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Development and Validation of an Inventory for Stressful Situations in University Students Involving Coping Mechanisms: An Interesting Cultural Mix in Ghana

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Abstract: Cognitive and behavioural coping strategies are relevant approaches for individuals such as university students as they attempt to manage stressful situations such as the COVID-19 pandemic and other academic-related pursuits within their social milieu. Although several instruments have been developed to measure the coping situations of such individuals, few studies have developed students' specific coping inventories, with none in the African context. Of the few that exist, a culturally dominant code such as religion has been ignored by many scholars in the development of coping measures. In this study, a cultural-mix coping inventory was developed and validated using university students in Ghana. Two distinct interrelated objectives were addressed. First, the structure of the coping inventory was identified through principal component analysis. Further confirmatory factor as well as reliability analyses were then performed to provide evidence of construct validity of the scale. The outcome of the study revealed a sixteen-item psychometrically sound coping inventory with a four-dimensional structure, namely, active coping, religious coping, behaviour disengagement, and emotional support. The implications of the results are further discussed in detail.

Keywords: coping inventory; culture; Ghana; stressful situation; university students; validation

1. Introduction

Stress is an inevitable part of student life, especially for university students, who have been found to experience stress in academics, social relationships, and the transition from one level to another [1–4]. The recent emergence of the COVID-19 pandemic has intensified the stress levels of students through the disruption of academic work, adoption of new instructional models, and the low predictability of the virus, among other stressors [5–7]. Research has shown that when individuals (e.g., students) find themselves in stressful situations, they adopt different ways of coping [8]. Therefore, developing and adopting both psychological and behavioural coping mechanisms to help maintain and avert the negative consequence of life's adversities are crucial to mental health and well-being [9].

Coping, as a broad concept, has been generally explained as a process and has gained importance as individuals' constant efforts in managing particular stress demands evaluated as overwhelming [10,11]. The earlier conception of coping stressed that people can adopt either problem-focused coping (i.e., efforts towards directly doing something to lessen the stressful event) or emotion-focused coping (i.e., efforts towards dealing with their emotions as a result of the stressful situation), and either active coping (i.e., efforts geared towards doing something to change the stressful situation) or avoidance coping (i.e., efforts of individuals towards involving themselves in actions which keep them away from the stressful event) [12,13].

Several instruments have been developed and psychometrically validated to measure the coping strategies of caregivers/relatives of schizophrenic patients [14,15], HIV patients and caregivers of children with cancer [16], primary care patients [17], athletes [18,19], children and adolescents [20–22], students [23,24], and the general population [25]. However, these existing coping measures have been calibrated in different continents such as Asia (Japan, [25]; Malaysia, [14]; Turkey, [21]), Europe (Italy, [15]; Norway, [17]; Spain, [16]) and North America (Canada, [19,22]), with no coping scale developed in the African context. Meanwhile, there is wide use of these existing scales (which were developed in other cultures) in Ghana as well as in other African contexts. Recently, Oti-Boadi et al. [26] and Hagan [27] adopted the brief religious coping inventories by Carver [28] and Pargament [29] to understand the coping styles of university students in Ghana. The adoption of these western-style coping instruments may not provide explicit contextual information that functionally addresses individuals' concerns in the face of life adversities. Thus, many lack practical applicability to stressful situations and settings. In addition, the degree to which people in different cultural and racial environments and orientations with varied value systems adapt to stressful conditions such as COVID-19 may differ considerably.

Besides, previous coping inventories had different factor structures and sub-dimensions reflecting the sample for whose use the instrument was intended. For example, Magliano et al. [15] developed a family coping inventory for schizophrenic patients that had eight factors, namely, the patient's social involvement, information, positive communication, coercion, social interests, resignation, and avoidance. Because Magliano et al.'s scale [15] was developed for families, it is necessary to understand whether family relatives of such patients coped by communicating positively, uniting through coercion, etc. Such factors are group-based strategies. Several other scales adopt similar factor-naming and item generation approaches to the development of their inventories [16,21], and this provides sufficient validity evidence to support the use and interpretations of results generated from those measures. Nevertheless, religion, which is a relevant cultural variable, has been ignored and not integrated for the majority of these existing coping measures, except for a few isolated religious coping scales developed by different authors [29–32].

