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1 **Personal Resilience and Coping Behavior as Protective Factors for Mental Health among**  
 2 **Construction Tradesmen**

3 **Abstract**

4 **Purpose** - Construction tradesmen are exposed to high levels of stress that can worsen mental  
 5 health, negatively impacting safety compliance, and organization productivity. Hence, effectively  
 6 coping with stress to prevent mental ill-health becomes an essential point of reference. Thus, this  
 7 study aims to examine the role of factors like resilience and coping strategies in protecting  
 8 tradesmen against mental ill-health.

9 **Design/methodology/approach**- Using a cross-sectional survey design, 110 tradesmen from 65  
 10 construction companies were surveyed using the Patient Health Questionnaire (PHQ), Generalized  
 11 Anxiety Disorder (GAD), Brief Resilience Scale (BRS), and Ways of Coping Questionnaire  
 12 (WCQ).

13 **Findings**- The results were analyzed using descriptive statistics and logistic regression analysis.  
 14 With a 74.5%, 36.4%, and 14.6% prevalence rate of self-reported depression, anxiety, and suicide  
 15 ideation among the tradesmen, only positive reappraisal, accepting responsibility coping  
 16 behaviors, and resilience would mitigate the likelihood of developing mental ill-health symptoms.

17 **Originality/value**- This study has extended existing literature by providing information vital to  
 18 building interventions to deal with stressors effectively. This information would benefit  
 19 individuals, organizations, and the economy and equip policymakers with deeper knowledge base  
 20 towards improving mental health.

21 **Keywords:** Stress; Anxiety; Depression; Resilience; Coping; Construction Industry.

22

23

24 **1. Introduction**

25 Research interest in mental health and coping in the construction industry is growing. The  
26 construction industry's production activities are isolated, repetitive, strenuous, involve working  
27 long hours, work-related injuries, and musculoskeletal pain (Roche et al., 2016; Deady et al.,  
28 2018). Thus, making construction tradesmen a vulnerable group for a heightened level of stress  
29 and related mental ill-health. Work stress is a problem for both individuals and organizations  
30 (Hannigan et al., 2004). Its effect has been evidenced in the construction industry of some  
31 developed countries e.g., Australia, USA, and the UK, as they suffered actual suicide rates 2 times,  
32 4.25 times and 3.7 times respectively above the general population (see Milner et al., 2014; Burki,  
33 2018; Peterson et al., 2018).

34 Although the work setting has been proven to be a risk factor for mental ill-health and  
35 suicide (Tsaras et al., 2018), non-work-related factors are also risk factors. These non-work factors,  
36 when carried to the workplace, worsens perceived stress and related mental ill-health. The stress  
37 caused in any aspect of the tradesmen's lives (work or non-work) spills over to the other aspect in  
38 setting up a vicious cycle, thereby worsening mental health and well-being (Michie, 2002).  
39 Interestingly, the workplace has proved to be an ideal place for mental ill-health prevention  
40 programs because 60% of the world's population is engaged in some form of employment, depend  
41 on good health to function properly, and spends two-thirds of their day at the workplace (Tan et  
42 al., 2014).

43 Irrespective of the stress that a person is exposed to, coping with stress is important in  
44 mitigating mental ill-health. In addition, emotional and physical stress symptoms impair  
45 construction workers' safety compliance (Liang et al., 2021). Thus, understanding how tradesmen  
46 cope with work-related stress and personal resources that can assist with the coping process, is an

47 important workplace strategy for building interventions to achieve improved health, performance,  
48 safety compliance, and organizational productivity (Tsaras et al., 2018). Resilience is a personal  
49 resource that can protect against mental ill-health, as it has been proven to relate inversely to  
50 mental ill-health symptoms in several populations. Unlike coping behaviors, which are short-  
51 termed and depend on personal resources, resilience is itself a personal resource and an extensive  
52 process that predicts the use of coping strategy (Rabenu and Yaniv, 2017). Individuals with high-  
53 resilience engage positive emotions, less than negative coping strategies to cope with stress and  
54 related outcomes over time (Rabenu et al., 2017). For instance, it is speculated that approach-  
55 coping behaviors are positively associated with resilience, while low resilience is associated with  
56 avoidance coping techniques (Rabenu and Yaniv, 2017).

57 In the construction industry, there has been a number of research on comprehensive stress  
58 and mental health. However, only a few of the studies focused on the protective factors of mental  
59 health among tradesmen (Lim et al., 2017; Langdon and Sawang, 2018; Liang et al., 2018). The  
60 studies focused on mental ill-health symptoms related coping behaviors and workplace stressors  
61 related coping behaviors. Thus, a gap still exists on the role of personal resources such as resilience  
62 in the stress-coping process, leading to a call for studies to consider a combination of protective  
63 factors to inform better interventions that best fit the construction workforce (Chan et al., 2020).  
64 Based on the preceding, this study is aimed at deducing protective factors for mental health among  
65 construction tradesmen in Nigeria. In order to achieve this aim, the specific objectives are to (i)  
66 determine the coping strategies employed by the tradesmen; (ii) determine the level of resilience  
67 among construction tradesmen; (iii) determine the relationship between coping strategies,  
68 resilience, and mental health.

69           This study will contribute to the existing knowledge in three ways: (i) it will add to  
70 knowledge on the state of the mental health of construction tradesmen; (ii) the effect of resilience  
71 and coping strategies on reducing the risk of developing mental ill-health; and (iii) it informs on  
72 appropriate target points for adequate application of primary and secondary interventions in  
73 dealing with the stress among tradesmen.

## 74   **2.     Literature review**

### 75    2.1    *Statement of the problem*

76 Although there have been studies on stress-coping in the construction industry, only a few  
77 considered tradesmen (Lim et al., 2017; Langdon and Sawang, 2018; Liang et al., 2018). Those on  
78 tradesmen considered only coping behaviors as a protective factor for mental health problems.  
79 This study focuses on the literature related to tradesmen because, as opined by Lazarus and  
80 Folkman (1987), the strategies for coping with work-related encounters vary between professions.  
81 Thus, strategies employed by construction professionals may be very different from those of  
82 tradesmen. Langdon and Sawang (2018), using the Brief Coping Inventory (BCI), deduced that in  
83 the face of stress, tradesmen in Australia mostly adopted maladaptive coping (particularly self-  
84 blame), while substance abuse appeared to relieve anxiety.

