.30 and 1.00–2.99, respectively.

Chi-square tests (χ^2) or Fisher's exact test were used to explore the statistical significance and differences between resilience, mental ill-health symptom groups, and demographic characteristics. If the expected number of frequencies in a cell is fewer than five during the Chi-square or Fisher's test, then the Fisher exact test value was recorded [65]. Logistic regression is used to evaluate an event's probability of occurrence [66]. In logistic

regression, when an odds ratio (OR) is greater than one (OR > 1), it indicates an increased occurrence of an event (i.e., risk factor), OR < 1 indicates a reduced occurrence of an event and an OR equal to one (OR = 1) signifies no effect on the occurrence of outcome [67]. Univariate logistic regression was used to indicate where to channel potential interventions targeted toward reducing stress for improved mental health since they are appropriate for modelling the effect of an independent variable on a dependent variable. For logistic regression, dichotomous coding (0 and 1) had to be employed. The responses were coded as follows:

- For coping strategies, "strongly disagree" was coded as 0 (i.e., No); "*very little*", "*moderately*", and "*very great*" were coded as 1 (i.e., Yes).
- For depression or anxiety symptoms, "*not at all*" was coded as 0; "*several days*", "*more than half the days*", and "*nearly every day*" were coded as 1.
- For resilience, BRS score 1.00–2.99 was coded as 0 (i.e., low); BRS 3.00–4.30 = 1 (i.e., normal); BRS $\geq$ 4.31 = 2 (i.e., high). The BRS scores were re-coded for moderation analysis, and to determine the reciprocal relationship between resilience and coping strategies, BRS 1.00–2.99 was coded as 0 (i.e., not resilient/low), and BRS scores $\geq$ 4.31 and 3.00–4.30" were re-coded as 1 (i.e., resilient/high).

Conditional process analysis (CPA) is a regression-based approach that integrates mediation and moderation analysis to examine and test hypotheses about how a mechanism varies based on individual differences [68]. Through the Hayes PROCESS macro add-on tool version 3.5 by Andrew F. Hayes for IBM SPSS version 26 [69], CPA was used to test if resilience can act as a mediator and moderator, as stated in hypothesis H5. Mediation analysis was used to examine if a pathway exists through resilience by which a coping strategy channels its effects on mental health; moderation analysis examines how the impact of a coping strategy on mental health is dependent on resilience [69].

2.4.2. Thematic Analysis

The semi-structured interviews were analysed using MAXQDA software 2022 by VERBI GmbH. After importing the interview data into the software, thematic coding of the transcribed data was carried out with respect to the Ways of Coping Questionnaire. Thereafter, MAXDA visual tool MAXMap feature "Code-Subcodes-Segments Model" was used to display the themes and their memos. At least one excerpt from the memo was illustrated in the model. Additionally, the frequency of the themes was deduced using the frequency tool in MAXQDA.

3. Results and Discussion

3.1. Profile of the Respondents

A total of 174 duly filled questionnaires were retrieved out of the 550 questionnaires administered, amounting to a response rate of 31.6% (see Table 1). The respondents were largely building engineers (53.4%) and civil engineers (42.5%), while 2.9% were quantity surveyors and 1.1% were architects. Given that the construction industry is male-dominated, 158 (90.8%) of the respondents were males, while 16 (9.2%) were females. All 13 (100%) interviewees were males, aged between 25 and 48 years, with 9 (69.2%) married.

3.2. Mental Ill-Health Symptoms and Resilience Level among the Respondents

The majority of the supervisors, 95 (54.6%), reported depression, while only 25 (14.4%) reported anxiety (see Table 1). Among supervisors who reported depression, the prevalence rate of mild depression was 37.4%, 15.5% for moderate depression, and 1.7% for moderately severe depression. With a mean score of 5.33 $\pm$ 3.80 for the PHQ-9, the level of depression among the supervisors was within the mild range. Additionally, with a mean score of 1.20 $\pm$ 1.39 for the GAD-2, the anxiety level was within the minimum level. Only 9.2% of supervisors surveyed experienced suicidal ideation. With respect to the level of individual resilience, from the BRS score, it was deduced that the majority (43.1%) of the supervisors had normal resilience levels. In comparison, about a quarter (25.3%) had high resilience,

and 31.6% had low resilience. With BRS mean score of 3.64 ± 0.90, on average, the resilience level of supervisors was within the normal level.

Table 1. Demographic, mental ill-health, and resilience characteristics of the supervisors.

Variable	Categories	Frequency (%)	Mean (SD)
Demographics Characteristics			
Sex	Male	158 (90.8)	
	Female	16 (9.2)	
Type of firm	Micro	37 (21.3)	
	Small	59 (33.9)	
	Medium	46 (26.4)	
	Large	32 (18.4)	
Years of Experience	1–5 years	46 (26.4)	
	6–10 years	66 (37.9)	
	11–15 years	41 (23.6)	
	16–20 years	10 (5.7)	
	21–25 years	4 (2.3)	
	over 25 years	7 (4.0)	
Position	Project Manager	62 (35.6)	
	Site Engineer/Supervisor	73 (41.9)	
	Asst. Site Engineer/Supervisor	39 (22.4)	
Education	HND	43 (24.7)	
	PGD	19 (10.9)	
	BSc./B.Tech.	67 (38.5)	
	MSc./M. Tech.	45 (25.9)	
Professional Affiliation			
	NIOB	93 (53.4)	
	NICE	74 (42.5)	
	NIQS	5 (2.9)	
	NIA	2 (1.1)	
Mental ill-health symptoms			
Depression (0, 17)			5.33 (3.80)
	None-Minimal (0–4)	79 (45.4)	
	Mild (5–9)	65 (37.4)	
	Moderate (10–14)	27 (15.5)	
	Moderately severe (15–19)	3 (1.7)	
	Suicide ideation	16 (9.2)	
Anxiety (0, 6)			1.20 (1.39)
	None-minimal (0–2)	149 (85.6)	
	Mild-moderate (≥3)	25 (14.4)	
Resilience	Low resilience (≥2.99)	55 (31.6)	
	Normal resilience (3.00–4.30)	75 (43.1)	
	High resilience (4.31–5.00)	44 (25.3)	