The absence of a validated coping measure developed in the African context coupled with the non-inclusion of a religious element in earlier instruments presents a cultural gap which limits the applicability and utility of such scales in societies such as Sub-Saharan Africa, where cultural issues are pervasive [33–36]. Culture separates one person from another by the way people respond to stimuli, and explains the variations in how people adapt to situations [37]. Taking the individualism (self) and collectivism (in-group) theory into consideration, for example, coping strategies tend to be different depending on one's cultural orientation and belief system [35,38]. This perspective suggests that instruments developed in an individualistic culture may suffer validity threats when applied within a largely collectivist society. Regarding religion, research has shown that culture and religion are inseparable [39]; consequently, coping measures that do not pay attention to cultural issues such as religion miss an important cultural element (i.e., diversity). Hence, developing an instrument with a cultural mix may complement and aid individuals during adversity by providing diverse coping options, especially for those with existential concerns [40]. Many religious persons believe that having the capacity to self-reflect through existential concerns linked with the uncertainty of random life events and being

able to initiate or use the coping options they believe to be the most effective are important considerations for maintaining well-being [41]. From a positive psychology perspective, religious coping has been found to act as a buffer against major stressful life events [42,43]. For instance, individuals with spiritual support (e.g., faith in God and use of prayer as a coping resource) are more likely to manage stressful events effectively [27,33–35,42–46]. This research seeks to address this diversity gap by developing and validating a cultural mix coping inventory that fits the Ghanaian context.

The psychometric tools employed in the development and validation of the coping inventory in this research provide an advantage over the existing coping measures. To date, previous coping instruments have been developed and validated using procedures which relied on interval and ratio data. Whereas these procedures are largely endorsed, utilized, and powerful, they have their weakness [47]. None of the existing instruments was validated using ordinal confirmatory factor analysis, which can help overcome the weaknesses of the previously-mentioned approaches [48,49].

University students were used in this study as the normative group for the validation of the coping measure for several reasons. The university student population is prone to stress in their academic and social lives [3,4], coupled with the emergence of the COVID-19 pandemic, which has caused a sudden shift in normal way of life [6]. This situation emphasizes the need for a standardized measure of diverse coping strategies which will provide useful information for university administrators and aid planned interventions. Although there are other coping measures developed for students, in both contextual and conceptual terms they appear not to fit the kind of sample required for this study. For example, Boujut et al. [23] and Côté et al.'s [24] coping instruments are not applicable because their measures do not have a cultural coping component and were developed using the French language.

The present study took advantage of the COVID-19 pandemic related events as a stressful situation present for all students. Despite this rationale, the coping inventory can be applied to benefit students in other stressful situations as well as students at other levels of education. The central aim of the study was to develop a new, brief, and context-specific reliable index of coping with stressful life situations to help bridge the shortcomings in the extant coping literature. Specifically, this research comprises two different and interrelated objectives aimed at developing and validating a coping measure for students. The two objectives are first to establish the scale structure of the coping measure, and second to assess the evidence of the construct's validity and the fairness of the items and scale in general.

2. Objective 1: Item Pool Creation and Scale Structure

2.1. Purpose

The objective was to examine the scale structure of the coping strategy scale. This started with item pool creation based on existing coping inventories to comprehensively gauge the coping strategies adopted by students in stressful situations, using the COVID-19 pandemic as a classical case, as well as to provide content validity evidence. This validity evidence is a necessary component of scale development, and relates to whether the proxies used to measure the constructs are relevant and represent the targeted variable [47].

2.2. Methods and Materials

2.2.1. Developing Item Pool

The items used for the coping strategy scale were carefully compiled from existing standardized coping strategy inventories, such as the modified coping scale (MCOPE) and religious coping scales, among others [29,31,50,51]. Four of the authors (with measurement and evaluation, health, and physical education backgrounds) compiled the items and modified them to suit the study context. Thirty items, with a response scale of 1 to 4 (with 1 being "not adopted", 2 "somewhat or moderately adopted", 3 representing "much adopted", 4 "very much adopted"), were initially developed and later reduced to 28 items