85           Although Langdon and Sawang (2018) determined the association between coping  
86 behaviors as a protective factor for mental ill-health symptoms (e.g., anxiety and depression), the  
87 study did not consider the role of resilience in the stress-coping process. Additionally, the use of  
88 the BCI scale may have impacted the findings as Langdon and Sawang (2017) noted that the  
89 inconsistency of their result with previous studies might have been influenced by the BCI  
90 questions' inability to tap into some coping construct properly. For example, the authors noted that  
91 the BCI acceptance coping responses read as "*accepting this happened*" and "*learning to live with*

92 *it,*" which may have translated to a defeat to the respondents and resulted in inadequate responses.  
93 Therefore, Langdon and Sawang (2018) recommended investigating WCQ when researching  
94 coping strategies among construction personnel.

95 Liang et al. (2018), using a qualitative technique, found that construction tradesmen in  
96 Hong Kong adopted mostly emotion-focused coping styles (such as alcohol consumption,  
97 smoking, and expressing negative feelings) when dealing with work-related stress. Lim et al.  
98 (2017) reported that construction tradesmen in Korea used more adaptive coping strategies  
99 (consisting of problem-focused coping, social support coping styles) than maladaptive coping  
100 strategies when dealing with work-related stress. Notwithstanding, Liang et al. (2018) and Lim et  
101 al. (2017) did not determine the role of resilience or the interaction of coping as a protective factor  
102 against mental ill-health symptoms (e.g., anxiety and depression).

103 Additionally, none of the studies examined the interaction between resilience and coping  
104 behaviors with mental ill-health; neither were they conducted in the context of a low-income  
105 country like Nigeria. Information from a low-income country, especially Africa's most populous  
106 country, would influence decision-making that will benefit individuals and organizations in similar  
107 contexts as well as high-income economies. The study extends existing study by applying logistic  
108 regression, the most widely used statistical analysis in occupational psychology, to determine the  
109 odds of being protected against a mental ill-health symptom based on one or more predictors.

110 In developing strategies to prevent and cure psychological distress (depression, anxiety,  
111 and stress) to enable people to overcome difficult situations, essential factors to consider are  
112 resilience and coping behaviors (Scuri et al., 2019). Therefore, this study expanded the existing  
113 body of knowledge by examining mental ill-health symptoms and their protective factors among  
114 construction tradesmen. This would provide information requisite in tailoring intervention

115 resources for good mental health, such as the coping strategies that need to be reinforced or learned  
116 and efforts required to build individual resilience among construction tradesmen.

117

## 118 2.2 *Explanation of terms and conceptual model*

119 Before discussing resilience and coping strategies, the concept of stress-coping is discussed.  
120 Lazarus and Folkman's transactional theory of stress and coping is vital to this study (Folkman,  
121 1997; Lazarus and Folkman, 1984). Although there is presently no generalized definition of stress,  
122 Lazarus and Folkman (1984, p. 19) defined stress as a "situation in which internal demands,  
123 external demands, or both, are appraised as taxing or exceeding the adaptive resources of an  
124 individual or group." The theory further asserted that stress initiates coping behavior to adapt,  
125 manage emotions, or directly address the stressor (Biggs et al., 2017). In which case, coping with  
126 stress entails a continuous change in cognitive and behavioral efforts to manage demands  
127 considered taxing or exceeding a person's resources (Biggs et al., 2017).

### 128 2.2.1 *Coping strategies*

129 Coping strategies refer to the behaviors employed to deal with the psychological impact of stress  
130 and subsequent physical and performance outcome (Folkman et al. 1986). Coping strategies or  
131 mechanisms refer to the categories employed to classify how people react to mental health  
132 problems (Rabenu and Yaniv, 2017). They comprise cognitive and problem-solving behaviors that  
133 people use to withstand, reduce, or remove stress and associated mental ill-health (Bowen et al.,  
134 2014a). According to Folkman et al. (1986), coping strategies serve two primary functions,  
135 namely: (i) to regulate stressful emotions and (ii) to alter the distress causing a person-environment  
136 relationship. Coping strategies either directly manage a stressor or cluster of stressors in which  
137 case called problem-focused strategies, or regulate emotions that arise as a consequence of the

138 stressful situation, thus referred to as emotion-focused strategies (Lazarus and Folkman, 1984;  
139 Biggs et al. 2017). Emotion-focused behaviors include accepting responsibility, avoidance, self-  
140 controlling, and distancing.

141           Problem-focused coping is adaptive in nature and behavioral, involving a person taking  
142 positive efforts to assess and solve the problem using a logical manner. Emotion-focused coping  
143 is maladaptive, involving cognitive strategies to reduce psychological distress (Lazarus and  
144 Folkman, 1984). Emotion-focused is described as maladaptive or escapist because the effect is  
145 temporary and does not entirely solve the stress (Bowen et al. 2014a; Langdon et al. 2018).  
146 However, the effectiveness of coping is determined by fit and context because it depends on how  
147 appropriately it corresponds with appraisals and specific conditions (Biggs et al., 2017). Problem-  
148 focused behaviors consist of plan problem solving, positive reappraisal, seeking social support,  
149 and confrontive coping.

150           *Confrontive coping* eliminate the stressor by engaging aggressive, hostile, and risk-taking  
151 efforts to alter the situation; *seeking social support* includes actions relating to seeking  
152 informational support, sympathy, tangible and emotional support; *planful problem-solving*  
153 describes deliberate problem-focused efforts to alter the situation, coupled with an analytic  
154 approach to solving the problem; *positive reappraisal (problem reappraisal)* includes efforts to  
155 create positive meaning by focusing on personal growth, it also has a religious tone (Folkman et  
156 al., 1986). *Distancing* provides for efforts to detach oneself from a situation by making light of the  
157 situation to create a positive outlook; *self-controlling* includes efforts employed to regulate one's  
158 feelings and actions; *accepting responsibility* involves acknowledging one's role in the problem,  
159 with following by effort to put things right; *avoidance* involves wishful thinking and efforts to  
160 escape or avoid the situation (Folkman et al., 1986).

