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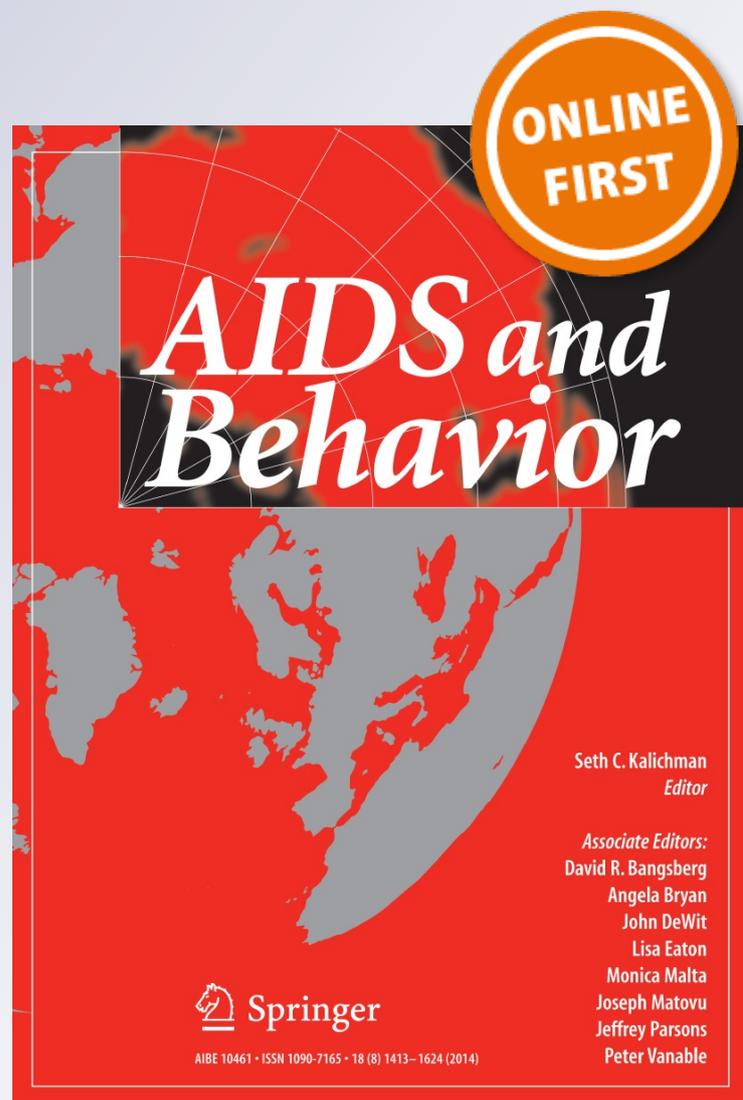
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# Cultural Adaptation of the Brief COPE for Persons Living with HIV/AIDS in Southern India

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**Abstract** Physical and psychological stressors of HIV infection demand adequate coping responses from persons living with HIV/AIDS (PLHA) and coping strategies may vary by cultural context. The Brief COPE is a well validated scale that has been used extensively to assess coping with cancer, depression, and HIV infection in other settings, but never in India. In this study we translated and validated the 28 item Brief COPE among 299 PLHA in South India, assessing reliability, validity, and cultural appropriateness. Although the original scale demonstrated acceptable internal consistency ( $\alpha = 0.70$ ) and good convergent validity with depression, the test–retest reliability was marginal (test–retest = 0.6) and the original factor structure demonstrated poor fit in a confirmatory factor analysis (CFA). An exploratory factor analysis yielded a 16 item scale with five factors (active planning, social support, avoidant emotions, substance use, religion). A second CFA demonstrated good model fit and acceptable reliability ( $\alpha = 0.61$ ) of the adapted scale.

**Keywords** HIV · Coping · India · PLHA · Brief COPE

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## Introduction

Approximately 1.5 million people in India live with HIV/AIDS [1] and it has one of the highest burdens of HIV-infected persons in the world [2]. HIV care and treatment programmes have improved tremendously over the years and, since the initiation of free anti-retroviral treatment (ART) in government health facilities in 2004, the number of infected persons accessing care has dramatically increased. In Tamil Nadu alone, one of six high prevalence states in India, nearly 70,000 persons were on ART in 2012–2013 [3]. Although access to ART has extended lives, persons living with HIV/AIDS (PLHA) continue to experience difficulties coping with their infection. Many of these difficulties are similar to those experienced by persons suffering from other chronic illnesses (e.g., compromised quality of life, side-effects from treatment, challenges in adhering to therapy, fear of death), and these stressors can have detrimental effects on mental health and hasten disease progression [4, 5]. Added to the general stress of dealing with a chronic disease is the HIV-associated stigma and discrimination that is pervasive in many settings, particularly in India.