after the items were reviewed by all the authors. Ten panel members and experts were then contacted to review the 28 items to establish their content and face validity. The panel comprised academics in educational psychology, health psychology, psychometrics, measurement and evaluation, practising clinical psychologists, and counselling psychologists. The panel members independently reviewed the items based on relevance (whether the items relate to the strategies adopted by individuals during the COVID-19 pandemic), specificity (whether the item has the probability of capturing a significant aspect of the coping during the pandemic), clarity (whether the items are unambiguous and easily understood) [52], and response option appropriateness. For an item to be maintained, all experts are supposed to endorse the item on all four rating dimensions. The experts had the opportunity to write comments for each item concerning their endorsement as well as their general impression of the items or scale. Ninety percent of the experts unanimously endorsed twelve items without any revision based on their relevance, specificity, clarity, and response options appropriateness. The experts also confirmed that some of the items needed minor revisions ($n = 8$), others required major revisions ($n = 4$) or should be deleted ($n = 4$). Based on the experts' suggestions in the comment section, a meeting was convened for all the experts and final decisions concerning the items were made. The experts agreed on 22 items, which include: "*I concentrate my effort on doing something about it*", "*I try to find comfort in my object of worship*", and "*I give up the attempt in dealing with the stressor*". The 22-item coping scale was used for further statistical validation

2.2.2. Survey Participants

The participants were university students from two universities in Ghana, the University of Cape Coast (UCC) and the University of Education, Winneba (UEW). A sample size of 380 out of 400 participants responded to the self-developed 22-item coping scale. Out of 380 participants, 218 (57.4%) were male students, and 162 (42.6%) were females. Regarding age, majority of the participants aged from 16–22 years ($n = 182$, 47.9%), 123 had age-range from 23–29 years old (32.4%), and 19.7% were above 30 years old ($n = 75$). Thirty-five percent (35%) of the sample were from UCC and 65% were from UEW.

2.2.3. Procedure

Institutional ethical clearance was obtained from the University of Cape Coast, Ghana, with a reference number of UCCIRB/EXT/2020/25. Informed consent was obtained from all participants. The data were collected from the students in their various lecture halls while adhering to all COVID-19 protocols. Participants were all required to wear nose masks, have their hands sanitized, and abide by the social distancing protocol before they were allowed to respond to the instrument. Due to the COVID-19 situations at the universities, a convenient sample was obtained. The researchers, with institutional and lecturer permission, went to the various lecture halls to collect the data. The participants were assured confidentiality, anonymity, volition, and freedom of withdrawal. The students used approximately 10–15 min to respond to the items and the questionnaires were retrieved off-hand afterwards. A similar data collection procedure was adopted for the other related objective in this paper. Changes in data collection in the related objective will be reported.

2.2.4. Data Analysis

There were no missing data reported. The data were analyzed using principal component analysis (PCA). A suitability assessment was carried out to establish whether the data met the criteria for the analysis to be conducted. Through the FACTOR software, the principal component extraction method was performed to identify the number of components to use for the scale based on the polychoric correlation matrix. The PCA was chosen due to the high level of interrelatedness among the items [53]. The Promin method, which is an oblique rotation procedure, was used for the rotation. This rotation method has been recommended in the literature as being superior to other methods based on simulation studies [53–55]. The FACTOR software was purposively developed to handle

PCA with ordinal data. Three different strategies were adopted to decide on the number of components: Kaiser's criteria, scree plot test, and parallel analysis.

2.3. Results

2.3.1. Preliminary Analysis

The sample size for the PCA was deemed suitable and acceptable to yield accurate results based on Tabachnick and Fidell's [56] recommendation that it is appropriate to use a minimum of 300 cases for the analysis. Having obtained a final sample of 380, the analysis was considered appropriate. Additionally, the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy test yielded an estimate of 0.750, indicating the appropriateness of the sample for this analysis, as the KMO value ranges from 0 to 1 and the recommended cut-off point is 0.60 or higher [57]. Lastly, Bartlett's test of sphericity returned a significant result, $\chi^2(231) = 2145.10$, $p < 0.001$, signifying the appropriateness of the analysis [56].