161 *2.2.1 Individual Resilience*

162 When evaluating protection and risk factors, it is expedient to consider resilience, a personal  
163 resource generally associated with low psychological distress (Scuri et al., 2019). According to  
164 Wu et al. (2018), resilience is a "dynamic process of maintaining positive adaptation and effective  
165 coping strategies in the face of stressful events." Resilience is a coping resource and an antecedent  
166 to a coping strategy (Taylor and Stanton, 2007). Individual resilience is a positive psychological  
167 capacity for performance improvement related to higher coping abilities (Rabenu et al., 2017). It  
168 is emphasized to reduce conflict-related outcomes and improve safety on construction sites. (Chen  
169 et al., 2017b). Individuals can effectively deal with non-modifiable stressors using resilience to  
170 strengthen mental health (Cooper and Cartwright, 1997; Ren et al., 2018). Although resilience can  
171 be a personality trait, it can be learned over a period or influenced by the environment (Cohn et  
172 al., 2009; Hornor, 2017; Wu et al., 2018).

173 *2.3 Conceptual model*

174 Based on the above literature review, a conceptual model was proposed to explain the hypothesized  
175 relationships between personal resilience, coping behaviors (problem-focused and emotion-  
176 focused), and mental ill-health symptoms (anxiety and depression) (see Fig. 1). It hypothesizes  
177 that: 1) individual resilience influences coping strategies among construction tradesmen, thereby  
178 eliminating mental ill-health; 2) coping behaviors can directly affect the mental health; and 3)  
179 resilience can directly affect the mental health of construction tradesmen. Categorically, it is  
180 expected that: (1) resilience would be negatively associated with the PHQ-9 and GAD-2 score, (2)  
181 Problem-focused coping strategies would be negatively associated with the PHQ-9 and GAD-2  
182 score, while the emotion-focused coping strategies would be positively associated with the PHQ-  
183 9 and GAD-2 score.



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*Insert Fig. 1*

### **3. Methodology**

The positivist philosophy was employed in this study to examine the mental health of tradesmen and determine the protective factors of mental health (Creswell, 2009). Therefore, a survey, which will involve validated psychometric instruments, was deemed appropriate for the study.

#### *3.1 Research instruments*

The questionnaire was divided into three parts: Part A- elicited demographic features, Part B- mental health status, and Part C- the coping strategies and resilience. Part B and C consisted of validated psychometric instruments, namely PHQ-9, GAD-2, WCQ, and BRS. The scales were employed for this study because they are the most popularly used among the Nigerian population (Obadeji et al., 2015; Adewuya et al., 2018).

##### *3.1.1 Patient Health Questionnaire-9 (PHQ-9)*

The PHQ-9 is an assessment tool used for diagnosing depression and its severity (Arroll et al., 2010). The tool is a brief measure, containing only nine questions facilitating its use in busy settings. The PHQ-9 enables an understanding of suicide ideation, as it includes an item (i.e., item 9) about suicidal ideation: "thoughts of being better off dead and active ideas of self-harm" (Tomitaka et al., 2018). Using a two-week recall period, the response options on the PHQ-9 are 0 = "not at all", 1 = "several days", 2 = "more than half the days" and 3 = "nearly every day". The total score ranged from 0 to 27, with a higher score indicating greater self-reported depression. The PHQ-9 uses cut-off point;  $\leq 4$  (minimal), 5 (mild), 10 (moderate), 15 (moderately severe), 20 (severe depression) (Li et al., 2017). A total score of 5-9 indicates minor depression, while  $\geq 10$  indicates major depression (Adewuya et al., 2018; Choi et al., 2020).

### 207 3.1.2 *Generalized Anxiety Disorder-2 (GAD-2)*

208 GAD-2 is an assessment tool used to assess clinically significant anxiety symptoms (Hughes et al.,  
209 2018). Using a two-week recall period, the response options on the GAD-2 are: 0 = "not at all", 1  
210 = "several days", 2 = "more than half the days", and 3 = "nearly every day". The total score ranged  
211 from 0 to 6, with a higher score indicating greater self-reported anxiety. For the GAD-2, a total  
212 score of  $\geq 3$  indicates anxiety (Hughes et al., 2018).

### 213 3.1.3 *Brief Resilience Scale (BRS)*

214 The Brief Resilience Scale (BRS) measures recovery. The scale shows excellent reliability and an  
215 intraclass correlation coefficient (Rodríguez-Rey et al., 2016). It contains a six-point scale, scored  
216 by reverse coding with three positively and negatively worded items. Questions two, four, and six  
217 are reverse coded to indicate pessimism, while questions one, three, and five are positively coded,  
218 indicating positivism. The response options on the BRS are: "strongly disagree" = 1, "disagree" =  
219 2, "neutral agree" = 3, "strongly" = 4, "agree" = 5. The BRS employs cut-off points ranging from  
220 1.00 to 5.00, where 1.00 to 2.99 shows low resilience, normal resilience ranges from 3.00 to 4.30,  
221 and 4.31 to 5.00 indicates high resilience (Smith et al., 2013).

### 222 3.1.4 *Coping strategies instrument*

223 The questions on coping strategies were developed by adapting the WCQ based on a review of  
224 prior studies (Leung et al., 2016; Liang et al., 2018). The respondents were required to indicate the  
225 extent to which they employed each coping measure in the face of a stressor on a four-point Likert  
226 scale: 1 = "never", 2 = "very little", 3 = "moderately", and 4 = "very great".

### 227 3.1.5 *Face and Content Validity*

228 A face and content validity involving four experts was conducted on the draft questionnaire using  
229 a two-stage review process. The experts consisted of two occupational health psychologists and

230 two construction professionals (i.e., an Associate Professor and a Professor), with numerous  
 231 publications in the field of study. A draft copy of the questionnaire was sent to the construction  
 232 professionals, and based on their feedback, an improved draft was developed. The draft was sent  
 233 to another panel consisting of two occupational health psychologists. Upon final approval, the  
 234 questionnaire was pilot tested among eighteen construction tradesmen. The tradesmen were asked  
 235 to comment on their understanding of the questions. All participants indicated their understanding  
 236 of the content and the time taken to respond to the questions.

