The Development and Initial Validation of the Adult Coping Inventory

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Abstract

There are few psychometrically sound measures of coping in adults. Widely used measures of coping have highly unstable sub-scale analyses, were developed on homogenous samples, and are outdated. The scarcity of empirically derived instruments is concerning given that coping skills are linked to a variety of positive and negative physical and mental health outcomes (e.g., substance use, depression). Thus, the aim of the current study was to develop a psychometrically sound measure of coping in adults: the Adult Coping Inventory (ACI). The study consisted of three phases: The aim of Phase 1 was to generate an initial item pool. After eliminating redundant items, 124 items remained. The purpose of Phase 2 was to eliminate items based on item frequency and factor loadings. A diverse sample of 526 adults participated in the study. Following item generation and elimination, an exploratory factor analysis produced a 57-item, five-factor model of coping which included the following subscales: Problem Solving, Mindfulness, Maladaptive Coping, Social Support, and Avoidance. Overall, reliability of the ACI was excellent and the internal consistency of the factors ranged from adequate to excellent. Evidence of convergent, concurrent, and incremental validity of the questionnaire was also established. Results provide initial support for the psychometric properties of the ACI.

Keywords Coping · Questionnaire · Measurement development · Adult

Introduction

Effective coping is essential to navigating life stressors, traumatic events, and losses. Coping is defined as an individual's response to an internal or external stressor that is appraised as difficult and is believed to surpass the resources an individual has available (Lazarus & Folkman, 1984). In other words, coping is an adaptive process by which an individual utilizes specific strategies to manage unpleasant emotions that result from negative or stressful experiences. On the other hand, engagement in negative coping strategies (e.g., rumination, substance use) have been linked to a host of negative outcomes such as increased levels of depression and poorer health outcomes (Awasthi & Mishra, 2007; Thompson et al., 2010). Although coping is a well-studied construct, there are multiple theoretical perspectives underlying the conceptualization of coping.

Currently, there are two different conceptualizations that are widely discussed in the literature. First, coping is differentiated by emotion and problem-focused coping (Brougham et al., 2009). Emotion-focused coping is the emotional expression of an individual's expectations and reinterpretation in expectations for a negative outcome (Brougham et al., 2009). The goal of emotion-focused coping is to reduce emotional turmoil that occurs in response to a stressor (Lazarus, 1998) and can manifest as positive strategies such as meditation, or negative strategies, such as rumination, denial, self-blame, and overeating (Holton et al., 2016; Pritchard et al., 2007; Thompson et al., 2010). The literature generally associates emotion-focused coping with maladaptive behaviors (Baker & Berenbaum, 2007). Garnefski and Kraaij (2006), for example, found that self-blame, rumination, catastrophizing, along with a lack of positive reappraisal (i.e., reframing an event in a positive manner), were associated with greater levels of depression in adults. Specifically, women who engaged in low levels of adaptive coping and exhibited high levels of rumination, demonstrated greater depressive symptomology (Thompson et al., 2010). Adaptive, emotion-focused strategies include behaviors such as meditation, seeking social support, and positive reappraisal (Garnefski & Kraaij, 2006; Holton et al.,

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2016). Positive reappraisal has been found to be related to lower depressive symptomology among adults and post-traumatic growth among partners of women diagnosed with breast cancer (Garnefski & Kraaij, 2006; Manne et al., 2004). Overall, research indicates that the type of emotion-focused strategy employed impacts the positive or negative nature of the outcome.

In contrast, problem-focused coping is defined as an attempt to change the perceived stressor (Carver et al., 1989; Lazarus, 1998) by engaging in behaviors designed to eliminate or alter the stressor (Brougham et al., 2009). Problem-focused coping includes planning, taking action, and seeking assistance, all which are considered adaptive coping (Carver et al., 1989). Sasaki and Yamasaki (2007), for example, found that college freshmen who engaged in problem-solving in response to a stressor enhanced their ability for adapting to new situations in the future. Thompson et al. (2010) concluded that the use of problem-focused coping may buffer the effects of maladaptive coping. Problem-focused coping is considered to be more adaptive than emotion-focused coping because changing a situation is a way to eliminate or reduce the problem rather than changing the emotional reaction to the problem.

Coping is also conceptualized as approach and avoidant strategies (Littleton et al., 2007; Roth & Cohen, 1986). Similar to problem-focused strategies, approach strategies involve taking action and recognizing when a situation changes in a way that may make it more controllable (Roth & Cohen, 1986). Specifically, behavioral approach strategies were associated with less distress among individuals who had experienced a trauma (Littleton et al., 2007). By contrast, avoidant strategies are those that attempt to reduce stress and anxiety of a negative experience (Roth & Cohen, 1986). Avoidant strategies include focusing on and venting emotions, avoidance, behavioral disengagement (i.e., engaging in other activities instead of solving the problem), and mental disengagement (i.e., avoid thinking about the stressor) (Carver et al., 1989; Evans & Dunn, 1995). Use of avoidant strategies are believed to be more effective for managing uncontrollable situations (e.g., avoiding being evaluated for an untreatable disease reduces anxiety), whereas approach strategies are considered more effective for situations that are within an individual's control (Awasthi & Mishra, 2007; Roth & Cohen, 1986). Women with diabetes who felt in control of their disease utilized approach strategies (Awasthi & Mishra, 2007). On the other hand, women who reported feeling unable to control their diabetes used more avoidant coping strategies, resulting in increased distress.