2.3.2. Main Analysis

Deciding on the number of components to retain, Kaiser's criteria, a scree plot test, and parallel analysis were all carried out. Kaiser [58] asserted that, as a rule of thumb, components with eigenvalues greater than 1.0 should be retained. The progression of components before the point at which information drops off quickly, with a sudden transition from vertical to horizontal and a sharp "elbow", should be retained for the scree plot [59]. Random eigenvalues should be less than their corresponding actual eigenvalues on a component for it to be retained for parallel analysis [60]. The details of the analysis are shown in Table 1 and Figure 1.

Table 1. Eigenvalues and Monte Carlo PCA.

Component	Initial Eigenvalues			Monte Carlo PCA	
	Total	% of Variance	Cumulative %	Random Eigenvalue	Standard Deviation
1	4.348	19.762	19.762	1.459	0.042
2	2.467	11.215	30.977	1.381	0.032
3	1.959	8.905	39.882	1.320	0.027
4	1.526	6.937	46.819	1.270	0.024
5	1.174	5.338	52.158	1.224	0.022
6	1.066	4.848	57.005	1.182	0.021
7	0.973	4.421	61.427	1.143	0.020
8	0.926	4.211	65.638	1.104	0.019
9	0.861	3.916	69.554	1.068	0.019
10	0.803	3.651	73.205	1.033	0.018

The outcome of Kaiser's eigenvalue test showed that the six-component structure was suitable for the scale, with six components contributing to about 57% of the variability in the construct coping strategies (see Table 1). However, the second test, the Monte Carlo PCA test with 22 items, 380 cases, and 1000 replications revealed four components, that is, only four of the actual eigenvalues for the respective components were greater than the simulated eigenvalues. The third test, the scree plot, yielded four components, as did the parallel analysis. Observing Figure 1, four of the components appeared before the elbow of the curve where the simulated data point meets the actual data.

Based on the three tests performed, two different structures were found: the six-component structure from the eigenvalue criterion, and the four-component structure from the Monte Carlo parallel analysis and scree plot. The four-component structure was retained based on recommendations from the literature. According to DeVellis [47], for example, the Monte Carlo PCA test should take priority when deciding on the number of components. Pallant [61] recommended that all three approaches should be compared and a decision should be made by the researcher(s). Thus, because Kaiser's eigenvalue criterion approach has the weakness of retaining many components [47,61], the four-component structure was retained. This decision was additionally informed by the pattern matrix,

which showed that of the six components, the majority of the items (*n* = 17, 81.8%) loaded adequately on four components with each having at least four items.
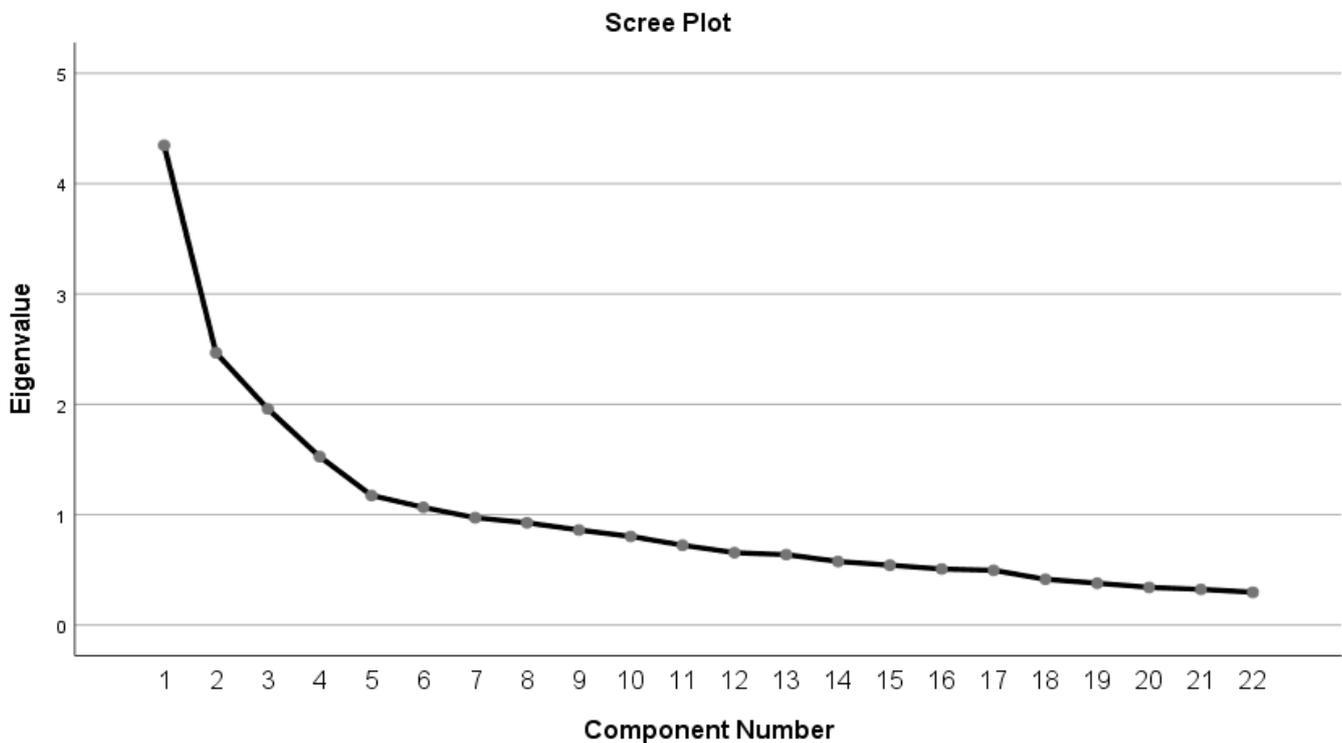