237 *3.2 Sample Size*

238 The formula for sample size given by Cochran (1977), cited in Sunindijo and Kamardeen (2017),  
 239 was used to arrive at the sample size since the number of tradesmen is unknown.

240 Sample size,  $n = \frac{(t)^2 \times (s)^2}{d^2}$  ..... Equation (1)

241  $n =$  Sample size

242  $t =$  1.96 (i.e., confidence level based on the value of the selected alpha level in each tail)

243  $s =$  estimate of variance deviation of the 4-point Likert scale used

244  $d =$  margin of error for the estimated mean (i.e., number of points on the 4-point Likert scale =  
 245 4; multiplied by the acceptable margin of error = 5%).

246 According to Bartlett et al. (2001), the "s" equals the number of points on the scale, which is 4,  
 247 divided by the number of standard deviation (in this scale equals 4), being two to each side of the  
 248 midpoint of the range). Upon the division, the value of "s" equals 1. Therefore, it was deduced that  
 249 a minimum of 96 tradesmen should be sampled (see Equation 2).

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

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### 253 3.3 Data collection

254 The questionnaires were delivered by hand to purposively recruited construction tradesmen on 65  
255 construction sites in Abuja and Lagos, Nigeria. In total, 453 copies of the questionnaires were  
256 administered to the respondents. Purposive sampling was adopted for some reasons: (i) to ensure  
257 that only skilled workers engaged by a structured construction firm were being surveyed, (ii) to  
258 ensure that respondents came from a variety of construction firms registered with the Federation  
259 of Construction Industry (FOCI), Nigeria, and (3) to preserve the quality of data collected and  
260 findings (Teddle and Yu, 2007).

### 261 3.4 Statistical analysis

262 Descriptive statistics (mean score, frequency, Chi-square, or Fisher's exact test) and logistic  
263 regression (univariate and multiple) were used to analyze the data. The analyses were performed  
264 using the Statistical Package for Social Sciences (SPSS) version 20.0. For the mental ill-health  
265 symptoms, the respondents were classified into two groups: *depression versus no depression*,  
266 *anxiety versus no anxiety*, and *suicidal ideation versus no suicidal ideation* (Li et al., 2017). PHQ-  
267 9 score  $\geq 5$  was used to categorize participants as "*with depression*," GAD-2 score  $\geq 3$  was  
268 categorized as "*with anxiety*." An answer indicating "an experience" to the ninth item of the PHQ-  
269 9 was classified as "*with suicidal ideation*." BRS score  $\geq 4.31$ , 3.00-4.30, 1.00-2.99 were used to  
270 categorize participants as "high resilience, normal resilience, and low resilience", GAD-2 score  $\geq$   
271 3 was categorized as "*with anxiety*." Descriptive statistics were used to analyze the respondents'  
272 demographic characteristics, the prevalence of depression, anxiety, and suicide ideation.

273 Chi-square tests ( $\chi^2$ ) or Fisher's exact test were used to explore the statistical significance  
274 of the differences in the distribution of demographic characteristics for each mental ill-health  
275 symptom groups. A posthoc test for a significant difference between demographic characteristics

276 and mental ill-health was done using Bonferroni correction (Li et al., 2017). During the Chi-square  
277 or Fisher's test, in a situation when the expected number of frequencies in a cell is fewer than five,  
278 the Fisher exact test is recorded (Kroonenberg and Verbeek, 2018). Logistic regression is used for  
279 evaluating the probability of an occurrence (Park, 2013). Univariate logistic regression analysis is  
280 appropriate for modeling an independent variable's effect on a dependent variable, e.g., to indicate  
281 where to aim potential effective interventions. Thereafter, multivariate logistic regression was used  
282 to construct a multivariate model. In contrast, multivariate analysis (e.g., multiple logistic  
283 regression) models the influence of a set of independent variables on a dependent variable (Park,  
284 2013).

285         The logistic regression began with univariate analysis to determine the association between  
286 the stressors and mental ill-health symptoms. Using a cut-off value of  $p < 0.25$  as recommended by  
287 Bursac et al. (2008) and Cheung and Yip (2015), all independent variables with a p-value of less  
288 than 0.25 in the univariate analysis were selected as a candidate for the multiple logistic regression.  
289 The multivariate logistic regression models were used to explore the cluster of coping strategies  
290 and resilience that protect against depression and anxiety. The multivariate logistic regression  
291 analysis began by using forward likelihood ratio (LR) to estimate the relationship between the  
292 independent variables (resilience and coping strategies) and the dependent variables (mental ill-  
293 health symptoms). Afterwards, the significant variables were combined in the final model and  
294 analyzed using the 'enter' method. Hosmer-Lemeshow test at  $p > 0.05$  was used to analyze the  
295 goodness fit of the multiple logistic regression model (Hosmer and Lemeshow, 1980; Choi et al.,  
296 2020). The SPSS statistical package 20.0 was used to perform all the analyses.

297         For dichotomous coding in the logistic regression, the response was coded as follows:

298 (i) For depression or anxiety symptoms, 0 = "not at all" was coded as 0, while 1 = "several days,"  
299 2 = "more than half the days," and 3 = "nearly every day" were combined and coded as 1.  
300 (ii) For coping strategies, "strongly disagree" = 1 was coded as 0 (i.e., No), while, 2 = "very little",  
301 3 = "moderately", and 4 = "very great" were combined and coded as 1 (i.e., Yes).

## 302 **4. Results**

### 303 *4.1 Profile of the respondents*

304 A total of 483 questionnaires was distributed to tradesmen through their site supervisors, out of  
305 which 110 duly filled questionnaires were retrieved, yielding a 24.3% response rate (see Table 1).  
306 All the tradesmen were fit to provide reliable information for the study as they have more than 10  
307 years of working experience and holding at least a secondary school leaving certificate.