3.3. Association between Individual Resilience, Mental-Ill Health Symptoms, Suicidal Ideation, and Demographic Variables

Using the Chi-square or Fisher test of differences, a statistically non-significant relationship was deduced between two demographic factors (i.e., years of experience and gender), individual resilience, and mental health symptoms (see Table 2). Additionally, Chi-square showed that there exists a statistically significant relationship between suicidal ideation and depression (χ^2 = 10.90, p = 0.01), as well as anxiety (χ^2 = 18.18, p = 0.00). As shown in Tables 2 and A2, Spearman's rank correlation between depression, anxiety, and suicide ideation was 0.30, 0.33 indicating a weak statistically significant relationship between mental ill-health and suicidality. Univariate regression further showed that depression (OR = 14.63) and anxiety (OR = 8.29) are associated with thoughts of suicide (see Table 3). This implies that the odds of experiencing suicidal ideation were 15 times and 8 times higher among supervisors who experience depression and anxiety, respectively.

Table 2. Exploring the association between demographic variables, resilience, mental-ill health symptoms, and suicidal ideation.

	Depression	No Depression	χ^2 or ^{F}	*p*	COR	Anxiety	No Anxiety	χ^2 or ^{F}	*p*	COR	Resilience	No Resilience	χ^2 or ^{F}	*p*	COR
Personnel (n = 174)	95 (55.1)	79 (44.9)				25 (14.8)	149 (85.2)				119 (68.4)	55 (31.6)			
Gender			2.08	0.19				1.62	0.25				1.35	0.28	
Male (n = 158)	89 (56.3)	69 (43.7)				21 (13.3)	137 (86.7)				106 (67.1)	52 (32.9)			
Female (n = 16)	6 (37.5)	10 (62.5)				4 (25.0)	12 (75.0)				13 (81.3)	3 (18.8)			
Years of experience			2.54 ^{F}	0.79				7.03 ^{F}	0.16				5.81 ^{F}	0.31	
1–5 year (n = 46)	24 (52.2)	22 (47.8)				4 (8.7)	42 (91.3)				35 (76.1)	11 (23.9)			
6–10 year (n = 66)	38 (57.6)	28 (41.8)				11 (16.7)	55 (83.3)				42 (63.6)	24 (36.4)			
11–15 year (n = 41)	24 (58.5)	17 (41.5)				7 (17.1)	34 (82.9)				27 (65.9)	14 (34.1)			
16–20 year (n =10)	5 (50.0)	5 (50.0)				-	10 (100)				5 (50.0)	5 (50.0)			
21–25 year (n = 4)	1 (25.0)	3 (75.0)				-	4 (100.0)				4 (100)	-			
>25 year (n = 7)	3 (42.9)	4 (57.1)				3 (42.9)	4 (57.1)				6 (85.7)	1 (14.3)			
Suicidal Ideation			10.90	0.00	0.30 ^{a}			18.18	0.00	0.33 ^{a}			1.20	0.40	−0.10
No (n = 158)	80 (50.6)	78 (49.4)				17 (10.8)	141 (89.2)				110 (69.6)	48 (30.4)			
Yes (n = 16)	15 (93.8)	1 (6.3)				8 (50.0)	8 (50.0)				9 (56.3)	7 (43.8)			

Note: *p* = *p*-value; COR = correlation; ^{a} = correlated significant at 0.01; bold values are significantly different at 0.01; χ^2 = Chi-square; ^{F} = Fisher Exact test and score.

Table 3. Univariate logistic regression estimating the odds ratios for poor mental health and suicidal ideation in relation to resilience level, suicidal ideation versus depression and anxiety.

Code		Suicidal Ideation			Depression			Anxiety		
		p-Value	OR	95% CI	*p*-Value	OR	95% CI	*p*-Value	OR	95% CI
R	Resilience									
	Low resilience	-	-		-	-		-	-	
	Normal resilience	0.54	0.71	0.23–2.14	0.51	0.79	0.39–1.60	0.56	0.76	0.31–1.88
	High resilience	0.18	0.33	0.64–1.66	0.66	0.47	0.21–1.05	**0.03**	**0.19**	**0.04–0.91**
MIL	Mental ill-health symptoms									
	Depression	**0.01**	**14.63**	**1.89–113.39**						
	Anxiety	**0.00**	**8.29**	**2.76–24.96**						

Note: CI = Confidence level; OR = Crude odds ratio; Numbers in bold are significant.

3.4. Resilience and Mental Health

As shown in Table 3, normal resilience level was not statistically significantly related to anxiety. However, it was deduced that high resilience was significantly associated with reduced anxiety levels. This indicates that the odds of experiencing anxiety reduced as resilience level increased. Thus, supporting hypothesis H2. Specifically, supervisors with high resilience were only 0.19 times more likely to experience anxiety symptoms, which implied that they were less likely to experience anxiety symptoms, unlike supervisors with low resilience. As shown in Table 3, it was deduced that as the level of resilience increased, the likelihood of experiencing anxiety reduced. Chi-square test, Spearman's rank correlation, and univariate logistic regression showed that individual resilience level was not significantly related to suicidal ideation (see Tables 2 and 3).

3.5. Coping Strategies Employed and Their Effects on Mental Health

As shown in Table 4, with mean scores of 3.35, 3.29, 3.28, 3.28, and 3.22, respectively, the five frequently employed coping strategies (i.e., C8, C6, C5, C4, C2) among the supervisors were related to PFC behaviours of *positive reappraisal and planful problem-solving*. In contrast, the least ranking strategies (C22, C23, C20, C21) were associated with EFC strategies. This implies that when most supervisors face a stressor, they employ strategies related to positive reappraisal and planful problem-solving skills. In contrast, fewer supervisors use techniques of EFC related to drinking, crying/venting, eating, and smoking. As shown in Table 5, the interview data revealed that the interviewees employed eight of the 26 coping skills considered in the quantitative aspect. Out of the eight coping skills, C11 (speaking to someone about the problem) was the most employed, followed by C8 (prayed to withstand or succeed) and C3 (made a plan of action and followed it).