Whether stress produces poor physical or mental health depends on an individual's engagement in one or more coping strategies [6]. Coping has been defined as an effort to deal with demands that tax or exceed the resources of the person [7] and effective coping mechanisms may counteract stressors, reducing their impact on disease progression. Skinner et al. [8] identified 400 different coping responses, all of which can be broadly classified as problem-focused or emotion-focused. Problem-focused coping (e.g., planning, seeking information) involves efforts to alter the stressful situation [9], is generally considered adaptive and is associated with positive adjustment after

stressful events [10]. Emotion-focused coping is aimed at reducing the distress caused by the situation and includes both active (e.g., seeking social support, focusing on positive aspects of the situation) and avoidant strategies (e.g., denial, alcohol abuse) [11]. While active emotion-focused coping behaviors are considered adaptive and avoidant emotion-focused coping is considered maladaptive [12, 13], the two are not mutually exclusive [14]. Maladaptive coping strategies have been associated with behaviors that adversely impact health including substance use, and poor eating habits [15, 16] and, of particular relevance to HIV-infection, increased sexual risk behavior [17, 18]. Adaptive coping by PLHA, in contrast, is associated with fewer depressive symptoms, slower disease progression [19] and greater life satisfaction [20]. This suggests that interventions to help PLHA adopt adaptive coping strategies may have beneficial impacts, but their development requires a culturally relevant understanding of coping strategies and effective tools to measure change.

Most scales to measure coping have been developed in Western settings, raising concerns about their applicability and relevance to the Indian cultural context. A person's culture, beliefs and norms influence coping goals, responses and outcomes [7, 21, 22]. Culture also defines stressors, emotional responses, and the language used to describe them [23]. Therefore, the construct of effective adaptive coping, the strategies used to cope effectively, and the language to articulate this may differ across cultural contexts. This makes cultural adaptation of measurement tools an essential precursor to understanding how Indian PLHA cope with HIV infection.

Although several qualitative studies have explored how PLHA in India cope with stigma and discrimination, disclosure of their HIV status, and mental health concerns [24–26], only a few have evaluated coping strategies using quantitative scales [27–29]. The 28 item Brief COPE [30] is an abridged version of the 60 item COPE inventory [31], based on Lazarus' transactional model of stress [7] and Carver and Scheiers' behavioural self-regulation model [32, 33]. The Brief COPE has been used to assess coping styles for many conditions including aging [34], breast cancer [35], depression [36] and HIV [37, 38], but has not been used in India. Given this, and the need for validated scales to measure coping behaviours of PLHA in India, we adapted the Brief COPE to the South Indian cultural context and identified dimensions of coping utilized by PLHA in this setting.

## Methods

We engaged in a six-step process to culturally adapt and validate the Brief COPE. Steps included (1) assessment of

face and content validity; (2) translation into Tamil (the local language), back translation and cognitive interviewing; (3) assessment of reliability and convergent validity of the original scale; (4) confirmatory factor analysis (CFA) of the original scale, (5) exploratory factor analysis (EFA) to assess the relevance of the factor structure to the Indian context, and (6) CFA, reliability and convergent validity assessment of a revised, adapted scale.

## Participants

Between June 2011 and August 2012, Tamil-speaking men and women aged 18–49 attending the ART clinic at the Rajiv Gandhi Government General Hospital in Chennai were recruited for the study. Potential participants were approached in the waiting area of the clinic and briefed about the study by one of the research staff. Eligible and interested participants who were literate provided written informed consent. The consent form was read to non-literate persons and those who could write signed their name; those who could not write affixed their thumb impression on the consent form. Individuals who participated in the test–retest reliability assessment of the Brief COPE questionnaire were contacted after 10–14 days for re-administration of the questionnaire. Subsequently 299 individuals were administered a structured questionnaire by trained raters. All participants could opt-out of any question they did not want to answer, and all were compensated Rs. 200 (USD4) for their time. Ethical clearance for this study was obtained from the Christian Medical College, (CMC), Vellore and the University of Washington.

## Measures

### *Sociodemographic and Clinical Characteristics*

We collected data on age, marital status, education, occupation and living situation (alone, with family or with friends). Other HIV-related information, including mode of transmission, timing of diagnosis, medication history and adherence to ART were also collected.

### *Brief COPE*

The Brief COPE can be used to assess trait coping (the usual way people cope with stress in everyday life) and state coping (the way people cope with a specific stressful situation). We used the state coping format which asked individuals to report their coping behaviour since their HIV diagnosis. The scale consists of 14 subscales with two items per subscale measuring *active coping*, *planning*, *positive reframing*, *acceptance*, *humor*, *religion*, *use of emotional support*, *use of instrumental support*,

*self-distraction, denial, venting, substance use, behavioral disengagement, and self-blame.* Cronbach's alphas for the Brief COPE sub-scales range from 0.50 to 0.90. Questions such as, "I've been taking action to try to make the situation better" measure active coping and others like "I've been expressing my negative feelings" measure venting. The items are scored along a 4-point scale with four response options: *I usually don't do this at all; I usually do this a little bit; I usually do this a medium amount; I usually do this a lot*, with higher scores indicating greater use of a specific coping strategy. The first eight scales (*active coping, planning, positive reframing, acceptance, humor, religion, use of emotional support, use of instrumental support*) were grouped together as adaptive coping strategies, and the latter six scales (*self-distraction, denial, venting, substance use, behavioral disengagement, and self-blame*) were considered maladaptive coping strategies [39, 40].