Thus far, coping has been described in relation to distress. However, there is a portion of literature dedicated to studying eustress, which is defined as healthy results of stressful events (Quick et al., 1997). An example of this includes conducting clinical work as a nursing student (Gibbons, 2010; Gibbons et al., 2008). Eustress is related to enhanced performance and lower emotional exhaustion and burnout (Gibbons et al., 2008; Lazarus, 1993). Therefore, it is important to distinguish between eustress and distress when examining coping strategies among individuals.

In sum, research consistently finds that distress is related to various outcomes, including psychological outcomes such as depression and increased stress (Chao, 2011; Garnefski & Kraaij, 2006; Manne et al., 2004; Thompson et al., 2010). Additionally, coping is also found to be related to resilience (Chen et al., 2018; Smith et al., 2008). However, since these results are based on poor coping measures, it is imperative that a new measure be developed to confirm these results and further the coping literature.

There are a number of limitations of existing coping measures. For example, frequently used scales such as the COPE and Brief COPE only included items based on a priori determined number of factors and/or had poor psychometric properties with subscale alphas below 0.6 (Carver, 1997; Carver et al., 1989). For example, the Brief COPE has three factors with alphas below 0.6 including the acceptance, denial, and venting subscales (Carver, 1997). Further, the COPE questionnaire, which is one of the most frequently used measures of coping, is modified by researchers who include this measure in their studies, which results in various factor structures (Kato, 2015). Other, measures were developed using only college student participants, which limits the generalizability of the scale (Lundqvist & Ahlströmb, 2006; Tobin et al., 1989). For example, the Ways of Coping Questionnaire, the second most widely used coping measure, was unable to replicate the factor structure and psychometric properties even when administered to the same homogenous sample (i.e., college students; Parker et al., 1993). Last, the coping measures in use are outdated as they were developed over 30 years ago. Therefore, these measures could be missing important coping outlets such as the use of social media.

Goals of the Current Study

The aim of this study is to develop a psychometrically sound measure of adult coping (Adult Coping Inventory) using best practices of test development. This measure aims to address many gaps in the literature including a modern coping measure, using a non-homogenous participant sample, and higher psychometric properties. The reliability, convergent, concurrent, and incremental validity of the Adult Coping Inventory (ACI) were examined. It was hypothesized that the total score of the ACI will be moderately correlated with the Brief COPE. Additionally, it was hypothesized that factors on the ACI that measure maladaptive coping will be negatively correlated with the total score on the Brief Resilience Scale. Similarly, the adaptive coping factors of the ACI will be positively correlated with scores on the Brief Resilience Scale. Last, it was expected

that the negative coping strategies will have a strong, positive correlation with scores on the Depression, Anxiety, and Stress Scale and that the positive coping strategies will have a negative correlation with scores on the Depression, Anxiety, and Stress Scale.

Phase 1: Item Generation and Scale Development

Item Generation

The purpose of Phase 1 was to generate a pool of items reflecting an array of coping behaviors. The item pool was generated based on a review of the assessment and treatment literature and existing coping measures.

Procedure

Items were generated by reviewing the relevant literature and current measures of coping. While examining the commonly used coping measures, items that appeared across measures were included in the item pool. Since the wording varied per measure, an inclusive item wording was established. Next, items that appeared in one measure were also included in the item pool. The literature was reviewed for clinical applications of coping skills on Google Scholar and PsychINFO. Items were drawn from positive psychology, dialectical behavior therapy and general stress management techniques. Among all sources, many skills were repeated. The item pool was grouped into categories including behavior activation, mindfulness/relaxation, health, problem-solving and social support. Six clinical and school psychology graduate students with advanced training and two Ph.D. level psychologists reviewed the items for redundancy, clarity and comprehensiveness based on their understanding of the literature and clinical experience.

Results

Results of the item generation procedures yielded a survey of 128 items, rationally derived from the literature and existing measures of coping. The reviewers minimized redundancy and provided feedback about additional items that may be relevant. This process resulted in the pool of 124 items called "Adult Coping Inventory-Pilot".

Phase 2: Initial Factor Structure and Reliability

Participants

Following IRB approval, participants were recruited from a scientific crowdsourcing website, Prolific. A small portion of the participants ($n = 6$) were collected from a local library. The participants included 526 adults in total (M = 45.6%, F = 51.1%, transgender 1.5%, other gender identity 1.7%) between the age of 18–65 who resided in the United States and were able to read and write English. Participants were predominantly White (76.8%) with 8.4% Asian, 8% African American and 5.5% Hispanic/Latino, which is comparable to the 2010 U.S. Census since data collection occurred prior to the 2020 census data collection (Census, 2018). Full demographic information can be found in Table 1.

Measures

Demographic Questionnaire This measure was used to collect descriptive information including age, gender, race, ethnicity, marital status, highest level of education, current occupation, annual household income, and religious affiliation.