### 308 *4.2 Mental ill-health symptoms among the participants*

309 The majority of the participants, 82 (74.5%), had depression; out of those experiencing depressive  
310 symptoms, 16 (14.6%) had suicidal ideation (see Table 1). The prevalence rate of mild depression  
311 (PHQ-9 score 5–9) was 63 (57.3%), 14 (12.7%) for moderate depression (PHQ-9 score 10–14),  
312 and 5 (4.5%) for moderately severe depression (PHQ-9 score 15-19). Item response revealed that  
313 6 (5.5%) of the study population had suicidal ideation for several days in two weeks, while 10  
314 (9.1%) experienced suicidal ideation for more than half the days in two weeks. Using GAD2, the  
315 prevalence rate of none-minimal anxiety (GAD-2 score 0–2) was 70 (63.6%), and 40 (36.4%) for  
316 anxiety (GAD-2 score  $\geq 3$ ). The BRS revealed that 20 (18.2%) had low resilience (BRS score 1.00-  
317 2.99), 66 (60.0%) normal resilience (BRS score 3.00 - 4.30), and 24 (21.8%) high resilience (BRS  
318 score 4.31 - 5.00).

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321 4.3 *Related demographic variables associated with resilience, depression, and anxiety*

322 The Chi-square or Fisher test revealed a statistically significant relationship between the two  
323 demographic factors (years of experience, education level) and resilience (see Table 2). The  
324 preliminary bivariate analysis revealed that the level of resilience is associated with mental health  
325 status. Tradesmen with normal and high levels of resilience were less likely to be anxious or  
326 depressive. There existed a statistic difference between resilience and depression ( $\chi^2 = 9.77$ ,  $p =$   
327  $0.01$ ), anxiety ( $\chi^2 = 18.02$ ,  $p = 0.00$ ), and suicide ( $\chi^2 = 8.33$ ,  $p = 0.01$ ) with a significant difference  
328 between the groups. The posthoc test revealed the difference between groups. As regards anxiety,  
329 tradesmen with high resilience and normal resilience were significantly different ( $\chi^2 = 17.64$ ,  $p =$   
330  $0.000$ ;  $\chi^2 = 10.24$ ,  $p = 0.006$ ) compared to low resilience. Likewise, for depression, high resilience  
331 was significantly different ( $\chi^2 = 9.61$ ,  $p = 0.008$ ) compared to normal and low resilience. Fisher's  
332 test and correlation analysis ( $r = -0.27$ ,  $p = 0.01$ ) revealed that as the level of resilience increased,  
333 the likelihood of suicide ideation reduced (see Table 1 and 2).

334 *Insert Table 1*

335 There existed statistical differences between years of experience ( $\chi^2 = 14.74$ ,  $p = 0.02$ ), level of  
336 education ( $\chi^2 = 15.51$ ,  $p = 0.01$ ), and resilience, with no significant difference between each of the  
337 groups (Table 2). Regarding mental health status, there is a statistical difference between  
338 depression ( $\chi^2 = 24.76$ ,  $p = 0.00$ ), anxiety ( $\chi^2 = 22.49$ ,  $p = 0.00$ ), and years of experience with a  
339 significant difference between the groups. Tradesmen with work experience less than 20 years ( $p$   
340  $= 0.000$ ) were more likely to have depressive symptoms. In contrast, younger tradesmen with less  
341 than 15 years of work experience ( $p = 0.001$ ) and older tradesmen with more than 25 years ( $p =$   
342  $0.002$ ) were likely to have anxiety symptoms.

343 *Insert Table 2*

344 4.4 *Mean scores of coping strategies adopted by the tradesmen*

345 The majority of the coping strategies had a minimum mean value of 2.00 on a 4-point Likert scale  
346 (see Table 3). The top five coping strategies employed by the tradesmen include: *came out of the*  
347 *experience better than when I went in, prayed to withstand or succeed, talked to someone to find*  
348 *out more about the situation, knew what had to be done, so I doubled my efforts, made a promise*  
349 *to myself that things would be different next time* ranked with mean scores of 3.33, 3.25, 3.25, 3.24,  
350 3.20 respectively. These topmost ranking strategies are forms of problem-focused coping  
351 strategies. The least ranked coping strategies were *"tried to lose myself for a while by smoking*  
352 *cigarettes"* and *"consumption of cannabis to ease stress"* with a mean of 1.71 and 1.36,  
353 respectively.

354 *Insert Table 3*

355 4.5 *Univariate analysis of resilience and coping strategy on mental health*

356 The simple logistic regression analysis revealed that individual resilience (COR = 0.25, 95% CI:  
357 0.06-0.97) was significantly associated with reduced odds of depression (see Table 4). In the  
358 analysis, problem-focused forms of coping, such as positive reappraisal strategy like *"came out of*  
359 *the experience better than when I went in"* (COR = 0.25, 95% CI: 0.10 - 0.63) was associated with  
360 reduced odds of anxiety. In contrast, positive reappraisal strategy, *"found a new faith,"* was  
361 associated with increased odds of anxiety (COR = 3.18) and depression (COR = 5.39) symptoms.  
362 Planful problem-solving strategies were not significantly associated with increased risk of  
363 depression and anxiety among the construction tradesmen. Confrontive coping, especially  
364 *"expressed anger to the person who caused the problem,"* was associated with increased risk of  
365 depression (COR = 3.64, 95% CI: 1.42 – 9.34) and anxiety (COR = 9.91, 95% CI: 2.20 - 44.66)  
366 among the construction tradesmen.



367 Emotion-focused coping forms, such as avoidance, self-controlling, and distancing  
368 strategies, were significantly associated with increased odds of anxiety. On the one hand,  
369 avoidance strategy "*fantasies about how things might turn out*" (COR = 5.40) was significantly  
370 associated with increased risk of depression. On the other hand, *alcohol consumption* (COR =  
371 2.25), *cannabis consumption* (COR = 3.22), and *venting of emotions* (COR = 13.50) were each  
372 significantly associated with increased risk of anxiety. Anxiety was significantly related to self-  
373 controlling strategy "*kept others from knowing how bad things were*" (COR = 4.33)" and distancing  
374 strategies "*didn't let it get to me and refused to think about it too much*" (COR = 9.50), "*went on*  
375 *as if nothing had happened*" (COR = 3.64) and "*made light of the situation and refused to get too*  
376 *serious about it*" (COR = 6.48)."