#### *Clinical Interview Schedule Revised*

We used the Clinical Interview Schedule-Revised (CIS-R) to measure depression. The CIS-R is a standardized semi-structured interview and was administered in Tamil by either a psychiatrist or a psychologist. A scoring algorithm provided International Classification of Diseases-10 Primary Care (ICD-10 PC) diagnoses [41] which were used to classify individuals as having depressive symptoms or not. Individuals diagnosed with severe, moderate, or mild depression, as well as those with diagnoses of mixed anxiety and depression on the CIS-R were considered 'depressed' in analyses of convergent validity.

#### *Face and Content Validity*

To ascertain face validity, the English version of the Brief COPE was given to an Indian psychiatrist who reviewed it to determine if the questions were appropriate to the target audience in the Indian setting. Content validity was determined by two study investigators (RM and SK) and a psychiatrist who reviewed each item to check for relevance and representativeness to the construct of coping in the Indian cultural context. Cognitive interviews with 15 PLHA were conducted to confirm content validity.

#### *Translation*

Items in the Brief COPE were translated into Tamil by members of the research team who speak the language and belong to the same culture as the target population. The translation process aimed to achieve semantic equivalence (e.g., words and sentence structure in the translated text express the same meaning as the source language);

conceptual equivalence (e.g., concept measured is the same across groups, despite differences in wording); and normative equivalence (e.g., translated text addresses social norms that differ across cultures) rather than literal translation. The translated version of the questionnaire was then back translated into English by an independent translator who was not part of the research team and compared for equivalence to the English version. Discrepancies were reconciled by the research team. Based on our previous research experience with participants of similar literacy level, we used a visual scale in conjunction with the Likert-scale response options and assigned numbers to each ( $1 = I$  usually don't do this at all;  $2 = I$  usually do this a little bit;  $3 = I$  usually do this a medium amount;  $4 = I$  usually do this a lot) to facilitate comprehension of the increasing intensity of the response options.

#### *Analyses of the Brief COPE*

##### *Cognitive Interviewing*

To assess how respondents understood and interpreted the items in the questionnaire and identify culturally relevant language to describe coping strategies, we carried out cognitive interviews with 15 respondents who were representative of the target population. Each item was read to respondents who were asked about their understanding of the questions; the meaning of each item and whether it would be applicable to them and other PLHA; whether it made them feel uncomfortable or could be misunderstood; and whether there was a better way of asking about the concept. Based on the responses provided by respondents, the initial translation was modified and finalized.

##### *Reliability*

To assess reliability, the Brief COPE was administered to a sample of 63 HIV positive men and women and subsequently re-administered after a gap of 10–14 days. Test-retest reliability was assessed by calculating the intra class correlation coefficient (ICC) for responses obtained at the two time points, where 0.60 was considered marginal, 0.70 acceptable and anything over 0.80 was considered high correlation [42]. To assess internal consistency, we calculated Cronbach's alpha, overall and for each subscale, considering alpha values 0.70 and higher indicative of good internal consistency [42].

##### *Convergent Validity*

Convergent validity of the Brief COPE was assessed by evaluating the relationship of the scale with a theoretically related variable. Given the association between coping and

depression [43, 44], we assessed convergent validity by evaluating the relationship between coping styles (adaptive and maladaptive) and depression as measured by the CIS-R, by comparing mean scores for depressed and not depressed individuals. Statistical significance was assessed by the Student's *t* test.

### Confirmatory Factor Analysis

Confirmatory factor analysis of the original 28 item Brief COPE scale was performed on the entire sample of 299 participants using the original 14 factor structure to evaluate the fit of each subscale for the Indian population. The root mean square error of approximation (RMSEA) was calculated, with a goal of 0.05 for good model fit [45]. Bentler's comparative fit index (CFI) was computed with a cut point of 0.95 set for good model fit [46, 47] and Cronbach's alpha was calculated for each of the sub-scales.

### Exploratory Factor Analysis

After the CFA, an exploratory factor analysis (EFA) of the original Brief COPE with 14 sub-scales was carried out using the principal-components factor extraction method with a varimax rotation to test the loading strength of the items on the factors. The eigenvalue was fixed at 1.5 and factor loading lambda at 0.5 in the EFA to guide item retention. In addition, items that were not relevant to the Indian cultural context, (as determined by cognitive interviews and the cultural knowledge of the Indian investigators, RM and SK) were considered for removal.

### Analyses of the Abridged Scale

A second CFA was conducted to assess the fit of the abridged scale and a Chi square test for goodness of fit was used to assess fit between the models for the original 28-item scale and the revised scale. Cronbach's alpha was calculated for each sub-scale as well as the overall scale. Convergent validity of the abridged scale was assessed in the same manner as described above.