Table 4. Estimating the odds ratios for poor mental health in relation to coping strategies and mean score analysis of coping strategies.

Code	Coping Strategies	Descriptive Statistics		Univariate Logistic Regression					
				Depression			Anxiety		
		Mean	R	*p*	OR	95% CI	*p*	OR	95% CI
	Problem-focused coping								
	Planful problem-solving (α = 0.76)								
C1	Knew what had to be done, so I doubled my efforts to make the thing work	3.11	8	0.74	1.22	0.38–3.94	**0.00**	**0.09**	**0.03–0.31**
C2	Came out with a couple of different solutions to the problem	3.22	5	0.99	-	-	0.99	0.00	**-**
C3	Made a plan of action and followed it	3.14	7	0.79	1.21	0.29–5.02	0.39	0.48	0.09–2.54
	Positive reappraisal (α = 0.71)								
C4	Came out of the experience better than when I went in	3.28	4	0.53	1.54	0.40–5.93	0.78	1.36	0.16–11.38
C5	Changed or grew as a person in a good way	3.28	3	0.68	0.60	0.53–6.70	0.37	0.33	0.03–3.74
C6	Rediscovered what is important in life	3.29	2	0.51	1.84	0.30–11.27	0.13	0.24	0.04–1.49
C7	Found a new faith	2.57	18	0.80	1.09	0.56–2.11	0.15	2.27	0.74–7.00
C8	Prayed to withstand or succeed	3.35	1	0.99	1.00	0.29–3.42	**0.00**	**0.17**	**0.05–0.60**
	Seeking social support (α = 0.78)								
C9	Talk to someone who could do something concrete about the problem	2.83	13	0.79	0.85	0.26–2.79	0.29	0.47	0.12–1.88
C10	Talk to someone to find out more about the situation	2.77	14	0.07	0.79	0.85–5.31	**0.04**	**0.29**	**0.09–0.93**
C11	Talk to someone about how I was feeling	2.62	16	0.16	2.15	0.75–6.20	0.35	2.69	0.34–21.30
	Confrontive coping (α = 0.69)								
C12	Expressed anger toward the person who caused the problem	2.05	22	0.26	1.45	0.75–2.79	0.49	1.41	0.53–3.77
C13	Tried to get the person responsible to change his or her mind	2.59	17	0.36	1.50	0.63–3.57	0.16	4.38	0.56–34.00
	Emotion-focused coping								
	Accept responsibility (α = 0.72)								
C14	Realised I had brought the problem on myself	2.11	21	**0.02**	**2.28**	**1.17–4.41**	0.47	0.72	0.30–1.76
C15	Criticised or lectured myself	2.84	11	0.66	1.23	0.49–3.13	0.23	3.51	0.45–27.45
C16	I made a promise to myself that things would be different next time	3.16	6	0.99	0.00	0.00	0.72	0.66	0.07–6.18
	Escape-Avoidance (α = 0.75)								
C17	Wished that the situation would go away or somehow be over	2.99	9	0.99	0.29	1.03–3.48	0.99	-	-
C18	I had fantasies about how things might turn out	2.83	12	0.25	1.76	0.67–4.62	0.99	-	-
C20	Tried to lose myself for a while by smoking	1.39	25	0.67	0.85	0.41–1.79	0.12	2.13	0.83–5.43
C21	Used alcohol to make myself feel better	1.35	26	0.18	1.66	0.79–3.46	0.22	1.79	0.71–4.53
C22	Tried to make myself feel better by eating	2.01	23	0.08	1.73	0.94–3.20	**0.01**	**4.06**	**1.33–12.42**
C23	Let my feelings out, like crying or venting my emotions	1.76	24	**0.00**	**2.69**	**1.44–4.99**	0.83	0.91	0.39–2.14

Table 4. *Cont.*

Code	Coping Strategies	Descriptive Statistics		Univariate Logistic Regression					
				Depression			Anxiety		
		Mean	R	*p*	OR	95% CI	*p*	OR	95% CI
	Self-controlling								
C19	Kept others from knowing how bad things were	2.43	20	0.25	1.59	0.73–3.46	0.80	1.16	0.37–3.66
	Distancing (α = 0.73)								
C24	Didn't let it get to me and refused to think about it too much	2.52	19	0.61	1.24	0.54–2.86	0.99	-	-
C25	Went on as if nothing had happened	2.75	15	0.99	1.00	0.41–2.46	0.19	3.94	0.51–30.68
C26	Made light of the situation and refused to get too serious about it	2.87	10	0.96	1.03	0.33–3.21	0.91	0.92	0.19–4.41

Note: Numbers in bold are significant; OR-Crude odds ratio; CI-Confidence interval; α = Cronbach's Alpha.

Table 5. Coping skills deduced based on Thematic Analysis.

Code	Coping Skills	Frequency	Percentage
	Problem-Focused Coping		
	Planful problem-solving		
C3	Made a plan of action and followed it	5	38.46
C2	Came out with a different solution to the problem	2	15.38
	Positive reappraisal		
C8	Prayed to withstand or succeed	8	61.54
C7	Explore other faith	3	23.08
	Seeking social support		
C11	Speak to someone about the problem	11	84.62
	Confrontive coping		
C12	Expressed anger toward the person who caused the problem	3	23.08
	Stress-reducing activity		
NC1	Take some rest	4	30.77
	Emotion-focused coping		
	Accept responsibility		
C16	I made a promise to myself that things would be different next	1	7.69
	Escape-Avoidance		
C22	Tried to make myself feel better by eating	3	23.08
NC2	Transfer aggression to my family (i.e., took it out on other people)	1	7.69
	Documents with code(s)	13	100.00
	Documents without code(s)	0	0.00
	Analysed documents	13	100.00

Note: NC = New coping skills identified.