377 *Insert Table 4*

#### 378 4.6 *Impact of resilience on coping strategy*

379 The resilience of tradesmen had a significant positive association with positive reappraisal coping  
380 strategy and a negative association with self-control behavior (see Table 5). In the analysis,  
381 resilience was associated with increased odds of employing problem-focused coping forms, such  
382 as positive reappraisal strategy (COR = 5.00). In contrast, resilience was associated with reduced  
383 odds of employing emotion-focused coping forms, such as self-controlling strategy (COR = 0.06).  
384 Therefore, as shown in Table 5, tradesmen with normal and high resilience employed were 4.50  
385 and 5.00 times respectively more likely to engage positive reappraisal behavior. In contrast,  
386 tradesmen with high resilience employed were 0.06 times likely to engage self-controlling  
387 strategies.

388 *Insert Table 5*

389

390 4.7 *Multivariate analysis of coping strategy and resilience on mental health*

391 Based on multiple logistic regression, resilience, positive reappraisal, and distancing strategies  
392 accounted for 40.6% variation in depression in the final model. The model for depression had a  
393 Hosmer and Lemeshow Test of 0.40, with an 83.6% predictive power. The model was adjusted for  
394 years of experience and education, but there was no significant effect observed. Resilience (aOR  
395 = 0.08, 95% CI: 0.01 - 0.50) was significantly associated with reduced odds of depression (see  
396 Table 6). In contrast, a positive reappraisal strategy "*found a new faith*" (aOR = 9.16), and a  
397 distancing strategy "*made light of the situation and refused to get too serious about it*" (aOR =  
398 17.39) were significantly associated with increased odds of depression. This indicates that among  
399 the tradesmen, a high resilience, positive reappraisal behavior, and distancing strategy were 0.08  
400 times, 9.16 times, 17.39 times, respectively, likely to cause depression.

401 Although Chi-square revealed an association between resilience and anxiety symptoms,  
402 the resilience data did not fit into the regression model for anxiety, and so it was omitted. In the  
403 final model, resilience, positive reappraisal, confrontive coping, accepting responsibility,  
404 avoidance, and distancing strategies accounted for 53.7% variation in anxiety. The model for  
405 depression had a Hosmer and Lemeshow Test of 0.24, with 81.8% predictive power. No significant  
406 effect was observed on adjusting the model for years of experience and education. As regards  
407 anxiety symptoms, positive reappraisal strategy like "*came out of the experience better than when*  
408 *I went in*" (aOR = 0.10, 95% CI: 0.02 - 0.43), accepting responsibility "*realized I had brought the*  
409 *problem on myself*" (aOR = 0.14) were associated with reduced odds of anxiety.

410 In contrast, confrontive coping, especially "*expressed anger to the person who caused the*  
411 *problem*" (aOR = 13.72), avoidance coping "*feelings out like crying or venting my emotions*" (aOR  
412 = 29.09), and distancing strategies "*went on as if nothing had happened*" (aOR = 6.89) was

413 significantly associated with increased risk of anxiety among the construction tradesmen (see  
414 Table 6). This indicates that among the tradesmen, positive reappraisal, accepting responsibility,  
415 confrontive, avoidance, and distancing strategies were 0.10 times, 0.14 times, 13.72 times, 29.09  
416 times, and 6.89 times respectively likely to cause anxiety.

417 *Insert Table 6*

## 418 **5. Discussion**

419 Due to the limited number of studies investigating the stress-coping and mental ill-health among  
420 tradesmen in the construction industry, some comparisons had to be made outside the construction  
421 work field. Finally, a Coping Resource-Strategies-Mental Health interaction model (see Fig. 2)  
422 and Stressors-Protective Factors model (see Fig. 3) for tradesmen were established. The Coping  
423 Resource-Strategies-Mental Health interaction model reveals that: (i) resilience can directly or  
424 indirectly protect against suicidality; (ii) resilience, positive reappraisal, and accepting  
425 responsibility mitigated the likelihood of negative stress outcomes (anxiety, depression, and  
426 suicide ideation) by ensuring positive stress response. Thus, acting as protection factors; and (iii)  
427 the adoption of problem-focused and emotion-focused coping strategies by tradesmen acted as risk  
428 factors, as the strategies predicted mental ill-health symptoms.

429 *Insert Fig. 2*

### 430 *5.1 Mental ill-health symptoms and prevalence among the tradesmen*

431 The prevalence rate of depression was higher than anxiety among the study participants, consistent  
432 with Langdon and Sawang (2018), where depression had a higher mean than anxiety among  
433 construction tradesmen. In Nigeria, depression appears to be more prevalent than anxiety among  
434 the general population (Oyewunmi et al., 2015; Adewuya et al., 2016; Adewuya et al., 2018). This  
435 may be due to the heightened level of poor interpersonal relations caused by cultural diversity,

436 worsening socioeconomic conditions, or persistent job insecurity in the Nigerian workplace (see  
437 Oyewunmi et al., 2015). In this study, the GAD-2 scores were not correlated with PHQ-9 scores,  
438 contrary to prior studies (e.g., Hughes et al., 2018; Choi et al., 2020) that have reported a co-  
439 morbidity of depression and anxiety. The GAD scores and the suicide ideation scores were  
440 correlated, implying that tradesmen with anxiety symptoms also experienced suicide ideation.  
441 Thus, anxiety is a significant risk factor for suicide ideation, aligning with previous studies (e.g.,  
442 Bentley et al., 2016).

#### 443 5.2 *Demographic factors influencing resilience, and mental health among tradesmen*

444 Years of experience significantly influenced anxiety, depression, similar to previous studies  
445 (Battams et al., 2014; Rees-Evans, 2020). This study suggests that younger tradesmen with fewer  
446 than 15 years were more likely to have anxiety and depressive symptoms than older tradesmen.  
447 Education and years of experience influenced the resilience among tradesmen. As regards  
448 education and resilience, this finding agrees with Ren et al. (2018). However, the finding  
449 contradicts Ren et al. (2018), who found that years of experience did not influence resilience.  
450 Since there exists some relationship between age and experience (Cheung and Yip, 2015), our  
451 findings corroborate Bowen et al. (2014), who deduced that younger construction professionals  
452 were subjected to more severe psychological stress.