Adult Coping Inventory-Pilot The pilot version of the ACI consisted of 124 items generated in Phase 1. Items were rated on a 4-point scale from 0 ("never") to 3 ("always"). Participants were instructed to rate coping skills that they use in their life, not if the coping skill is effective or not.

Procedure

Participant identifiers were specified in Prolific including age 18–64, United States nationality, fluent in English and not pregnant. After the completion of the first data collection, the gender equivalence was heavily skewed to females. Therefore, two additional data collection efforts were made which included identical specifiers as well as being male. Participants provided consent and completed an online questionnaire. Per Prolific's rules, the participants were provided a monetary compensation for their participation at the minimum rate of \$6.50/hour. The questionnaire included the Adult Coping Inventory-Pilot and a Demographic form. Two validity checks were included in the study. If a participant did not pass one or both validity checks, their data was excluded from further analyses. Additionally, Prolific monitors participants accounts and has checks and balances to reduce the likelihood of bots or repeat participants in their studies.

Results

Item Analysis Items endorsed by 40% of the population as "never" were considered for elimination, which suggested low endorsement frequency (Sytsma et al., 2001). Based on this criteria, 39 items were eliminated. Next, item means were examined and those < 1.0 were considered for elimination (Systma et al., 2001). Two additional items were eliminated based on this criterion. Inter-item correlations were examined and those above .8 were considered for

Table 1 Demographic characteristics

	Frequency (N = 526)	Percentage
Gender		
Female	269	51.1
Male	240	45.6
Transgender	8	1.5
Other Gender Identity	9	01.7
Age		
18–25	147	27.9
26–35	176	33.5
36–45	98	18.6
46–60	93	17.7
60+	12	2.3
Race		
White	404	76.8
Asian	44	8.4
Black or African American	42	8.0
American Indian or Alaska Native	5	1
Native Hawaiian or Other Pacific Islander	2	0.4
Hispanic Ethnicity		
Not Hispanic or Latino	473	89.9
Hispanic or Latino	53	10.1
Marital Status		
Single	296	56.3
Living with Partner	230	43.7
Highest Level of Education		
Post-College Degree	71	13.5
College Graduate	192	36.5
Some College	186	35.4
High School Graduate	67	12.7
Less than High School	10	1.9
Annual Income		
0–24,999	130	24.7
25,000–49,000	138	26.2
50,000–99,999	172	32.7
100,000+	86	16.3
Type of Occupation		
White Collar	173	32.9
Unemployed	143	27.2
Blue Collar	91	17.3
Self-Employed	88	16.7
Professional Career	31	5.9
Religious Affiliation		
Religious Affiliation	265	50.5
No Religious Affiliation	261	49.5

elimination (Field, 2017). One item pair met this criterion. These two items were combined into one. This resulted in 82 remaining items.

Exploratory Factor Analysis An exploratory factor analysis was conducted using IBM SPSS to determine the factor structure of the ACI (IBM Corp, 2017). An oblique maximum likelihood analysis was conducted since the underlying latent variables are believed to correlate (DeVellis, 2016) and factor loadings above .4 were specified to be included in the analysis. Scree plots were analyzed for a two-, three-, four-, five- and six-factor model. The five-factor model accounted for much of the variance and demonstrated the cleanest model. The five-factor model includes 57 items and accounts for 39.82% of variance.

As seen in Table 2, Factor 1, Problem Solving, accounted for 19.1% of the variance and included fifteen items related to active approaches to reduce distress. An example item included: "Brainstorm all possible solutions". Factor 2, Mindfulness, accounted for 8.97% of the variance and included sixteen items that describe mindfulness techniques. An example item included: "Visualize being somewhere peaceful". Factor 3, Maladaptive Coping, accounted for 4.97% of the variance and included nine items that describe negative coping strategies. An example item included: "Dwell on the worst outcomes". Factor 4, Social Support, accounted for 4.02% of the variance and included eight items that involve turning to others when distressed. An example item included: "Talk to a friend about the problem". Factor 5, Avoidance, accounted for 2.75% of the variance and included six items that involve avoiding the problem and/or others. An example item included: "Avoid stressful situations".

Reliability Reliability was examined for the total scale and for each factor using Cronbach's alpha. The full scale demonstrated excellent internal consistency ($\alpha = .92$) and the factor's reliability scores range from adequate to excellent (Factor 1 $\alpha = 0.92$; Factor 2 $\alpha = .89$; Factor 3 $\alpha = .86$; Factor 4 $\alpha = .89$; Factor 5 $\alpha = .76$).

Phase 3: Preliminary Validation

Participants

The participants who participated in Phase 2 ($N = 526$) were used to explore initial evidence for construct (convergent, concurrent) validity and incremental validity of the ACI.