Additionally, two coping skills, NC1 (take some rest) and NC2 (transfer aggression to my family), adopted by the interviewees, were deduced. NC1 corresponds to item 32 and NCS2 is synonymous with coping item 47 in the WCQ [70]. The interview discussion revealed that supervisors mostly employed problem-focused coping. This finding is similar to that deduced from the quantitative survey. Figure 2 illustrates the themes and some excerpts from the comments. With respect to C11, the discussions included speaking to their spouse or HR personnel about the stress.

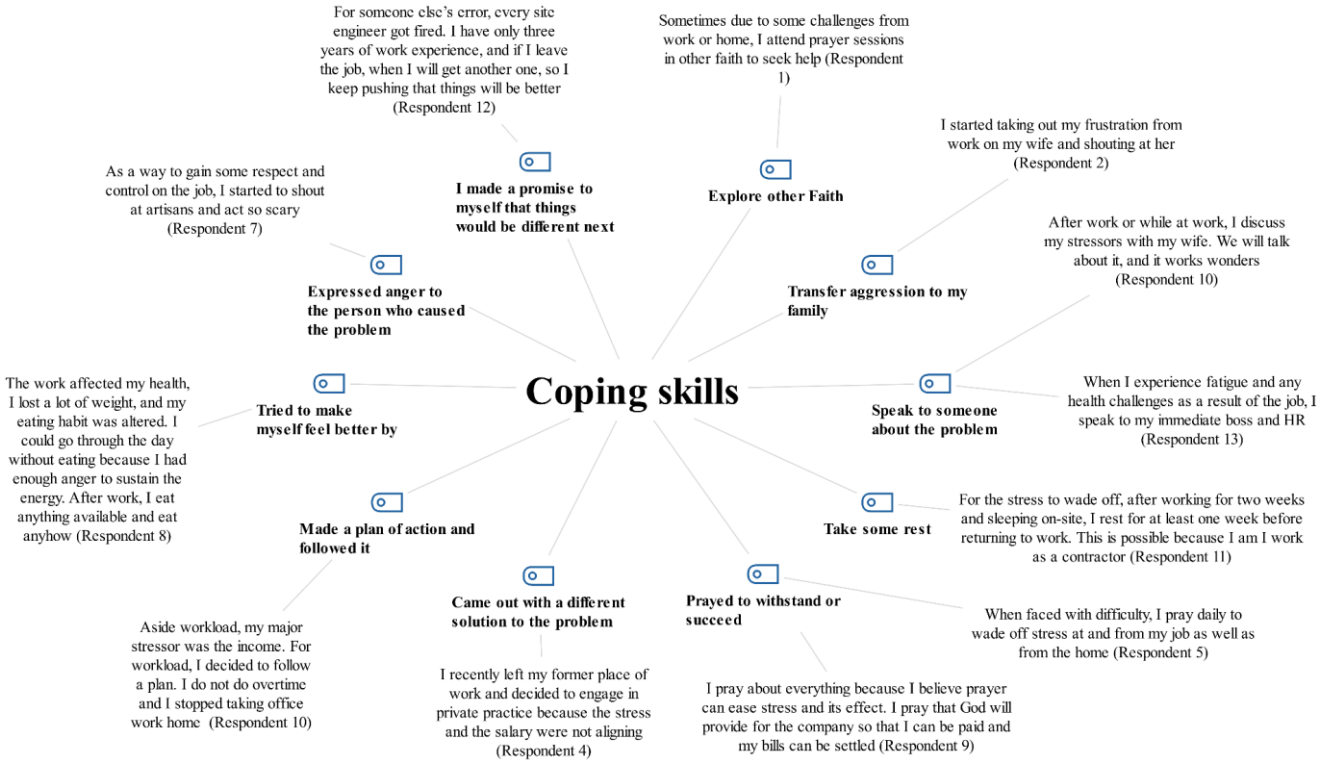

Figure 2. Coping skills employed by supervisors and some excerpts based on thematic analysis.

Using univariate logistic regression, it was gathered that PFC skills of *positive reappraisal* (OR = 0.17), *planful problem-solving* (OR = 0.09), and *seeking social support* (OR = 0.29) were significant predictors for reduced odds of anxiety symptoms (see Table 4). This indicates that supervisors who employ the PFC skills were only 0.09 times, 0.17 times, and 0.29 times likely to experience anxiety. As indicated in Table 4, *accepting responsibility* (OR = 2.28) and *avoidance coping skills* (OR = 2.69; OR = 4.06) were associated with elevated odds of anxiety and depression symptoms. Supervisors who employ emotion-focused coping strategies, especially *avoidance skills*, were 2.69 times and 4.06 times more likely to experience depression and anxiety symptoms, respectively, while those who employ *accepting responsibility skills* were 2.28 times more likely to experience anxiety. This result indicates that hypothesis H1 is supported. This implies that skills related to PFC are negatively associated with mental ill-health symptoms, while EFC strategies are positively related to mental ill-health symptoms.

3.6. Association between Individual Resilience, Coping Strategies and Mental Health

As indicated in Table 6, among supervisors with high resilience scores, the odds of employing *avoidance coping* (OR = 0.46) reduced, and the odds of employing *planful coping* (OR = 17.2) and *positive reappraisal* (OR = 20.09) increased. Resilience accounted for 22.6%, 3.5% and 20.4% variance in *planful problem-solving*, *avoidance strategies* and *positive reappraisal*. Resilience was positively associated with *positive reappraisal* and *planful coping*

and negatively associated with *avoidance coping strategies*. Thus, supporting Hypothesis H3. As shown in Table 6.

Table 6. Univariate association between individual resilience and coping strategies.