## Results

### Face and Content Validity

With only two exceptions, the Indian psychiatrist and psychologist judged the items in the Brief COPE as appropriate and relevant to the construct of coping among South Indian persons infected with HIV. Two items which expressed coping behaviour through use of humour, "I've been making jokes about it" and "I've been making fun of

the situation" were deemed not culturally relevant, but were retained to allow us to explore how people responded to them during the cognitive interviews and to maintain the integrity of the original Brief COPE scale for the EFA.

Information gleaned during the cognitive interviews resulted in minor changes in the choice of Tamil words, typically simpler terms that were incorporated in the final scale. With regard to the two items on coping through humour, most participants said that HIV is a serious condition hence, 'making jokes' and 'making fun of the situation' was not appropriate. They suggested alternate Tamil words that toned down the humour aspect of it. When back-translated to English these items meant "I've been taking the situation lightly" and "I've been taking the situation humorously". Similarly, one item under the denial sub-scale, "I have been saying to myself "this isn't real"" also tended to be misunderstood and most participants felt that this was inappropriate in the Indian culture. The respondents found the response scales simple and easy to understand and the visual presentation of the response scale was reported to improve understanding for non-literate participants.

### Reliability

Fifty-four of the 63 participants (85.7 %) who participated in the validation phase completed the test-retest phase. The ICC for the 28 item Brief COPE scale was 0.60 (95 % CI 0.38–0.75), indicating marginal test-retest reliability. The Cronbach's alpha for the overall Brief COPE was 0.70 indicating good consistency among the items. The alphas for the 14 sub-scales ranged from 0.44 to 0.89, with the lowest alpha for the behavioural disengagement subscale and the highest for the substance use subscale. Despite the fact that the scales had only two items each, the alphas for 11 of the 14 sub-scales were >0.5 [48].

### Socio-demographic Characteristics

The socio-demographic characteristics of the 299 participants who completed the full interview are presented in Table 1. An equal proportion of men ( $n = 150$ ) and women ( $n = 149$ ) were enrolled and the mean age was 36.4 (SD  $\pm$  5.9) years, with men significantly older than women (mean age 38.1 (SD  $\pm$  5.7) vs. 34.7 (SD  $\pm$  5.9),  $p < 0.001$ ). The vast majority of respondents were living with their families and overall literacy was high (87 %). Relative to men, women were less likely to be married or employed, and somewhat more likely to have a recent diagnosis of HIV. Women were also more likely to report they had acquired HIV through sexual contact, whereas men were more likely to say they did not know how they became infected. Only 8 % were classified as AIDS patients, with CD4 counts <200 cells/ $\mu$ l.

**Table 1** Socio-demographic characteristics by gender

Characteristics	Total (N = 299)		Gender				p value
			Male (n = 150)		Female (n = 149)		
	n	%	n	%	n	%	
<i>Marital Status</i>							
Married	194	64.9	119	79.3	75	50.3	0.000
Single	27	9.0	27	18.0	–	–	
Separated	17	5.7	2	1.3	15	10.1	
Widowed	61	20.4	2	1.3	59	39.6	
<i>Age (Years)</i>							
36.4 ± 5.9			38.1 ± 5.7		34.7 ± 5.9		
≤30	54	18.1	17	11.3	37	24.8	0.000
31–35	79	26.4	32	21.3	47	31.5	
36–40	83	27.8	40	26.7	43	28.9	
>40	83	27.8	61	40.7	22	14.8	
<i>Education</i>							
No education	39	13.0	19	12.7	20	13.4	0.539
Primary school	50	16.7	23	15.3	27	18.1	
Secondary school	165	55.2	81	54.0	84	56.4	
Higher secondary	21	7.0	11	7.3	10	6.7	
College and above	24	8.0	16	10.7	8	5.4	
<i>Living situation</i>							
I live alone	13	4.4	10	6.7	3	2.0	0.022
I live with my own family	209	69.9	109	72.7	100	67.1	
I live with my parents or in-laws	76	25.4	30	20.0	46	30.9	
I live with friends	1	0.3	1	0.7	–	–	
<i>Employed</i>							
Yes	232	77.6	142	94.7	90	60.4	0.000
No	67	22.4	8	5.3	59	39.6	
<i>Type of work (among those employed)</i>							
Unskilled	118	50.9	56	39.4	62	68.9	0.000
Skilled	59	25.4	54	38.0	5	5.6	
Business	12	5.2	8	5.6	4	4.4	
Professional	19	8.2	16	11.3	3	3.3	
Working in a positive network	8	3.4	3	2.1	5	5.6	
Other	16	6.9	5	3.5	11	12.2	
<i>Income (INR/month)</i>							
≤4000	100	33.4	34	22.7	66	44.3	0.001
4001–6000	86	28.8	52	34.7	34	22.8	
6001–8000	43	14.4	26	17.3	17	11.4	
>8000	70	23.4	38	25.3	32	21.5	
<i>Time since HIV diagnosis</i>							
6 months to 1 year ago	33	11.0	11	7.3	22	14.8	
1–5 years ago	132	44.2	66	44.0	66	44.3	0.094
> 5 years ago	134	44.8	73	48.7	61	40.9	
<i>HIV support network participant</i>							
Yes	57	19.1	28	18.7	29	19.5	0.861