Measures

Adult Coping Inventory This is the 57-item measure generated in Phase 2. Items were rated from 0 ("never") to 3 ("always). To calculate the total score of the ACI, all items on the Maladaptive Coping subscale and two

Table 2 Factors and Factor loadings

Items	Factor				
	1	2	3	4	5
Evaluate the possible outcomes of the situation	**.92**	−.21	−.04	−.05	.00
Checking the facts of the situation	**.91**	−.11	−.02	−.05	.03
Brainstorm all possible solutions	**.81**	−.13	.01	.03	.02
Assess the outcome after I used the solution	**.74**	.05	−.03	.02	−.06
Determine whether there is another way to look at the situation	**.71**	.04	.10	.00	.10
If my initial solution, doesn't work, choose a different solution and try it	**.63**	.1	.02	.04	−.05
Stop and think about my response	**.63**	.08	.03	.01	.10
Identify the problem	**.59**	.00	.10	.13	.12
Rate how effective each solution is	**.56**	.19	−.05	−.08	−.06
Identify irrational beliefs	**.55**	.00	−.14	.07	−.12
Plan to use the highest rated solution	**.52**	.24	−.01	−.06	−.06
Think back to past situations for solutions	**.52**	.03	−.28	.02	−.04
Nonjudgmentally accepting the experience	**.49**	.23	.08	-.06	.03
Seek information online about the situation	**.42**	−.05	−.18	.12	−.03
Pretend I am in the other person's shoes	**.41**	.29	−.09	.05	−.06
Visualize myself somewhere peaceful	−.02	**.76**	−.09	−.18	.01
Visualize a place I enjoy	−.00	**.73**	−.06	−.11	.07
Commit to engage in something meaningful and important everyday	.13	**.65**	.02	−.09	−.05
Practice deep breathing	−.06	**.61**	−.13	−.00	−.03
Stretch my muscles	.07	**.60**	−.02	−.13	.02
Do something creative (i.e., paint, arts and crafts)	−.03	**.56**	−.01	−.02	.20
Practice a skill or hobby	.01	**.55**	.01	−.04	.16
Engage in positive self-talk	.13	**.51**	.12	.05	.03
Take a bath or shower	−.12	**.49**	−.15	.05	−.04
Do something nice for someone else	.17	**.48**	−.11	.08	−.04
Clean my house	−.04	**.47**	−.06	.04	.13
Engage in a social activity	−.02	**.47**	.05	.24	−.18
Reward myself for successfully using a solution	.26	**.46**	−.01	.07	−.05
Consume a healthy diet	.18	**.46**	.14	−.04	−.02
Listen to music	−.24	**.45**	−.07	.03	.19
Read a book	.01	**.45**	−.12	−.02	.08
Exercise	.11	**.44**	.09	−.07	−.09
Take a walk	−.01	**.41**	.04	−.03	−.02
Take my frustration out on myself	.04	-.12	**.80**	.08	.16
Dwell on the worst outcome	−.11	.13	**.73**	−.02	.06
Blame myself for the situation	−.09	0.2	**.73**	−.03	.11
Feeling shame/guilt	−.07	−.00	**.69**	−.05	.03
Feeling ignored, criticized or rejected	.03	.08	**.62**	−.18	−.09
Easily annoyed by others	.04	.09	**.52**	−.16	−.13
Go over and over the situation in my mind	−.43	.23	**.51**	.04	−.02
Take my frustration out on others	.08	−.08	**.48**	−.16	.01
Blame others for the situation	.04	.01	**.43**	−.20	−.06
Talk to someone about my feelings around what is bothering me	.03	−.17	−.02	**.91**	.07
Talk about the experience	.09	−.07	.00	**.83**	.03
Talk to someone about what is bothering me	.08	−.13	.02	**.82**	.06
Talk to a friend about the problem	.02	.00	.03	**.75**	.04
Seek reassurance from others	.03	−.04	−.15	**.73**	.07
Venting my emotions	−.02	−.12	−.20	**.64**	.06
Ask for help	.04	.01	−.04	**.59**	−.07

Table 2 (continued)

Items	Factor				
	1	**2**	**3**	**4**	**5**
Talk to someone about something positive	.10	.27	.11	**.45**	.13
Chat with someone online about what is bothering me	−.09	.03	−.11	**.40**	.01
Avoid people or situations that are upsetting	−.09	.16	.12	-.00	**.67**
Leave stressful situation	.08	.03	.14	.12	**.66**
Avoid stressful situations	−.07	.02	.13	.14	**.59**
Avoiding other people	.01	.06	.35	.23	**.51**
Take quiet time to myself	.07	.18	.05	−.01	**.48**
Engage in an activity by myself	.15	.05	−.05	.04	**.46**

Factor 1 = Problem Solving; Factor 2 = Mindfulness; Factor = Maladaptive Coping; Factor 4 = Social Support; Factor 5 = Avoidance

items on the Avoidance subscale were reverse scored. Then, the total score of each factor was summed to create the total score of the ACI. Higher scores indicate more positive coping skills. On the individual subscales, items are not reverse scored resulting in higher subscale scores indicating a higher frequency of items within that subscale.

Depression-Anxiety Stress Scale-21 (**DASS-2**; Lovibond & Lovibond, 1995) The DASS-21 is a 21-item self-report measure of symptoms of depression, anxiety, and stress. The items are ranked on a scale from 0 ("never") to 3 ("almost always) based on how an individual felt over the past week. Higher scores on each subscale indicate increased symptomology. This measure has acceptable internal consistency for depression ($\alpha = .94$), anxiety ($\alpha = .87$), and stress ($\alpha = .91$) (Antony et al., 1998).