Resilience	Emotion-Focused			Problem-Focused					
	Escape-Avoidance			Planful Problem-Solving			Positive Reappraisal		
	p-Value	OR	95% CI	*p*-Value	OR	95% CI	*p*-Value	OR	95% CI
Low *									
High	**0.047**	**0.46**	**0.22, 0.99**	**0.01**	**17.21**	**2.06, 143.6**	**0.01**	**20.09**	**2.44, 165.0**
Overall model									
R → CP	R^2 = 0.035, 2 LI = 170.835			R^2 = 0.204, 2 LI = 53.478			R^2 = 0.226, 2 LI = 57.172		
CP → R	R^2 = 0.031, 2 LI = 213.255			R^2 = 0.089, 2 LI = 205.691			R^2 = 0.106, 2 LI = 203.446		

Note: * reference category; Numbers in bold are significant; OR-Crude odds ratio; CI-Confidence interval; R → CP = Resilience predicts coping strategy; CP → R = Coping strategy predicts resilience; Low = No resilience group; High = Resilient group.

Hypothesis H4 was not supported as it was deduced that resilience did not mediate the relationship between coping strategies and mental ill-health symptoms (e.g., see Table A3). On the other hand, hypothesis H5 was supported, given that the moderation ability of resilience was deduced for only one skill (i.e., CP1) related to PFC (see Tables 6 and A4). A significant interaction effect was deduced between resilience and *planful problem-solving* skill (CP1) in predicting anxiety (β = −3.26, se = 1.49, p = 0.03), indicating that resilience is a moderator. The interaction term between resilience and *planful coping* skill CP1 was found to account for a 19.9% variance in anxiety.

Since the interaction effect is negative (i.e., negative association), it implies that as the level of resilience increases, the use of *planful problem-solving* coping skill CP1 will mitigate anxiety. As shown in Table 7, At high levels of resilience (1), the relationship between *planful problem-solving* coping skill CP1 and anxiety was significant (β = −4.06, se = 1.15, p = 0.000). However, at low levels of resilience (0), the relationship between planful problem-solving coping skills and anxiety was insignificant (β = −0.80, se = 0.94, p = 0.396). The conditional effect shows that, at a high level of individual resilience, *planful problem-solving* coping skill (CP1) makes the supervisors experience less anxiety. To visualise the conditional effect of the coping strategy, a scatter plot of CP1 with anxiety by resilience was generated (see Figure 3).

Table 7. Testing the moderating effect of resilience in the coping process.

Model summary						
−2 LL	ModelLL	df	*p*	McFadden	CoxSnell	Nagelkrk
122.5892	20.6423	3.0000	0.0001	0.1441	0.1119	0.1994
	Coeff	se	z	*p*	LLCI	UPCI
Constant	−0.693	0.866	−0.800	0.424	−2.391	1.004
CP1	−0.799	0.941	−0.848	0.396	−2.644	1.047
Res	2.303	1.396	1.649	0.099	−0.434	5.040
Int_1	−3.258	1.486	−2.193	0.028	−6.170	−0.347
Likelihood ratio test(s) of highest order unconditional interactions(s):						
	Chi-sq	df	*p*			
X*W	5.7393	1.0000	0.0166			
Conditional effects of the focal predictor at values of the moderator(s):						
Res	Effect	se	Z	*p*	LLCI	ULCI
0.0000	−0.7985	0.9413	−0.8483	0.3963	−2.6435	1.0465
1.0000	−4.0566	1.1492	−3.5298	0.0004	−6.3091	−1.8042

Note: Dependent variable (Y) = Anxiety; Independent variable (X) = Planful coping skill (CP1); Moderator (W) = Resilience (Res). Int_1 (Interaction term): CP1 x Resilience.

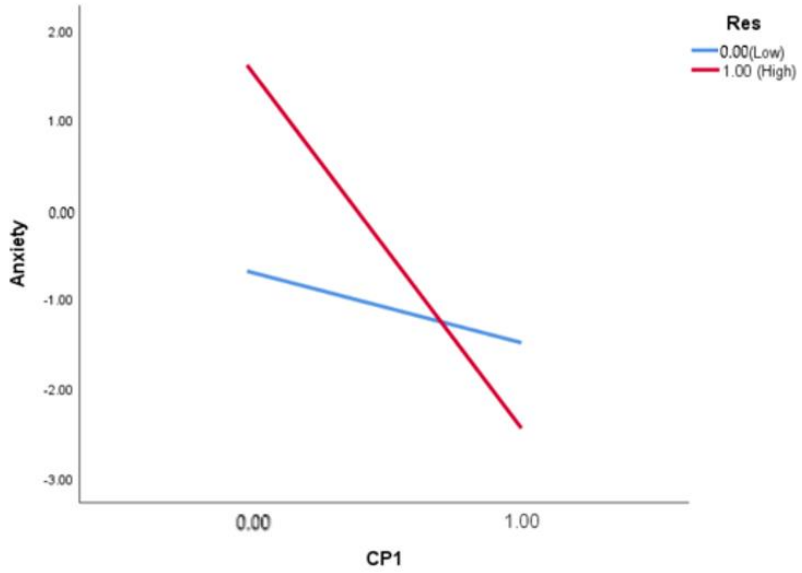

Figure 3. Moderating effect of resilience on the relationship between a planful coping skill (CP1) and anxiety.

Figure 3 shows that there is no association between CP1 and anxiety among supervisors with low levels of resilience. In contrast, there was a negative association between CP1 and anxiety among supervisors with high resilience, indicating that the *planful problem-solving* coping skill CP1 was associated with reduced anxiety.

3.7. Discussion

Figure 4 shows a schematic representation of the findings. Following the analysis, it was deduced that: (i) resilience and PFC strategies related to *positive reappraisal* and *planful problem-solving* skills mitigated the likelihood of supervisors experiencing mental ill-health by spurring positive stress response; (ii) resilience as a coping resource can directly or indirectly protect against suicidal ideation; (iii) resilience and coping strategies have a reciprocal relationship. Studies among nurses [17,36] and the Chinese Han population [55] have suggested that years of experience and gender predict anxiety, depression, or resilience. Contrary to those findings, this study found that demographic characteristics were not significantly associated with resilience and mental ill-health. The mean score of the PHQ-9, GAD-2, and BRS indicated that, on average, the construction supervisors' level of depression, anxiety, and resilience was within the mild range, minimal range, and normal level, respectively.