**Table 1** continued

Characteristics	Total (N = 299)		Gender				p value
			Male (n = 150)		Female (n = 149)		
	n	%	n	%	n	%	
No	242	80.9	122	81.3	120	80.5	
<i>Mode of HIV infection</i>							
Intravenous drug use	11	3.7	11	7.3	–	–	0.000
Sexual contact	197	65.9	73	48.7	124	83.2	
Contaminated blood	18	6.0	9	6.0	9	6.1	
Don't know	73	24.4	57	38.0	16	10.7	

**Table 2** Correlation of Brief COPE scores with CIS-R depression diagnosis

	CIS-R (mean score ± SD)		p value
	Depressed* (n = 74)	Not depressed (n = 223)	
<i>Full Brief COPE</i>			
Maladaptive coping	1.965 ± 0.378	1.755 ± 0.338	<0.001
Adaptive coping	2.671 ± 0.440	2.736 ± 0.437	0.267
<i>Revised Brief COPE</i>			
Maladaptive coping	1.761 ± 0.479	1.522 ± 0.403	<0.001
Adaptive coping	2.735 ± 0.554	2.821 ± 0.487	0.239

\* Depression diagnosis includes severe, moderate, mild depression, and mixed anxiety and depression (MAD)

Analyses of Brief COPE

*Convergent Validity*

The overall mean score for the maladaptive coping domain was 1.81 (±0.36) with a range of 1.08–3.08; it was 2.72 (±0.44) for adaptive coping (range 1.69–3.94). Literate individuals scored somewhat higher on the adaptive coping domain (2.74 ± 0.44 vs. 2.59 ± 0.44, *p* = 0.05). Mean maladaptive coping scores were significantly higher among individuals with depression than among those without depression (1.97 (±0.38) vs. 1.76 (±0.34, *p* < 0.001; Table 2), suggesting the Brief COPE was appropriately capturing the construct of coping in the Indian cultural context. AIDS status did not influence responses.

*Confirmatory Factor Analysis*

The CFA of the 28 item scale suggested poor model fit with the original subscale structure. The Chi square statistic had

**Table 3** Fit statistics from confirmatory factor analysis of the original and revised Brief COPE scales, overall and by domain

Model fit statistics	Original scale	Revised scale
<b>Overall</b>		
Number of items	28	16
<i>p</i> value	0.0001	0.283
RMSEA	0.094	0.029
Bentler's CFI	0.578	0.924
Cronbach's Alpha	0.698	0.611
<b>Factor 1</b> Active coping		
Number of items	2	4
<i>p</i> value	–	0.060
RMSEA	0.000	0.078
Bentler's CFI	0.798	0.978
Cronbach's alpha	0.240	0.620
<b>Factor 2</b> Planning		
Number of items	2	4
<i>p</i> value	–	0.066
RMSEA	0.000	0.076
Bentler's CFI	0.975	0.980
Cronbach's alpha	0.526	0.670
<b>Factor 3</b> Positive reframing		
Number of items	2	4
<i>p</i> value	–	0.106
RMSEA	0.000	0.065
Bentler's CFI	0.987	0.985
Cronbach's alpha	0.654	0.606
<b>Factor 4</b> Acceptance		
Number of items	2	2
<i>p</i> value	–	–
RMSEA	0.000	0.000
Bentler's CFI	0.997	0.997
Cronbach's alpha	0.913	0.913
<b>Factor 5</b> Humor		
Number of items	2	2
<i>p</i> value	–	–
RMSEA	0.000	0.000
Bentler's CFI	0.967	0.995
Cronbach's alpha	0.479	0.810
<b>Factor 6</b> Religion		
Number of items	2	–
<i>p</i> value	–	–
RMSEA	0.000	–
Bentler's CFI	0.987	–
Cronbach's alpha	0.646	–
<b>Factor 7</b> Use of emotional support		
Number of items	2	–

**Table 3** continued

Model fit statistics	Original scale	Revised scale
<i>p</i> value	–	–
RMSEA	0.000	–
Bentler's CFI	0.648	–
Cronbach's alpha	0.191	–
<b>Factor 8</b> Use of instrumental support		
Number of items	2	–
<i>p</i> value	–	–
RMSEA	0.000	–
Bentler's CFI	0.935	–
Cronbach's alpha	0.375	–
<b>Factor 9</b> Self-distraction		
Number of items	2	–
<i>p</i> value	–	–
RMSEA	0.000	–
Bentler's CFI	0.921	–
Cronbach's alpha	0.348	–
<b>Factor 10</b> Denial		
Number of items	2	–
<i>p</i> value	–	–
RMSEA	0.000	–
Bentler's CFI	0.943	–
Cronbach's alpha	0.394	–
<b>Factor 11</b> Venting		
Number of items	2	–
<i>p</i> value	–	–
RMSEA	0.000	–
Bentler's CFI	0.976	–
Cronbach's alpha	0.537	–
<b>Factor 12</b> Substance use		
Number of items	2	–
<i>p</i> value	–	–
RMSEA	0.000	–
Bentler's CFI	0.927	–
Cronbach's alpha	0.350	–
<b>Factor 13</b> Behavioral disengagement		
Number of items	2	–
<i>p</i> value	–	–
RMSEA	0.000	–
Bentler's CFI	0.995	–
Cronbach's alpha	0.810	–
<b>Factor 14</b> Self-blame		
Number of items	2	–
<i>p</i> value	–	–
RMSEA	0.000	–
Bentler's CFI	0.991	–
Cronbach's alpha	0.724	–