Figure 1. Scree Plot.

Once the four-component structure was confirmed, further results were inspected to decide whether any of the items needed to be deleted. The pattern structure and the commonalities results were both inspected. Items that had loadings below 0.40 on the pattern matrix as well as the unrotated loadings of the items were deleted [61]. The outcome of the analysis showed that six of the items had loadings between 0.31–0.39. Further inspection of the component matrix showed that these six items could not independently load on a component. For example, an item loaded 0.406 on two components at the same time. Similarly, another item also had a loading of 0.313 on two components simultaneously. The remaining sixteen items were retained. Afterwards, the experts helped the researchers to name the four components, bearing in mind the items which formed the specific components. After several hours of deliberation, the four components were, thus, named active coping, religious coping, behaviour disengagement, and emotional support.

3. Objective 2: Confirmatory Factor Analysis, Reliability, and Measurement Invariance

3.1. Purpose

The second study generally aimed to cross-validate the developed sixteen-item, four-component structure scale. This objective first sought to confirm the link between the observed variables and their underlying latent construct (i.e., the internal structure of the measure), and second, to assess whether the items and scale structure discriminated across persons from particular sub-groups within the sample (measurement invariance).

3.2. Materials and Methods

3.2.1. Participants

A convenient sample of 638 students from the UEW were recruited to participate in the study. The participants responded to the instrument face-to-face as well as online. The larger percentage of participants were male (72.1%); 27.9% were female. Christians made up 65.5% of the total participants. The mean age was 25.8.

3.2.2. Measure

The sixteen-item scale endorsed through the PCA was used for data collection. The instrument had four subscales, namely, active coping, religious coping, behaviour disengagement, and emotional support, all with four items each. Each item had four category options, with 1 being "not adopted", 2 "somewhat or moderately adopted", 3 representing "much adopted", and 4 "very much adopted". The items were preceded by a preamble: "*Think about what strategies you usually resorted to when you were under stress induced by the COVID-19 pandemic*".

3.2.3. Analysis

The analysis of data (with ordinal responses) was performed in the *R* environment. The lavaan package was used for the analysis [62]. No missing data were recorded. Using the diagonally-weighted least squares (DWLS) estimation procedure, confirmatory factor analysis was conducted to evaluate the construct validity of the scale. The assessed indicators included the standardized item loadings, average variance extracted, and reliability estimate. Measurement invariance on gender was conducted to find out whether the specified model was similar across male and female participants. Measurement invariance was conducted for gender because the coping strategy literature have stressed gender invariance as a major concern for scholars who have developed instruments measuring coping mechanisms; most coping instruments have violated the invariance assumption in scale development [63–70]. In determining the measurement invariance across both male and female respondents, the multi-group confirmatory factor analysis was performed to establish configural invariance (reference model), metric invariance (equality of item loadings), and scalar invariance (equality of item loadings and intercepts) [71]. The change in Comparative Fit Indices (CFI) (ΔCFI < 0.010) and Root Mean Square Error of Approximation (RMSEA) (ΔRMSEA < 0.015) were assessed to examine the extent of invariance [72].