Brief Resilience Scale (Smith et al., 2008) The Brief Resilience Scale is a 6-item self-report measure of resilience. Resilience is defined as the ability to recover from stress. Items are rated on a scale from 1 ("Strongly Disagree") to 5 ("Strongly Agree). Item responses are summed, and the mean is taken to form a participant's overall score, with higher scores indicating greater resilience. Cronbach's alphas range from .80–.91 with factor loadings ranging from .68–.91. Test–retest reliability was also found at one month ($\alpha = .69$) and three months ($\alpha = .62$).

Brief COPE (Carver, 1997) The Brief COPE is a 28-item self-report measure that encompasses 14 different coping methods including venting, religion, and denial. Items are rated on a scale from 1 ("not at all") to 4 ("a lot"). The sum of scores on each factor were measured to determine the participants' current coping strategies. Cronbach's alphas range from .50 to .90. For these specific analyses, adaptive and maladaptive coping scales were created following the

procedure outlined in Meyer (2001). The adaptive coping scale has a Cronbach's alpha of .81 and the maladaptive coping scale's Cronbach's alpha is .69.

Procedure

Participants completed the ACI along with the Brief Resilience Scale and the DASS-21 to evaluate concurrent validity. Additionally, participants completed the Brief COPE to determine the convergent validity of the ACI. Then, incremental validity was examined between the ACI and the Brief COPE in predicting resilience, depression, anxiety, and stress.

Statistical Analyses

SPSS Version 25 (IBM Corp. 2017) was used for data analyses. Partial correlations were utilized controlling for age, ethnicity, gender, education level, occupation type, college enrollment, annual income, and religious affiliation. Specifically, partial correlations were conducted to examine the relationship between the Brief Cope, Brief Resilience Scale, and DASS-21 with the ACI. Then, hierarchical regressions were conducted to examine whether the ACI increases the predictive validity above and beyond the Brief COPE.

Results

Convergent Validity Partial correlations were conducted between the ACI and Brief COPE to examine convergent validity of the ACI. The adaptive and maladaptive subscales of the Brief COPE were utilized (Meyer, 2001). There was a significant positive partial correlation between the adaptive coping scale of the Brief COPE and the total score of the ACI ($r(518) = .76$, $p < .01$). Additionally, each factor of the ACI was significantly correlated to the adaptive and maladaptive subscales on the Brief COPE after controlling for various

demographic variables (i.e., age, ethnicity, gender, education level, occupation type, college enrollment, annual income, and religious affiliation). The Problem Solving, Mindfulness and Social Support scales were significantly positively correlated to the adaptive coping scale of the Brief COPE, r (518) = .72, r(518) = .60, r(518) = .65, $p < .01$, respectively. The Maladaptive Coping and Avoidance subscales were positively related to the maladaptive coping scale of the Brief COPE r(518) = .70, r(518) = .29, $p < .01$. Results from the correlational analyses are presented in Table 3.

Concurrent Validity To examine concurrent validity, partial correlations were conducted between the ACI, Brief Resilience Scale and Depression, Anxiety, Stress Scale-21, as shown in Table 3. Maladaptive Coping and Avoidance subscales were found to have a significant negative relationship with the total score of the Brief Resilience Scale as hypothesized, r(518) = −.47, $p < .01$, r(518) = −.14, $p < .01$. Additionally, Maladaptive Coping and Avoidance subscales, which assess negative coping skills, has a significant positive relationship with the Depression (r(518) = .49, r(518) = .14, $p < .01$), Anxiety (r(518) = .43, r(518) = .14, $p < .01$) and Stress Scales (r(518) = .58, r(518) = .20, $p < .01$). Problem Solving and Mindfulness subscales were found to have a significant positive relationship with the total score of the Brief Resilience Scale, r(518) = .26, $p < .01$, r(518) = .23, $p < .01$, respectively. Additionally, Problem Solving, Mindfulness, and Social Support subscales of the ACI, which assesses positive coping skills, had a significant negative relationship with the Depression scale, r(518) = −.15, $p < .01$, r(518) = −.17, $p < .01$, r(518) = −.13, $p < .01$.

There was a strong, positive partial correlation between the adaptive coping scale of the Brief COPE and the total score of the ACI, which was statistically significant, r(518) = .76, $p < .01$. Additionally, the total score of the ACI was significantly positively related to the total score of the Brief Resilience Scale, r(518) = .37, $p < .01$. The total score of the ACI also had a significant negative relationship with the Depression and Stress scales, r(518) = −.32, r(518) = −.14, $p < .01$.

Incremental Validity Incremental validity was examined to determine whether the ACI increased the predictive validity above and beyond the Brief COPE. Hierarchical regression analyses were used to examine this relationship for each outcome variable of interest (i.e., resilience, depression, anxiety, stress). The appropriate control variables were entered in the first step. Then, the appropriate Brief COPE subscale (adaptive or maladaptive) was entered in the second step and the appropriate ACI subscale was entered for the third step of the equation.