**Table 4** Factor Loadings from exploratory factor analysis of the brief COPE

Items in Brief COPE	Factor loadings				
	F1	F2	F3	F4	F5
I've been concentrating my efforts on doing something about the situation I'm in	0.706	0.052	0.068	0.090	0.086
I've been taking action to try to make the situation better	0.666	0.149	0.075	-0.027	0.007
I've been trying to come up with a strategy about what to do	0.658	0.080	-0.036	0.011	0.019
I've been thinking hard about what steps to take	0.492	0.289	0.080	-0.001	-0.045
I've been looking for something good in what is happening	0.461	0.323	0.167	-0.107	0.007
I've been accepting the reality of the fact that it has happened	0.461	-0.302	-0.057	0.032	-0.051
I've been trying to see it in a different light, to make it seem more positive	0.459	0.166	0.051	0.170	0.047
I've been learning to live with it	0.349	-0.006	-0.133	0.039	0.030
I've been trying to get advice or help from other people about what to do	0.126	0.662	0.037	0.057	0.072
I've been getting help and advice from other people	0.149	0.627	-0.039	0.054	-0.018
I've been getting comfort and understanding from someone	0.079	0.610	-0.077	0.050	-0.198
I've been getting emotional support from others	0.115	0.546	-0.099	0.085	0.030
I've been blaming myself for things that happened	0.072	-0.192	0.688	0.164	0.033
I've been criticizing myself	0.027	-0.191	0.672	0.096	-0.025
I've been expressing my negative feelings	-0.030	0.069	0.586	0.085	-0.082
I've been refusing to believe that it has happened	0.024	0.339	0.559	-0.092	0.031
I've been saying to myself "this isn't real."	-0.125	0.370	0.515	0.029	0.162
I've been saying things to let my unpleasant feelings escape	0.215	0.185	0.402	0.213	-0.099
I've been giving up trying to deal with it	-0.003	-0.165	0.372	0.038	-0.024
I've been giving up the attempt to cope	-0.353	0.009	0.366	-0.027	-0.095
I've been using alcohol or other drugs to help me get through it	0.032	-0.165	0.070	0.847	0.060
I've been using alcohol or other drugs to make myself feel better	0.009	-0.151	0.019	0.845	0.106
I've been making fun of the situation	0.159	0.093	0.110	0.567	0.031
I've been making jokes about it	0.045	0.212	0.059	0.452	-0.101
I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping	-0.035	0.206	0.098	0.364	-0.040
I've been praying or meditating	0.104	-0.016	0.000	-0.052	0.882
I've been trying to find comfort in my religion or spiritual beliefs	0.140	0.057	-0.032	0.014	0.876
I've been turning to work or other activities to take my mind off things	0.134	0.251	0.137	-0.121	-0.311
Variance	12.5	9.3	7.9	6.2	5.6

a *p*-value of 0.0001 with an RMSEA of 0.09, despite a Bentler's CFI of >0.90 for most of the subscales (Table 3). However, the overall Bentler's CFI was low (0.58) and Cronbach's alpha was low for many of the subscales (ranging from 0.19 to 0.81), with the exception of the substance use subscale (Cronbach's alpha = 0.91).

*Exploratory Factor Analysis*

The EFA of the original 28 item Brief COPE resulted in a five factor structure accounting for 41.5 % of the variance, and 17 items with eigenvalues >1.5 and factor loadings >0.5 (Table 4). We examined each item in each factor to check for consistency of factor structure with the original Brief COPE. Items from active coping and one item from planning loaded on Factor 1. Both items from the emotional support and instrumental support factors in the

original Brief COPE loaded on a single factor (Factor 2). The two items from the self-blame and denial subscales as well as one from the venting subscale loaded on the third factor. Two items from the substance abuse subscale and one item from the humour subscale formed Factor 4. Finally, the two items from the original religion sub-scale formed Factor 5.