3.3. Results

3.3.1. Model Fit

Examining the model fit indices for the confirmatory factor analysis, the literature stresses that several model fit indices should be used due to the notion that each of the indices has its weakness [73,74]. According to Kline [75], although several model fit indices need to be reported, the premium should be placed on the chi-square, CFI, RMSEA, and Standardized Root Mean Square Residual (SRMR) indices. Following these suggestions, the four indices recommended by Kline [75] were reported. The following indices were reported: Chi-square (χ^2, non-significant with χ^2/df less than 3.0), Goodness-of-Fit (GFI, >0.90), RMSEA (<0.10), SRMR (<0.08), and CFI (>0.90) [74,76–79]. The interpretation of these indices was applied to other subsequent analysis in this report. The results revealed the following model fit indices for the confirmatory factor analysis: χ^2 = 347.39 (p < 0.05), χ^2/df = 3.54, CFI = 0.994, RMSEA = 0.061, SRMR = 0.047, GFI = 0.959. Only one of the model fit indices was not encouraging (i.e., χ^2/df). This was not much of an issue, however, as the chi-square value is sensitive to larger sample sizes [75].

3.3.2. Construct Validity

The loadings of the items should be greater than 0.50 for the item to be judged as having a sufficient contribution to the sub-domain [80], as a rule of thumb. The item loadings for the active coping dimension ranged from 0.760 to 0.819, the religious coping dimension ranged from 0.736 to 0.893, the behaviour disengagement coping sub-scale had loadings from 0.809 to 0.918, and emotional support had loadings from 0.782 to 0.843 (see Table 2). The loadings of the items were generally sufficient to explain the variances in the sub-construct. This evidence supports the validity of the scale.

The second piece of validity evidence adopted is the use of AVEs. Accordingly, the AVE of a sub-dimension should be 0.50 or greater to establish construct validity [81]. The AVEs were greater than 0.50 for all the subscales. Taking the active coping sub-scale, for

one, an AVE estimate of 0.633 was obtained, while the religious coping dimension had an AVE of 0.639, behaviour disengagement coping had an AVE of 0.721, and the emotional support sub-scale had an AVE of 0.654 (see Table 2). These results suggest that there is evidence of sufficient construct validity, and for that matter, the internal structure of the measure is established.

The reliability estimate of the sub-dimensions was assessed using the omega ω reliability estimate. The omega coefficient was employed because the procedure has been proven to be more precise and resolute in estimating internal consistency relative to Cronbach's alpha, which was used by previous validations of coping inventories [47,82–85]. The reliability estimates for the dimensions were 0.823, 0.812, 0.869, 0.826 for the active coping, religious coping, behaviour disengagement coping, and emotional coping dimensions, respectively. According to the recommendations of McDonald [85] and Karagöz [86], a reliability estimate of 0.70 or greater is required for a scale to be judged as reliable; thus, all the sub-scales were reliable. This indicates that the items that made up the specific sub-scales "hang together" in terms of measuring the specific sub-domains [61].

Table 2. Item Loadings, Variances, AVE and Reliability Estimates.

S/N	Items	Loadings	Item Variance	AVE	ω
—	ACTIVE COPING	–	–	0.633	0.823
AC1	I concentrate my effort on doing something about it	0.809 *	0.654		
AC2	I take additional action to try to get rid of the problem	0.760 *	0.578		
AC3	I take direct action to get around the stressor	0.819 *	0.671		
AC4	I do what has to be done, one step at a time	0.794 *	0.630		
–	RELIGIOUS COPING	–	–	0.639	0.812
RC1	I put my trust in God/object of worship	0.764 *	0.584		
RC2	I seek help from God/object of worship	0.796 *	0.634		
RC3	I try to find comfort in God/object of worship	0.736 *	0.542		
RC4	I pray more than usual for my God/object of worship to guard me	0.893 *	0.797		
–	BEHAVIOUR DISENGAGEMENT COPING	–	–	0.721	0.869
BD1	I admit to myself that I can't deal with the stressor and quit trying	0.918 *	0.843		
BD2	I just give up trying to reach my goal because of the stressor	0.836 *	0.699		
BD3	I give up the attempt in dealing with the stressor	0.829 *	0.687		
BD4	I reduce the amount of effort I'm putting into solving the problem	0.809 *	0.654		
–	EMOTIONAL SUPPORT			0.654	0.826
ES1	I discuss how I feel about the stressor with someone	0.816 *	0.666		
ES2	I try to get emotional support from friends or relatives when dealing with the stressor	0.782 *	0.612		
ES3	I get sympathy and understanding from someone to reduce my fears about the problem	0.843 *	0.711		
ES4	I learn to live with the stressor	0.793 *	0.629		