For resilience, the overall model was significant on the second step $F(6, 519) = 11.52$, $p < .001$; Adjusted $R^2 = .11$), indicating the Brief COPE adaptive subscale significantly predicted resilience ($\beta = .29$, $t = 6.65$, $p < .001$). The third step, $\Delta F(7, 518) = 15.41$, $p < .001$; $\Delta R^2 = .06$, Adjusted $R^2 = .16$), was also significant, with the ACI total score significantly contributing to the model ($\beta = .37$, $t = 5.86$, $p < .001$) above and beyond the Brief COPE adaptive subscale. Specifically, the ACI explains an additional 8% of variance in resilience scores compared to the Brief COPE.

For depression, the overall model was significant on the second step $F(5, 519) = 40.84$, $p < .001$; Adjusted $R^2 = .31$), indicating the Brief COPE maladaptive subscale significantly predicted depression ($\beta = .52$, $t = 14.04$, $p < .001$). The third step, $\Delta F(7, 518) = 50.92$, $p < .001$; $\Delta R^2 = .09$, Adjusted $R^2 = .40$), was also significant, with the ACI total score significantly contributing to the model ($\beta = −.30$, $t = −8.72$, $p < .001$) above and beyond the Brief COPE maladaptive subscale. Specifically, the ACI explains 9% more variance in depression scores when added to the model.

For anxiety, the overall model was significant on the second step $F(6, 519) = 32.00$, $p < .001$; Adjusted $R^2 = .26$), indicating the Brief COPE maladaptive subscale significantly predicted anxiety ($\beta = .47$, $t = 12.34$, $p < .001$). The third step, $\Delta F(7, 518) = 27.70$, $p < .001$; $\Delta R^2 = .002$, Adjusted $R^2 = .26$, was not significant, indicating the ACI total score did not significantly contributing to the model ($\beta = −.05$, $t = −1.29$, $p < .2$) above and beyond the Brief COPE maladaptive subscale.

Table 3 Validity Partial Correlations

Subscales	ACI: Problem Solving	ACI: Mindfulness	ACI: Maladaptive Coping	ACI: Social Support	ACI: Avoidance	ACI: Total Score
Adaptive Coping	.72**	.60**	.12**	.65**	.29**	.76**
Maladaptive Coping	.11**	.13**	.70**	.21**	.29**	---
Resilience	.26**	.23**	-.47**	.08	−.14**	.37**
Depression	−.15**	−.17**	.49**	−.13**	.14**	−.32**
Anxiety	---	---	.43**	---	.14**	---
Stress	---	---	.58**	---	.19**	−.13**

*Correlation significant at the $p < .05$ level; **Correlation significant at the $p < .01$ level; controlling for age, ethnicity, gender, education level, occupation type, college enrollment, annual income, and religious affiliation

For stress, the overall model was significant on the second step $F(6, 519) = 42.11$, $p < .001$; Adjusted $R^2 = .32$), indicating the Brief COPE maladaptive subscale significantly predicted stress ($\beta = .55$, $t = 15.07$, $p < .001$). The third step, $\Delta F(7, 518) = 38.47$, $p < .001$; $\Delta R^2 = .02$, Adjusted $R^2 = .33$, was also significant, with the ACI total score significantly contributing to the model ($\beta = -.13$, $t = -3.39$, $p < .001$) above and beyond the Brief COPE maladaptive subscale. Specifically, the ACI explains 2% more variance than the Brief COPE for stress.

Discussion

The aim of this study was to develop and initially validate a psychometrically sound measure of adult coping. An exploratory factor analysis was conducted on these items, resulting in a 57-item measure across 5 subscales: Problem Solving, Mindfulness, Social Support, Maladaptive Coping, and Avoidance. These scales were derived empirically rather than confirming an a priori hypothetical factor structure as seen in existing measures. Preliminary results indicate that the Adult Coping Inventory (ACI) has good internal consistency, convergent validity, concurrent validity and incremental validity for resilience, depression, and stress. The internal consistency of the full scale was excellent ($\alpha = 0.95$) and ranged from adequate to excellent for each subscale ($\alpha = 0.76$–0.92). Compared to the Brief COPE, which internal consistency ranged from $\alpha = .50$ to $.90$, the ACI well improves upon these psychometric properties.

During the validation phase, the measure demonstrated excellent convergent validity when compared to the widely used and established measure, the Brief COPE. Although this measure was used to determine convergent validity, the Brief COPE has limitations. Specifically, it has poor psychometric properties and was developed on a homogenous sample. Each subscale of the ACI demonstrated good convergent validity with the maladaptive and adaptive coping scales of the Brief COPE. Results indicate that the ACI was correlated with adaptive coping strategies including Problem Solving, Mindfulness and Social Support. Additionally, the ACI was also correlated with maladaptive coping including Avoidance and Maladaptive Coping generally. Concurrent validity was also demonstrated between the ACI and the Brief Resilience Scale and the Depression, Anxiety, Stress Scale-21. Adaptive coping subscales of the ACI were associated with resilience and a decrease in depression symptomology which is consistent with adaptive coping literature (Steinhardt & Dolbier, 2008). Whereas the maladaptive coping subscales of the ACI were related to a decrease in resilience and an increase in depression, anxiety and stress symptoms which is also consistent with the current coping literature (Steinhardt & Dolbier, 2008). It is important

to note that the ACI total score significantly explains more variance on resilience, depression, and stress than the Brief COPE, indicating good incremental validity. Therefore, this measure appears to provide a psychometrically sound instrument with updated items.