This study reflects a higher prevalence of depression than anxiety among the supervisors, consistent with the Nigerian population [49]. The result also extends Oladinrin, Adeniyi and Udi [21], which identified *depression and feeling of helplessness* and *worsening of existing anxiety*, respectively, as the second and ninth-ranking stress outcomes among construction professionals. This study showed that supervisors with depression and anxiety had some odds of experiencing suicidal ideation than those not experiencing mental ill-health symptoms. This reinforces that untreated mental ill-health symptoms are risk factors for suicidality [7,16]. This highlights the need to put in place primary and secondary intervention strategies that could help alleviate the onset of work-related stress and its adverse mental health effects. Such primary interventions should mitigate the onset of excessive stress, including strategies for job redesign, improving interpersonal relationships, and improving job control. The secondary interventions should be directed towards enhancing resilience and appropriate coping skills in order to help supervisors cope with stress effectively.

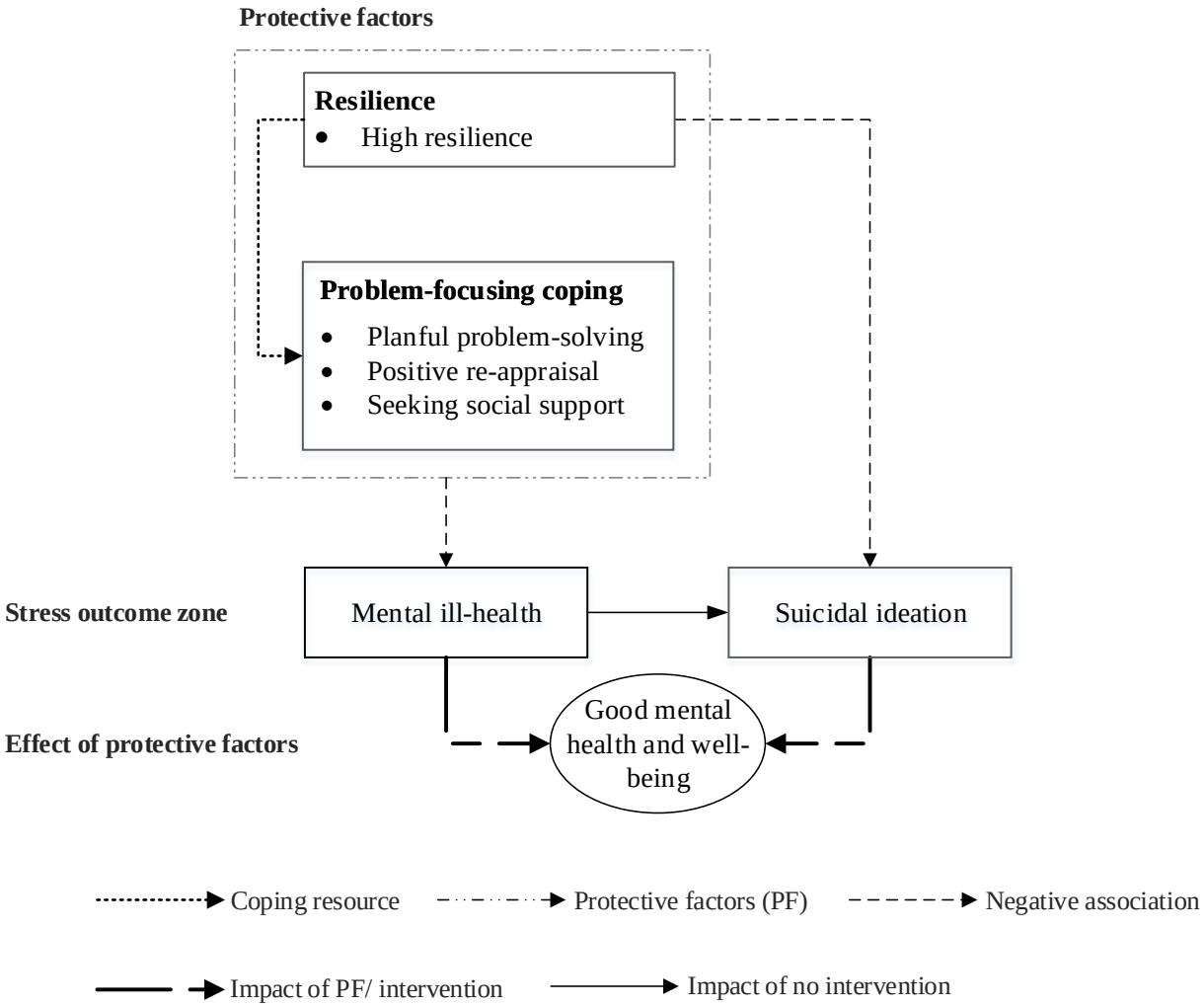

Figure 4. A schematic representation of the results.

The supervisors appeared to mostly employ problem-focused coping (PFC) strategies, mainly *positive reappraisal*, *planful problem-solving and seeking social support*. In contrast, the less frequently employed were related to EFC strategies, particularly *avoidance* coping skills. This aligns with Aitken and Crawford [71] that deduced that project managers adopted PFC rather than EFC strategies. This may be because the site managers viewed the stressors as challenges rather than threats and were determined to overcome them by taking appropriate actions. PFC strategies offered protection against anxiety, as supervisors who employed behaviours related to *seeking social support*, *positive reappraisal*, and *planful problem-solving* were less likely to experience anxiety than those who did not utilise the skills to cope with stress. On the contrary, EFC strategies acted as a risk factor for mental ill-health as supervisors who employed *avoidance* and *accepting responsibility* behaviours were more likely to experience anxiety or depression than others who did not. This finding supports hypothesis H1 and echoes studies [2,16] that found that adopting EFC strategies among construction professionals increased depression and anxiety, while PFC strategies reduced anxiety and depression.