* significant at $p < 0.001$; AVE—Average Variance Extracted.

The results, as shown in Table 3, reveal correlation coefficients ranging from 0.397 to 0.629 (see Table 3). The relationship between active coping and religious coping, for example, was 0.494, whereas that of active coping and behaviour disengagement was 0.568. These coefficients were deemed appropriate [82], and confirmed the multidimensionality of the scale.

Table 3. Inter-dimension Correlation from the CFA using the DWLS estimation procedure.

Dimensions	AC	RC	BD	ES
Active coping (AC)	1			
Religious coping (RC)	0.494	1		
Behaviour disengagement (BD)	0.568	0.629	1	
Emotional support (ES)	0.397	0.417	0.497	1

3.3.3. Measurement Invariance

The measurement invariance across gender was assessed as shown in Tables 4 and 5.

Table 4. Multi-Group Analysis.

Models	df	CMIN	*p*
Measurement weights	12	1.027	0.054
Structural covariances	18	7.062	0.053
Measurement residuals	34	444.003	<0.001 *

* significant at $p < 0.05$.

Table 5. Model Level Invariance.

Fit Indices	Male	Female	Model Level Invariance		
			Overall (Unconstrained)	Fully Constrained	Difference
Chi-square, χ^2 (df)	566.64 * (98)	247.92 * (98)	923.43 * (196)	918.12 * (230)	5.31 (34)
CMIN	5.68	2.53	4.71	3.99	
GFI	0.89	0.88	0.87	0.85	
SRMR	0.03	0.03	0.03	0.04	
RFI	0.84	0.86	0.85	0.86	
RMSEA	0.09	0.09	0.06	0.07	
CFI	0.90	0.91	0.91	0.90	

RFI—Relative Fit Index; * Chi-square test is significant.

The outcome of the analysis showed that there was metric invariance across gender, $p = 0.054$ (see Table 4). That is, each item contributed to the latent trait in a similar way across gender. Further, the structural covariances across the groups were found to be similar, $p = 0.053$, indicating a level of scalar invariance. The measurement residuals were, however, not equivalent across gender, indicating that the measurement residuals for the items were different for male and female participants. The configural invariance of the model was tested across gender, and the results are presented in Table 5.

The outcome of the analysis revealed little difference in the model fit indices across gender. Taking GFI, for example, the male model yielded a value of 0.89, whereas the female model yielded 0.88. Concerning the CFI, a difference of 0.01 was obtained, and the RMSEA obtained a difference of 0 between the male and female models. These values showed a sufficient level of invariance across gender [72]. In addition, two models were fitted and the difference tested. First, the unconstrained model across gender was specified and the model was estimated. Then, a fully constrained model was fitted and estimations were performed. The chi-square difference between these two models was tested in order to establish the configural invariance. The results revealed a non-significant chi-square difference of 5.31 ($p > 0.05$) [76].

4. Discussion

In this study, a cultural-mix coping inventory was developed and validated using university students in Ghana. Two distinct but interrelated objectives were assessed to achieve this purpose. Objective 1, through PCA and upon careful consideration, was to identify a four-component coping inventory, the components being active coping, religious coping, behaviour disengagement, and emotional support. The four-component structure is

supported by the basic goal of PCA, which seeks to use the smallest number of components to explain correlations among items [87]. Evidence from Objective 2, the confirmatory factor analysis, showed consistent results across all of the indicators used, indicating evidence of internal structure [87–89]. The results from Objective 2 showed that the measurement model was similar with respect to gender. This was necessary because the previous literature has revealed that males and females differ on the coping strategies they adopt [63–70]. The results showed that only the residuals were not equivalent based on gender, while the rest were all equivalent. Brown [87] indicated that in testing for measurement invariance, the "residuals is optional" (p. 243), suggesting that invariance here is quite impossible to achieve.