Based on our earlier field experiences encountering PLHA's coping responses and results of the face and content validity assessment, we decided to remove two items. We removed the item "I've been making fun of the situation" from Factor 4, despite its relatively higher factor loading (0.567), as this item had raised concerns among respondents during the cognitive interviewing phase. Two denial items loaded in Factor 3. Given concerns about the understanding of the concept of the item "I have been saying to myself "this isn't real"" similar to the item on

using 'humour', we removed it from Factor 3. We included the item "I have been accepting the reality of the fact that it has happened" from the acceptance subscale into Factor 1, despite a factor loading of 0.46 because it was consistently reported by patients during our qualitative interviews. Moreover, this item represents a characteristic trait of Indian culture, wherein people tend to resign themselves to their fate [49–51]. Our final model resulted in 16 items.

#### Analysis of the Abridged Brief COPE

##### Reliability

The overall internal consistency of the abridged scale was 0.61, somewhat less than the 28 item version (alpha 0.61 vs. 0.70). However, in contrast to the full 28 item version, Cronbach's alphas for each of the five factors were acceptable to high, ranging from 0.60 to 0.91.

##### Convergent Validity

The overall mean score for maladaptive coping of the abridged scale was 1.58 ( $\pm 0.43$ ) and for adaptive coping it was 2.80 ( $\pm 0.50$ ). There were no significant differences by literacy level or AIDS status. Similar to the 28-item Brief COPE, mean maladaptive coping scores were significantly higher among individuals with depression than among those without depression. (1.76 ( $\pm 0.48$ ) vs 1.52 ( $\pm 0.40$ ); Table 2), suggesting the revised scale was accurately capturing the constructs.

##### Confirmatory Factor Analysis

The 16 item version of the Brief COPE had very good model fit with an RMSEA of 0.029,  $p = 0.283$  and Bentler's CFI of 0.924 (Table 3). We also assessed model fit for each of the subscales. The first subscale, consisting of four items reflecting *active planning*, demonstrated reasonable fit as did the second subscale encompassing *social support*, also with four items. The third subscale again consisted of four items, demonstrated better fit and measured *avoidant emotions*. The fourth subscale consisted of the two *substance use* items in the original Brief COPE, had high factor loadings and demonstrated excellent fit. Finally, the fifth subscale with the two *religion* items from the original Brief COPE also had high factor loadings and demonstrated excellent fit.

## Discussion

Understanding coping responses to HIV infection is an essential precursor to the development of effective

interventions to improve mental health and quality of life for PLHA. In this validation and cultural adaptation of the Brief COPE among PLHA attending a Government ART Center in South India, we found that the original factor structure with 14 sub scales was not completely supported in this population and the model fit poorly to the original factor structure. A revised 16 item version had a five-factor structure consisting of *active planning*, *social support*, *avoidant emotions*, *substance use*, and *religion*. Psychometric properties of this revised scale were good, with acceptable Cronbach's alphas for the subscales in the revised scale that were higher than those in the original 14 factor version of the Brief COPE.

The five broad dimensions of coping behaviour in this South Indian population consisted of items from 11 of the 14 conceptually different coping strategies in the original Brief COPE. This reduction in dimensions is consistent with studies in other settings. An analysis of the Brief COPE in Kenyan care givers yielded five factors (emotional and instrumental support; planning, active coping and acceptance; self-blame and behavioural disengagement; religion, positive-reframing and humour; denial and venting) [52], similar to the eight factors identified in Greek adults (behavioural disengagement; humor; religion; substance use; active/positive; seeking support; avoidance; expression of negative feelings) [53]. Even simpler structures were identified among gay men in the U.S. (two factors: behavioural disengagement and active coping) [54] and HIV-positive African-American mothers (three factors: active coping; social support; avoidance) [55].

In these South Indian PLHA, adaptive coping items pooled in three factors, whereas maladaptive items pooled in two factors. The *social support* factor consisted of two conceptually distinct coping mechanisms (using emotional support and using instrumental support), similar to analyses among victims of Hurricane Andrew [30] and Greek adults [53]. In fact, Carver's original factor analyses [30, 31] grouped the two types of support together, but he retained them as separate factors for theoretical reasons to differentiate between the problem-focused nature of instrumental support (seeking advice or information) and the emotion-focused emotional support (seeking support for sympathy and understanding). These two support functions predominantly occur together, further supporting the combined *social support* factor that surfaced in the factor analysis. Similarly, active coping and planning, while conceptually different, are tightly linked. Planning typically motivates active coping, rationalizing the clustering of items from the active coping scale and the planning scale into the *active planning* factor. A similar pooling of these adaptive/positive strategy items was also observed among international students in the US [56].

In the *avoidant emotions* factor, both items from the self-blame scale, one item from the venting scale and both items from the denial scale grouped together. While self-blame is generally a predictor of poor adjustment under stress [57], there are mixed opinions about denial and venting. In some cases denial may reduce distress [58]; in others it may aggravate the situation [59]. Carver et al. [31] argued that denial reduces distress only if it can be profitably ignored. HIV cannot be ignored and hence adopting denial as a coping strategy may aggravate the situation. Venting can be functional in the early period of the distressing situation, but if continued for a longer time can interfere with adjustment [60].