453 Therefore, tradesmen with experience less than 15 years may lack the requisite emotional  
454 expertise to deal with pressure from work, non-work stressors, and related mental ill-health  
455 (Bowen et al., 2014; Chan et al., 2020). Furthermore, tradesmen with over 25 years of work  
456 experience, tended to be more anxious. This may result from family commitments that could  
457 interfere with work factors. For instance, older tradesmen would most likely have adult children  
458 enrolled in tertiary institutions, subjecting them to increased financial obligations.

459 5.3 *Mean scores of coping strategies adopted by the tradesmen*

460 Problem-focused coping strategies related to planful problem solving, positive reappraisal, seeking  
461 social support ranked as the most commonly used by the tradesmen. In contrast, the least frequently  
462 used strategies were related to escape (avoidance). This finding corroborates Tsaras et al. (2018),  
463 who deduced that positive re-evaluation, positive approach, problem-solving, and seeking social  
464 support had the highest mean score among nurses while the least employed strategies included  
465 avoidance strategy. Like Lim et al. (2017), the preferred coping behavior following seeking social  
466 support relate to emotion-based coping, especially accepting responsibility. Owing to the labor-  
467 intensive nature of construction, tradesmen are risk-takers, enabling them the prowess to employ  
468 problem-focused coping (Lim et al., 2017). This may be because tradesmen work in stressful  
469 conditions and under varying weather conditions, enabling them to adjust to happenings mentally.

470 5.4 *Mental ill-health among the tradesmen*

471 Based on logistic regression, the study deduced that the role of coping strategies and resilience in  
472 protecting against either depression, anxiety, or both. An interesting finding of this study is the  
473 univariate analysis indicating that substance abuse and alcohol intake increased the risk of anxiety.  
474 Contrary to Langdon and Sawang (2018), where substance abuse was associated with better mental  
475 health. Overall, this study's results agree with prior research, which suggests that when dealing  
476 with workplace stress, problem-focused coping strategies are more likely than emotion-focused to  
477 be associated with better mental health (Tsaras et al., 2018). Consistent with the findings in other  
478 work settings, resilience, positive reappraisal coping, and accepting responsibility appeared to  
479 protect against mental ill-health among tradesmen.

480

481

482 5.4.1 *Resilience and mental health*

483 Resilience was an apparent protective factor for mental health, as tradesmen with increased  
484 resilience were less likely to experience depressive and anxiety symptoms as well as suicide  
485 ideation. Thus corroborating previous studies that have established that higher levels of resilience  
486 are associated with reduced depression and anxiety (Schure et al., 2013; McDowell et al., 2019;  
487 Ran et al., 2020). Additionally, resilience was found to be a significant predictor of coping strategy.  
488 The higher the resilience level of tradesmen, the more likely they were to employ positive  
489 reappraisal coping behaviors than others. As the resilience level increased from normal to high,  
490 the likelihood to engage positive reappraisal behavior increased.

491 In contrast, the higher the resilience level of tradesmen, the less likely they were to employ  
492 emotion-focused coping forms such as self-controlling. This finding corroborates Rabenu and  
493 Yaniv (2017) and Ren et al. (2018), who noted that approach-coping (active or problem-focused)  
494 behaviors are positively associated with high resilience, while low resilience is associated with  
495 avoidance coping (passive or emotion-focused) techniques. Therefore, organizations may consider  
496 training and awareness activities that can improve individual resilience and cognitive coping skills  
497 to mitigate the impact of stressors on employees' mental health and performance on the job.

498 5.4.2 *Coping strategies and mental health*

499 Tradesmen who employed positive reappraisal strategies such as "*came out of the experience better*  
500 *than when I went in*" were less likely to experience anxiety. This finding negates Langdon and  
501 Sawang (2018), who found that positive reframing was associated with increased anxiety in  
502 Australia's construction workers. This study's finding aligns with Tsaras et al. (2018), who noted  
503 that a positive reappraisal strategy is more likely to mitigate anxiety. This may be because this

504 form of strategy consciously regulates emotions (Nowlan et al., 2015; Nowlan et al., 2016). Thus,  
505 focusing on personal growth by intentionally reappraising the situation to identify positive gain.

506 Tradesmen who employed a positive reappraisal strategy "*finding a new faith*" were more  
507 likely to experience depressive symptoms. This aligns with Tsaras et al. (2018), who found that  
508 the positive reappraisal strategy's religious tone predicted an increased risk of depressive  
509 symptoms. This may be because there are harmful forms of religious coping linked to  
510 psychological distress (Pargament et al., 2011). Furthermore, problem-focused strategies  
511 involving confrontive behavior predicted anxiety; tradesmen who "*expressed anger to the source*  
512 *of stressor or problem*" were more likely than others to experience anxiety symptoms. Adopting  
513 confrontive coping behavior in the face of stress does not seem to remedy but escalates stress,  
514 especially among construction workers (Liang et al., 2021). Thus, agreeing with Whittington and  
515 Wykes (1994), who suggested that confrontive coping is a problematic strategy to adopt since it is  
516 linked to increased anxiety (Whittington and Wykes, 1994).

517 Tradesmen who employed emotion-focused coping forms such as avoidance or distancing  
518 were more likely to experience anxiety or depression symptoms. This is consistent with Langdon  
519 and Sawang (2018), who deduced that behavioral disengagement is significantly associated with  
520 poor mental health symptoms (anxiety and depression). Emotion-focused coping forms have been  
521 identified as related to poor mental health symptoms when dealing with stress among the working  
522 population (Tsaras et al., 2018). This may result from the maladaptive nature of emotion-focused  
523 strategies because they do not focus on the personal growth needed to withstand stressors and  
524 prevent related mental ill-health adequately. Tradesmen who employed *accepting responsibility*  
525 *coping strategies* were less likely to experience anxiety symptoms. This implies that emotion-  
526 focused coping form "*accepting responsibility*" is an obvious protective factor against anxiety.