This study supports the growing evidence that coping may not be a two-dimensional construct. Consistent with the ACI, well validated measures of coping in childhood also include more than two factors (Mayberry et al., 2009). The ACI demonstrates 5 factors with good psychometric properties that assess coping. Due to the link between poor coping and other negative health outcomes, (i.e., depression and stress), examining the multiple factors within coping can provide more specific treatment considerations (Chao, 2011; Garnefski & Kraaij, 2006; Thompson et al., 2010). The ACI can provide more detailed information about the different mechanisms of coping for future researchers.

While the ACI demonstrated adequate psychometric properties, there are limitations to be considered and addressed in future research. First, although this sample consisted of a general adult population, the data were collected on a crowdsourcing website. Therefore, there may be characteristics of this population that may not be generalizable to other individuals due to these participants taking the initiative to sign up for this website in order to complete research studies. Despite being a diverse population on many factors (e.g., gender, age, income), this was not a community-based sample. Therefore, it is unclear how this sample generalizes to a community sample. Additionally, although the participant sample is diverse, the majority of the sample is white and college educated. However, compared to the other coping measures, this sample is more diverse and is comparable to the 2010 U.S. Census (Census, 2018). Lastly, the order of the measures given to participants was not counterbalanced which could have impacted participants' responding on latter measures due to fatigue. Therefore, future studies should consider counterbalancing the measures to determine validity and reliability estimates.

A confirmatory factor analysis is needed to provide further support for factor and item retention demonstrated by the exploratory factor analysis. Additionally, reliability and validity analyses should also be conducted in an independent sample. This will aid in determining whether the current structure should be maintained. Additionally, examining the discriminant validity and test–retest reliability should be considered in future studies.

Future research should explore the clinical utility of this assessment tool. Given the preliminary correlations between coping skills with depression and anxiety, this suggests a need to explore the use of this tool within clinical populations to further support generalizability and clinical utility.

In summary, these results suggest that the ACI demonstrates appropriate initial validity and reliability and is a

promising new measure for use with adults. The measure improves upon existing coping tools by exhibiting higher psychometric properties and by use on a less homogeneous population.

Declarations

Ethical Approval The questionnaire and methodology for this study was approved by the Human Research Ethics committee of Louisiana State University #E11975.

Consent to Participate Informed consent was obtained from all individual participants included in the study. Patients signed informed consent regarding publishing their data.

Conflicts of Interest Kristen Hollas, Kelsey Coulthard, Jennifer Piscitello, and Mary Lou Kelley certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

References

Antony, M. M., Bieling, P. J., Cox, B. J., Enns, M. W., & Swinson, R. P. (1998). Psychometric properties of the 42-item and 21-item versions of the depression anxiety stress scales in clinical groups and a community sample. *Psychological Assessment, 10*(2), 176.

Awasthi, P., & Mishra, R. C. (2007). Role of coping strategies and social support in perceived illness consequences and controllability among diabetic women. *Psychology and Developing Societies, 19*(2), 179–197.

Baker, J. P., & Berenbaum, H. (2007). Emotional approach and problem-focused coping: a comparison of potentially adaptive strategies. *Cognition and Emotion, 21*(1), 95–118. https://doi.org/10.1080/02699930600562276

Brougham, R. R., Zail, C. M., Mendoza, C. M., & Miller, J. R. (2009). Stress, sex differences, and coping strategies among college students. *Current Psychology, 28*(2), 85–97. https://doi.org/10.1007/s12144-009-9047-0

Carver, C. S. (1997). You want to measure coping but your protocol's too long: Consider the brief cope. *International Journal of Behavioral Medicine, 4*(1), 92.

Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: a theoretically based approach. *Journal of Personality and Social Psychology, 56*(2), 267.

Census. (2018). *Quick Facts.* Census.gov. https://www.census.gov/quickfacts/fact/table/US/PST045218

Chao, R. C. L. (2011). Managing stress and maintaining well-being: Social support, problem-focused coping, and avoidant coping. *Journal of Counseling & Development, 89*(3), 338–348.

Chen, K. J., Yang, C. C., & Chiang, H. H. (2018). Model of coping strategies, resilience, psychological well-being, and perceived health among military personnel. *Journal of Medical Sciences, 38*(2), 73.

DeVellis, R. F. (2016). *Scale Development: Theory and Applications* (Vol. 26). Sage publications.

Evans, D. M., & Dunn, N. J. (1995). Alcohol expectancies, coping responses and self-efficacy judgments: a replication and extension of Copper et al.'s 1988 study in a college sample. *Journal of Studies on Alcohol, 56*(2), 186–193.

Field, A. (2017). *Discovering statistics using IBM SPSS statistics: North American edition.* Sage.