The dimensions of this coping inventory partially reflected certain dimensions of other coping inventories [14,16,19,21,23]. Ibrahim et al. [14], for example, identified six dimensions, with social support and religion among them. These dimensions appear to be similar to those in the current study, however, our inventory added the element of emotions. The scale by Alonso-Tapia et al. [16] had an element of emotion, emotional expression. Generally, the dimensions of coping in previous studies are embedded in the current inventory, such that the dimensions are related; in some cases, they are named differently, though with the same overall idea. Interestingly, among the studies examined, only a few had religious coping dimensions [14,21]. Ibrahim and colleagues [14] developed a Malaysian-based (in Malaysian language) coping inventory which was purposely meant for family relatives and/or caregivers of schizophrenic patients. DanIşman et al.'s [21] coping inventory was developed for Turkish children and adolescents to examine how they cope with self-identified stressors. Coping instruments with religious dimensions have not, however, been previously developed for students.

This coping inventory is relevant for its cultural element and the attempt to bring together different aspects of coping into a single inventory for students. This is because the few coping instruments [23,24] developed for students do not have religious and emotional coping components and were not developed in the African context. In essence, previous coping instruments appear to lack the element of cultural relevance. Issues of religion are perceived differently based on context and within the African region. For instance, in Ghana, people draw a strong connection with a deity or supernatural being as a way of coping or dealing with the issues confronting them [33–35]. This current validation study begins the discussion on developing culturally relevant coping instruments within specific geographical contexts where cultural issues are dominant [40].

5. Conclusions, Limitations, and Future Directions

The overarching aim of this research was to develop a brief and psychometrically sound coping inventory for students through a series of rigorous procedures. Assessing two distinct but related objectives, this research developed a culturally responsive coping strategy scale with a four-component structure, namely, active coping, religious coping, behaviour disengagement, and emotional support. The outcome of the study provided sufficient validity evidence to support the use and interpretations of the coping scale among students in Ghana. The validation procedures employed helped in establishing the construct's validity. Although the research was carried out among university students in Ghana, the items were crafted in a way that suits different elite populations (e.g., pre-tertiary students, teachers, and nurses, among others). However, caution should be used, as the instrument may be sensitive to contextual factors which may affect the scale structure and item generation. For instance, the items may be quite difficult to comprehend for pre-tertiary students. The suggestion here is that the psychometric coping inventory should be re-assessed if this coping inventory is used for a different population. Furthermore, the responses provided by the participants in this validation research are limited to how they coped with stress induced by the COVID-19 pandemic. Essentially, this coping inventory can be used to measure how students adapt to other stressful situations such as academic stress, intimate relationship problems, and adjustment challenges.

This study should be viewed as a preliminary validation of a cultural mix coping inventory for students. In addition to the highlighted limitations, the samples recruited for the study were selected on the basis of convenience and may not be representative of the university student population. This approach has implications for the applicability of the instrument to the wider university population in the country, as well as for the validation results. A convenience sample can produce either a highly heterogeneous sample or a homogeneous sample, which can influence the direction of the results. We call on other scholars to further validate this inventory to improve its utility and functionality.

Importantly, there is the need to mention that the validation of this coping instrument is not exhaustive. Further validation is needed to strongly establish its usefulness and applicability in other contexts. There is no clarity as to whether this instrument is bias-free in terms of participant characteristics such as ethnicity, language, religious affiliation and age, as this information is beyond the scope of this article. The recommendation here is that future studies should incorporate measurement invariance estimations based on the mentioned demographic characteristics of the participants. Further validation studies should be conducted by translating the instrument to local languages in Ghana, with the goal of creating a psychometrically sound version of the scale that the indigenes can relate to more, especially those who are not of the elite class. This study is the starting point in developing a culturally valid and acceptable coping inventory in Africa, and specifically in Ghana.

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