Although accepting responsibility is an EFC strategy, Nakamura and Orth [72] opine that some of its skills have an adaptive ability because it precedes the use of PFC. Likewise, since PFC and EFC are often used interchangeably [28,70], while training programs must elucidate the importance of adopting PFC strategies, they should train supervisors on the proper use of certain EFC-coping strategies, such as accepting responsibility behaviours so as to tap into its adaptive ability in the stress-coping process. The supervisors adopted two

additional coping skills, a problem-focused coping skill and an emotion-focused coping skill. The PFC skill involves engaging in stress-reducing activities such as taking rest, while the EFC skill entails displacing anger (i.e., transferring aggression) caused by a stressor to another person. In other populations, particularly students [73] and nurses [74], taking rest has been identified as a coping strategy to deal with stress.

Overall, it was revealed that supervisors considered prayers a vital way to cope with stress and its health consequences. This may be due to the religious atmosphere in Nigeria. Religious coping strategies have been identified as a tool to deal with stress and the negative effects of life problems and illnesses [75]. Irrespective of religious affiliations, Nigerians are inclined to take religious coping as a means to confront challenges because of their belief in religion [75].

Resilience emerged as a protective factor against anxiety among the supervisors. As the level of individual resilience increased from normal to high, the supervisors were less likely than those with low resilience to experience anxiety symptoms. Although the resilience level was not significantly associated with depression or suicidal ideation, it was noticed that as the level of resilience increased from normal to high, the odds of experiencing depression or suicidal ideation reduced. This confirms that high resilience is associated with reduced mental ill-health [41]. Thus, supporting hypothesis H2.

Aligning with studies that found that PFC strategies and resilience coexist and are significantly related [14,42], this study deduced that coping strategies and resilience could predict each other. High resilience predicted increased use of coping skills related to *positive reappraisal*, *planful problem-solving*, and reduced use of *avoidance* coping skills. Therefore, fulfilling hypothesis H3. This echoes Wu, Yu, Wu, Wan, Wang and Lu [33] and Liang, Liu, Lu, Wu, Chien and Tsay [14], which showed that highly resilient persons would more likely use PFC strategies instead of escaping stress. Thus, it suggests that resilience-building should be essential in stress reduction and mental ill-health prevention interventions aimed at construction supervisors.

The study hypothesised that resilience would mediate and moderate the relationship between coping strategy and mental ill-health symptoms. This study contradicted previous literature e.g., ref. [42] that reported the mediation ability of resilience by deducing that resilience did act as a mediator. Therefore, hypothesis H4 was not fulfilled. However, resilience acted as a moderator in the case of a skill related to PFC strategy. Thus hypothesis (H5) was fulfilled in a *planful problem-solving* skill, as resilience heightened the negative relationship between *planful problem-solving* and anxiety. Specifically, among supervisors with high resilience, there is a negative association between *planful problem-solving* skill "CP1" and anxiety. This finding negates Li and Miller [41] predictions that although resilience will moderate the relationship between coping skills and anxiety, a stronger relationship between the coping strategy and anxiety will be observed among people with a low level of resilience. This study confirms that persons with a high level of resilience were more likely to gain more mental health benefits from adaptive strategies [35]. Thus, it highlights the need for mental health education and training investments to promote individual resilience and spur the effective use of PFC techniques.

4. Conclusions and Recommendations

This study examined the stress-coping process using a mixed methodology. It highlights the role of individual resilience and coping strategies as protective factors against stress outcomes related to mental health, particularly anxiety, depression, and suicidal ideation. Five hypotheses were tested and confirmed. As hypothesised, (i) PFC strategies reduced mental ill-health symptoms, and EFC strategies increased the symptoms; (ii) high resilience reduced mental ill-health symptoms and suicidal ideation; (iii) As resilience increased, the odds of using behaviours related to PFC increased, and those related to EFC strategies reduced; (iv) H4 was not supported while H5 was supported as resilience moderated the relationship between *planful problem-solving* coping skill and anxiety. Resilience and *planful problem-solving*, *positive reappraisal*, and *seeking social support* coping behaviours were

protective factors against anxiety. This study highlights resilience's protective (defensive) ability against depression and suicidal ideation. The commonly practised problem-focused coping skills by most supervisors include taking rest, praying, rediscovering what is important in life, and changing or growing as a person in a good way.

Although a reciprocal relationship exists between coping strategies and resilience, resilience accounts for more significant variance in coping strategy than otherwise, thus emerging as a strong predictor of mental health outcomes. Since individual resilience and the use of coping strategies are modifiable, intervention and prevention programs aimed at improving construction supervisors' mental health should be engaged. The intervention programme should focus on resilience building and nurturing the adoption of problem-focused coping strategies among supervisors, especially those with low resilience levels. The programme could begin by assessing the resilience level of construction personnel to identify those with low, normal, or high resilience, thereafter, engage the depth of training required for each group.

Intervention programs should include secondary and tertiary intervention strategies directed towards (i) practical skills to minimise identified stressors and adopt PFC strategies, (ii) mental health literacy, and (iii) addressing self and social network stigma that may arise due to seeking help. Construction organisations must implement tertiary intervention strategies such as employee assistance programs that can provide counselling. More importantly, education on resilience and coping strategies during mandatory continuous development programs (MCDP) in professional bodies and among undergraduate students training to be construction supervisors may help prevent an increase in mental ill-health in the construction industry. Individual resilience, *planful problem-solving*, *positive reappraisal*, and *seeking social support* coping behaviours were significant predictors of mental health.

This study has a few limitations; it investigated construction supervisors in Lagos State and the Federal Capital Territory (Abuja), Nigeria, which are the centres of industrialised building projects and may not reflect supervisors in other States. Therefore, the result may not offer generalisation but certainly helps inform on action points for designing effective interventions to improve mental health and safety among construction supervisors. Additionally, given a shortage in the literature on the subject, especially in Nigeria, it would draw attention to the role of resilience when evaluating effective stress-coping strategies among construction personnel. There was an uneven gender distribution in this study which could have negatively impacted the ability to tap into the impact of gender. Thus, future research should expand the scope of the study sampling. Although this study employed a self-reported questionnaire, which may be subjected to individual bias, the consistency of the result with previous studies indicates that the use of validated psychometric instruments strengthened the findings.