527 This finding negates previous studies (Haynes and Love, 2004; Love and Irani, 2007) that found  
528 that *accepting responsibility* predicted an increase in anxiety.

529 *Insert Fig. 3*

## 530 **6. Implications of findings and recommendations**

531 Based on analytical methods, this current study revealed the protective factors for mental health  
532 among the tradesmen comprise resilience and both problem and emotion-focused coping strategies  
533 (see Fig. 3). Among the problem-focused and emotion-focused coping forms employed, only  
534 positive reappraisal and accepting responsibility behaviors, respectively, appeared to protect  
535 against anxiety in the face of stress and related mental ill-health. Surprisingly, none of the coping  
536 strategies appeared to protect against depression symptoms. Based on the result of the study as  
537 represented in Fig. 3., it can be seen that if the protective factors form the basis for mental health  
538 intervention in the construction workplace, the negative impact of work and non-work stressors on  
539 mental health can be mitigated and prevented. Thus, these coping strategies and resilience-building  
540 should form the basis for secondary interventions targeted towards tradesmen and other laborious  
541 workers in the industry.

542 The study confirmed that resilience is a vital coping resource. Although over three-quarters  
543 of the respondents tended to report normal and high resilience levels, less than a quarter of the  
544 respondents had high levels of resilience. Hence, there is a need to deploy interventions toward  
545 increasing the level of an individual's resilience or resilience building in Nigeria's construction  
546 industry. This will include educating tradesmen on the importance of optimism, pre-stress  
547 inoculation training, workplace coaching, and workplace physical activity interventions (Glozier  
548 and Brain and Mind Centre, 2017). The proven benefit of resilience training includes reducing  
549 burnout by fostering mental preparedness, improving relaxation techniques, cognitive coping



550 skills, appropriate lifestyle modifications, and improving safety (Chen et al., 2017a). Hence,  
551 building individual resilience skills of construction personnel through some mentioned techniques  
552 can improve cognitive coping skills and resilience.

553         Although the tradesmen adopted problem-focused coping forms more frequently, adopting  
554 the strategies does not effectively control the adverse effect of stress. Thus, it is necessary to  
555 empower employees with practical means of applying problem-focused coping forms for efficient  
556 stress reduction and workplace safety benefits. For instance, to spur the use of problem-focused  
557 coping forms, management teams should consult construction workers while assigning jobs and  
558 safety plans (Liang et al., 2021). Therefore, primary intervention strategies such as job crafting  
559 could be adopted for tradesmen for a psychologically healthy construction workforce (Nwaogu  
560 and Chan, 2020). This will serve two major purposes: (i) provide job control and support  
561 opportunities, and (ii) practically equip construction tradesmen with planful problem-solving skills  
562 to deal with stressors for effective results.

563         Additionally, tradesmen should be educated on the positive and negative forms of religious  
564 coping and the best means to adopt such coping for improved health benefits. This is important  
565 because Nigerians have great ties to religious inclination (Akah and Ajah, 2020), so tradesmen  
566 will often opt for religious coping in the face of stress. Notably, the interventions in the  
567 construction industry should: (i) reinforce the disadvantages of adopting emotion-focused  
568 strategies, especially those that appeared to escalate the likelihood of developing poor mental  
569 health among the tradesmen; and (ii) educate the tradesmen on the appropriate use of "*accepting*  
570 *responsibility*" and "*positive reappraisal*" strategies to achieve maximum protection.

571

572

573 **7. Limitation**

574 There are some limitations to this study. First, this study relied on self-report questionnaires, which  
575 may have caused some response bias. Irrespective, the quality of findings is assured as validated  
576 questionnaires were employed to elicit information from the respondents. Second, this study and  
577 its data are cross-sectional. Thus, longitudinal studies should be conducted by developing a robust  
578 intervention and examining its effect on mental health and well-being. Third, this study  
579 investigated tradesmen who are literate and with formal employment. This indicates that the  
580 sample may not be representative of all tradesmen in the Nigerian construction industry. Hence,  
581 the result should be interpreted with caution. Future research should extend this study by  
582 considering tradesmen who are neither literate nor engaged in formal employment. Due to literacy  
583 barriers, such studies should gather information using qualitative methods or combine qualitative  
584 methods with quantitative methods.

585 **8. Conclusions**

586 The study employed quantitative methods and logistic regression analysis to determine the abilities  
587 of resilience and coping strategies in protecting tradesmen against mental ill-health development  
588 in the construction industry. The study deduced that problem-focused coping forms were most  
589 frequently employed by the tradesmen but appeared that most tradesmen did not employ the  
590 strategies appropriately, as only positive reappraisal behaviors mitigated anxiety. Surprisingly, no  
591 coping strategy protected the tradesmen against experiencing depressive symptoms. This study  
592 deduced that: (i) the prevalence rate of depression was higher than anxiety among the tradesmen;  
593 (ii) individual resilience, directly and indirectly, protects against suicidality; (iii) resilience is a  
594 predictor of use of coping strategies (iv) individual resilience, positive reappraisal and accepting

595 responsibility strategies mitigated the likelihood of negative stress outcomes (anxiety, depression  
596 and suicide ideation), acting as protective factors.

597         Based on the findings, two models to explain the interaction between variables were  
598 developed, namely the Coping Resource-Strategies-Mental Health and Stressors-Protective  
599 Factors model. The construction industry and professional bodies should focus on building  
600 individual resilience and engage a series of interventions to develop resilience and effective coping  
601 strategies among tradesmen. In addition, emotional and physical stress symptoms impair  
602 construction workers' safety compliance (Liang et al., 2021). This study has extended existing  
603 literature by providing information vital to building interventions to deal with stressors effectively.  
604 This information benefits individual, organizations, and the economy. The benefits include  
605 improved health, performance, and safety compliance on the individual level; reduced lost-work  
606 hours, sick benefit, safety penalty, increased organizational productivity on the organizational  
607 level, and increased gross domestic product remittance from the construction industry the  
608 economy.

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