Garnefski, N., & Kraaij, V. (2006). Relationships between cognitive emotion regulation strategies and depressive symptoms: a comparative study of five specific samples. *Personality and Individual Differences, 40*(8), 1659–1669. https://doi.org/10.1016/j.paid.2005.12.009

Gibbons, C. (2010). Stress, coping and burn-out in nursing students. *International Journal of Nursing Studies, 47*(10), 1299–1309.

Gibbons, C., Dempster, M., & Moutray, M. (2008). Stress and eustress in nursing students. *Journal of Advanced Nursing, 61*(3), 282–290.

Holton, M. K., Barry, A. E., & Chaney, J. D. (2016). Employee stress management: an examination of adaptive and maladaptive coping strategies on employee health. *Work, 53*(2), 299–305. https://doi.org/10.3233/WOR-152145

IBM Corp. (2017). IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.

Kato, T. (2015). Frequently used coping scales: a meta-analysis. *Stress and Health, 31*(4), 315–323. https://doi.org/10.1002/smi.2557

Lazarus, R.S. (1993) From psychological stress to the emotions: a history of changing outlooks. In: L. W. Porter, & M. R. Rosenzweig (Eds.), *Annual Review of Psychology*, *44*, 1–21.

Lazarus, R. S. (1998). Coping with aging: Individuality as a key to understanding. In: I. H. Nordhus, G. R. VandenBos, S. Berg, & P. Fromholt (Eds.), *Clinical Geropsychology*, (pp. 109–127). Washington, DC: American Psychological Association. https://doi.org/10.1037/10295-007

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping.* Springer Publishing Company.

Littleton, H., Horsley, S., John, S., & Nelson, D. V. (2007). Trauma coping strategies and psychological distress: a meta-analysis. *Journal of Traumatic Stress: Official Publication of the International Society for Traumatic Stress Studies, 20*(6), 977–988.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the depression anxiety stress scales (DASS) with the Beck depression and anxiety inventories. *Behaviour Research and Therapy, 33*(3), 335–343. https://doi.org/10.1016/0005-7967(94)00075-U

Lundqvist, L. O., & Ahlström, G. (2006). Psychometric evaluation of the ways of coping questionnaire as applied to clinical and nonclinical groups. *Journal of Psychosomatic Research, 60*(5), 485–493. https://doi.org/10.1016/j.jpsychores.2005.08.019

Manne, S., Ostroff, J., Winkel, G., Goldstein, L., Fox, K., & Grana, G. (2004). Posttraumatic growth after breast cancer: Patient, partner, and couple perspectives. *Psychosomatic Medicine, 66*(3), 442–454. https://doi.org/10.1097/01.psy.0000127689.38525.7d

Mayberry, D., Steer, S., Reupert, A., & Goodyear, M. (2009). The kids coping scale. *Stress and Health, 25*(1), 31–40.

Meyer, B. (2001). Coping with severe mental illness: Relations of the Brief COPE with symptoms, functioning, and well-being. *Journal of Psychopathology and Behavioral Assessment, 23*(4), 265–277.

Parker, J. D., Endler, N. S., & Bagby, R. M. (1993). If it changes, it might be unstable: Examining the factor structure of the ways of coping questionnaire. *Psychological Assessment, 5*(3), 361. https://doi.org/10.1002/per.2410060502

Pritchard, M. E., Wilson, G. S., & Yamnitz, B. (2007). What predicts adjustment among college students? A longitudinal panel study. *Journal of American College Health, 56*(1), 15–22. https://doi.org/10.3200/JACH.56.1.15-22

Quick, J. C., Quick, J.D., Nelson, D. K., & Hurrell, J. J. (1997). Preventive stress management in organizations. Washington, DC, American Psychological Association.

Roth, S., & Cohen, L. J. (1986). Approach, avoidance, and coping with stress. *American Psychologist, 41*(7), 813.

Sasaki, M., & Yamasaki, K. (2007). Stress coping and the adjustment process among university freshmen. *Counselling Psychology Quarterly, 20*(1), 51–67. https://doi.org/10.1080/09515070701219943

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: Assessing the ability to bounce back. *International Journal of Behavioral Medicine, 15*(3), 194–200. https://doi.org/10.1080/10705500802222972

Steinhardt, M., & Dolbier, C. (2008). Evaluation of a resilience intervention to enhance coping strategies and protective factors and decrease symptomatology. *Journal of American College Health, 56*(4), 445–453.

Sytsma, S. E., Kelley, M. L., & Wymer, J. H. (2001). Development and initial validation of the Child Routines Inventory. *Journal of Psychopathology and Behavioral Assessment, 23*(4), 241–251. https://doi.org/10.1023/A:1012727419873

Thompson, R. J., Mata, J., Jaeggi, S. M., Buschkuehl, M., Jonides, J., & Gotlib, I. H. (2010). Maladaptive coping, adaptive coping, and depressive symptoms: Variations across age and depressive state. *Behaviour Research and Therapy, 48*(6), 459–466. https://doi.org/10.1016/j.brat.2010.01.007

Tobin, D. L., Holroyd, K. A., Reynolds, R. V., & Wigal, J. K. (1989). The hierarchical factor structure of the coping strategies inventory. *Cognitive Therapy and Research, 13*(4), 343–361. https://doi.org/10.1007/BF01173478