This study adds to the body of knowledge by using univariate logistic regression to gather information on the protective factors for mental health and highlights where to direct effective interventions. This study points out that resilience-building should be an integral part of any intervention in stress reduction and management in the construction industry.

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Appendix A

Table A1. The BRS Questionnaire.

BRS QUESTIONNAIRE					
Respond to Each Statement Below by Ticking One Answer Per Row	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
I tend to bounce back quickly after a hard time of stress	1	2	3	4	5
I have a hard time making it through stressful events	5	4	3	2	1
It does not take me long to recover from a stressful event	1	2	3	4	5
It is hard for me to snap back when something bad happens	5	4	3	2	1
I come through difficult times with little trouble	1	2	3	4	5
It tend to take a long time to get over setbacks in my life	5	4	3	2	1

Table A2. Correlation matrix between anxiety, depression, resilience and suicidal ideation.

Correlations						
			Suicidal Ideation	**Depression**	**Anxiety**	**Resilience**
Spearman's rho	Suicidal Ideation	Correlation Coefficient	1.000	0.301 **	0.326 **	−0.101
		Sig. (2-tailed)	.	0.000	0.000	0.187
		N	174	174	174	174
	Depression	Correlation Coefficient	0.301 **	1.000	0.239**	−0.172 *
		Sig. (2-tailed)	0.000	.	0.001	0.023
		N	174	174	174	174
	Anxiety	Correlation Coefficient	0.326 **	0.239 **	1.000	−0.160 *
		Sig. (2-tailed)	0.000	0.001	.	0.035
		N	174	174	174	174
	Resilience	Correlation Coefficient	−0.101	−0.172 *	−0.160 *	1.000
		Sig. (2-tailed)	0.187	0.023	0.035	.
		N	174	174	174	174

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

Table A3. Analysis result on the mediating effect of Resilience.

Run MATRIX procedure:
*************** PROCESS Procedure for SPSS Version 3.5.2 ***************
Written by Andrew F. Hayes, Ph.D. www.afhayes.com (accessed on 20 August 2022)
Documentation available in Hayes (2018). www.guilford.com/p/hayes3 (accessed on 20 August 2022)
****
Model : 4
Y : Alogit
X : nCP1
M : RES
Sample
Size: 174
****
OUTCOME VARIABLE:
RES
Model Summary
R R-sq MSE F df1 df2 p
0.1582 0.0250 0.5572 4.4127 1.0000 172.0000 0.0371
Model
coeff se t p LLCI ULCI
constant 1.5000 0.2155 6.9608 0.0000 1.0747 1.9253
nCP1 0.4691 0.2233 2.1006 0.0371 0.0283 0.9100
****
OUTCOME VARIABLE:
Alogit
Coding of binary Y for logistic regression analysis:
Alogit Analysis
0.00 0.00
1.00 1.00
Model Summary
-2LL ModelLL df p McFadden CoxSnell Nagelkrk
126.8091 16.4223 2.0000 0.0003 0.1147 0.0901 0.1606
Model
coeff se Z p LLCI ULCI
constant 1.1162 0.7776 1.4355 0.1512 −0.4078 2.6402
nCP1 −2.2378 0.6461 −3.4639 0.0005 −3.5041 −0.9716
RES −0.5161 0.3326 −1.5516 0.1208 −1.1680 0.1358

Note: Dependent variable (Y) = Alogit represents Anxiety; Independent variable (X) = nCP1 represents CP1; M = RES represents Resilience count (1, 2, 3) {where 1 = low Resilience, 2 = normal resilience, 3 = high resilience).

Table A4. Analysis result on the moderating effect of Resilience.

Run MATRIX procedure:
*************** PROCESS Procedure for SPSS Version 3.5.2 ***************
Written by Andrew F. Hayes, Ph.D. www.afhayes.com (accessed on 20 August 2022)
Documentation available in Hayes (2018). www.guilford.com/p/hayes3 (accessed on 20 August 2022)
****
Model : 1
Y : Alogit
X : nCP1
W : DicotRES
Sample
Size: 174
****
OUTCOME VARIABLE:
Alogit
Coding of binary Y for logistic regression analysis:
Alogit Analysis
0.00 0.00
1.00 1.00
Model Summary
-2LL ModelLL df p McFadden CoxSnell Nagelkrk
122.5892 20.6423 3.0000 0.0001 0.1441 0.1119 0.1994
Model
coeff se Z p LLCI ULCI
constant −0.6931 0.8660 −0.8004 0.4235 −2.3905 1.0042
nCP1 −0.7985 0.9413 −0.8483 0.3963 −2.6435 1.0465
DicotRES 2.3026 1.3964 1.6489 0.0992 −0.4344 5.0395
Int_1 −3.2581 1.4855 −2.1932 0.0283 −6.1697 −0.3465
These results are expressed in a log-odds metric.
Product terms key:
Int_1 : nCP1 x DicotRES
Likelihood ratio test(s) of highest order
unconditional interactions(s):
Chi-sq df p
X*W 5.7393 1.0000 0.0166
———
Focal predict: nCP1 (X)
Mod var: DicotRES (W)
Conditional effects of the focal predictor at values of the moderator(s):
DicotRES Effect se Z p LLCI ULCI
0.0000 −0.7985 0.9413 −0.8483 0.3963 −2.6435 1.0465
1.0000 −4.0566 1.1492 −3.5298 0.0004 −6.3091 −1.8042
Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.
—— END MATRIX ——

Note: Dependent variable (Y) = Alogit represents Anxiety; Independent variable (X) = nCP1 represents CP1; Moderator (W) = DicotRES represents Resilience.

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