*Religion* and *substance use* emerged as strong and independent factors, as in the original version and similar to other studies [30, 53, 56, 61, 62] indicating no cultural differences in these two factors. While religion is considered adaptive, substance use is maladaptive and particularly harmful to HIV-infected individuals [63]. Substance use is also a significant risk factor for acquiring HIV infection and likely represents a trait coping strategy that is easily implemented in times of distress.

Several strategies in the original Brief COPE did not figure prominently in this South Indian population. Positive re-framing did not substantively contribute to the active planning factor despite moderate factor loading, suggesting it plays a smaller role in this cultural context. Notably, positive reframing also did not emerge as an important dimension of coping in the other cultural settings that assessed the Brief COPE [53–55, 64]. Behavioural disengagement and self-distraction did not factor strongly in coping strategies employed by South Indian PLHA. Although behavioural disengagement figured prominently in the factor structure of coping in other populations, self-distraction has not emerged as an important component of coping, either here or in other cultural contexts.

The two modifications we made to the factor structure identified in the EFA were based on cognitive interviews and our own knowledge of South Indian culture. The humour item, *I've been making jokes about it*, was removed because culturally, individuals in India are unlikely to cope with a sense of humour during stressful situations, as highlighted in the cognitive interviews. The removal of one item of denial (in spite of both items loading on the avoidant emotions factor) was based on concerns about the understanding of the true concept of the item. Carver et al. [31] operationalized denial as 'refusal to believe that the stressor exists or of trying to act as though the stressor is not real'. While the item *I've been refusing to believe that it has happened* captures the first definition, the item "I have been saying to myself 'this isn't real'" captures the second definition. Our interactions with PLHAs during cognitive interviews revealed difficulties

with 'trying to act as though the stressor is not real'. According to them, HIV "is actually real" and stating "it was not" did not make sense. The introduction of the acceptance item into the active planning factor was based on the predominant cultural belief of resigning oneself to one's fate/God's will [49–51] and theoretical foundations [31].

Previous studies of coping in India, although limited, are largely consistent with our observations. Qualitative studies of coping responses to HIV-infection in India have reported self-isolation, performing religious acts, praying, and venting to other PLHAs [24–26], consistent with both the religion and social support factors that emerged in our EFA. Religion has been consistently identified as a primary coping strategy for cancer patients in India [65, 66], and, like the grouping of instrumental and emotional support into our *social support* factor, Indian head and neck cancer patients jointly employed problem-focused and emotion-focused coping strategies [67]. Both types of social support were leveraged by women with moderate to severe depression and anxiety, who reported that both social and financial support from family, friends and colleagues mitigated their mental distress [68]. In contrast to the typical Western view of women as more emotion-focussed, Talukdar found that women in India engaged in problem-focused coping more frequently than men [28]. Finally, avoidant coping, represented by our *avoidant emotions* factor, has been consistently observed in Indian populations, including sero-positive women in discordant partnerships in Bangalore [27], depressed patients in Jaipur, Rajasthan [69], and women with high levels of felt stigma and/or AIDS symptoms in rural South India [29]. Given the preponderance of this maladaptive strategy, interventions targeted at avoidant coping may have broad reach.

This study was characterized by a number of strengths. We assessed an HIV-positive population attending a public facility, which reflects the vast majority of PLHA in care in India, enhancing the generalizability of our results. We also employed a thorough validation process in a relatively large sample, producing a measure of coping more relevant to PLHA in India. Despite these strengths, there are also limitations. The study was carried out among a sample of PLHA in care whose coping styles may be different from individuals not seeking care. At the time this study was conducted, the majority of ART clinic attendees were on antiretroviral therapy; therefore, healthier individuals not yet on ART were poorly represented. Although 'acceptable', test-retest reliability was somewhat low and may reflect the relatively short retest interval (10–14 days); in this short time-period, the experience of answering the questions the first time may have influenced retest answers. Despite good model fit of the reduced scale, the unexplained variance was still greater than 50 %, suggesting

that there may be coping mechanisms and strategies specific to Indian culture that were not captured in the Brief COPE. Furthermore, the Cronbach's alphas for the active planning and avoidant emotions subscales were approximately 0.6, despite our exploration of the meaning of the items during cognitive interviews and adaption of the translation. These somewhat lower alphas are likely due to the small number of items, and may underestimate reliability [70, 71], but there may also be some culturally-related ambiguity in the underlying factors. Well-designed qualitative studies will be required to explore this and more fully describe India-specific coping mechanisms and strategies used by PLHA.

The shortened and culturally validated measure of coping with HIV in the Indian context that emerged from these analyses has potential as an effective assessment tool for PLHA in clinical care and could be used in several ways. Given the strong links between depressive symptoms and maladaptive coping strategies, this measure may be able to simultaneously identify individuals that would benefit from mental health interventions and/or interventions designed to promote healthy coping behaviors. As PLHA continue to do well on ART regimens and lives are extended, healthy coping strategies are becoming increasingly important. This culturally adapted version of the Brief COPE provides a targeted tool to monitor effectiveness of interventions and changes in coping capacity over time in India.

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