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Measuring Differential Beliefs in Complementary Therapy Research: An Exploration of the Complementary and Alternative Medicine Beliefs Inventory (CAMBI)

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Abstract

The Complementary and Alternative Medicine Beliefs Inventory (CAMBI) was developed to provide a comprehensive measure of beliefs believed to differentiate complementary therapy (CT) users from nonusers. The initial evaluation of the CAMBI was based on a relatively homogeneous sample of CT users, which raises questions about its applicability in more generalized samples. This study uses data from a community-based sample of older adults (N=200) to evaluate the utility of the CAMBI in more diverse samples. Results indicated substantial variation in responses to items with each of a-priori belief domains (i.e., perceived value of *natural treatments*, preference for *participation in treatments*, and orientation toward *holistic health*) and modest inter-correlation among items within each belief domain. Confirmatory factor analysis results indicated the a-priori measurement structure provided a poor fit to obtained data. Post-hoc analyses indicated that African Americans and those with less education had less consistent responses to items within each belief domain. Revision and additional development of the CAMBI is needed to enable its use in more diverse research samples.

Introduction

Complementary therapy (CT) users are believed to hold distinct attitudes and beliefs about both health and healing compared to non-users of CTs. Astin¹ noted that CT users have alternative or post-modern views of health. Similarly, Barrett and colleagues² noted that CT users had a more holistic view of health than did users of conventional medicine. Others

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have suggested that CT users have stronger beliefs than nonusers in the body's innate ability to heal itself, as well as the belief that healing therapies should enable rather than override natural healing processes.³ Finally others have highlighted the apparent preference that CT users have over nonusers for participation in making decisions about health treatments.⁴ Variation in these and other beliefs, collectively referred to as the "differential beliefs" hypothesis, is posited to explain why some adults initiate and maintain use of CTs whereas others are reluctant to engage in anything other than biomedical treatments.

Tests of the "differential beliefs" hypothesis remain encumbered by poor measurement. Specifically, there is no agreed measurement strategy for assessing beliefs about health and healing. Several measures of discrete concepts have been developed and used in previous studies of complementary and alternative medicine use. For example, Furnham and Forey⁵ reported that users of acupuncture were more critical and skeptical of conventional medicine than nonusers. Similarly, other research suggests that stronger adherence to culture-based belief systems about health (e.g., yin/yang) is associated with greater use of CTs.⁶ These studies notwithstanding, there has been little attempt to develop broader measures of health and healing that could be used to systematically evaluate the differential beliefs hypothesis of CT use. A recent qualitative review of the literature suggests that a discrete set of beliefs such as viewing health holistically and the importance of individual participation in health treatments appear to underlie the use of various CTs.⁷

The Complementary and Alternative Medicine Beliefs Inventory (CAMBI) was created to reliably measure discrete beliefs presumed to shape decisions to initiate and maintain the use of complementary and alternative medicine.⁸ Culling items from the literature, Bishop and colleagues created a 20-item inventory tapping three distinct belief domains. The first domain, labeled "natural treatments," assesses the extent to which individuals believe in the value of natural treatments. The second domain, "participation in treatment," assesses individuals' beliefs about the importance of individuals working collaboratively with their health care provider. The final domain, "holistic health," represents the idea of holism or the idea that the physical body cannot be separated from mind and spirit. Preliminary validation research using a non-representative sample of British adults suggested that 17 of the 20 CAMBI items produced subscales with good internal inconsistency, as well as good evidence of criterion and convergent validity. Subsequent research by the instrument developers using an internet-based sample indicated the "holistic health" and "natural treatments" sub-domains of the CAMBI had estimated reliabilities greater than 0.70,⁹ and that the holistic health subdomain was associated with increased odds of using several distinct types of CTs (e.g., biologically-based therapies and energy therapies). Prospective results obtained from an age-heterogeneous sample of adult CT users indicated the estimated reliabilities of the CAMBI subscales ranged between 0.58 and 0.77, and that greater holistic health beliefs predicted adherence to a regimen of complementary and alternative remedies.¹⁰

Although the CAMBI provides a tool for systematically evaluating the differential beliefs hypothesis, more measurement evaluation of the tool is needed. In particular, the initial evaluation was undertaken in a sample of young (44% were less than 30 years of age), predominantly female, and highly educated individuals that were primarily users of complementary and alternative medicines. A homogeneous sample of CT users provided an appropriate preliminary test of the CAMBI's structure and measurement properties; however, an important next step is determining how well the instrument performs in demographically and culturally diverse samples. The primary value of the CAMBI lies in its ability to differentiate users and nonusers of CTs, and as such, the instrument and its underlying measurement models needs to hold in demographically diverse samples consisting of both users and nonusers of CT.

The goal of this study is to determine the utility of the CAMBI for measuring CT beliefs among ethnically diverse older adults. An ethnically diverse sample of older adults provides a valuable opportunity to evaluate the CAMBI. Racial differences in the level of trust in conventional medicine held by older adults¹¹ and clear evidence indicating that CT use differs substantially by race and ethnicity^{12,13} all portend substantial variation in beliefs about health and healing.

Method

Study Design

The data for this study are from a larger project designed to document the use of complementary therapies by older adults for health self-management. The parent project was a prospective study wherein participants living in rural counties of North Carolina completed a baseline interview, and then completed daily interviews that elicited their use of CTs on three consecutive days at one-month intervals for six months. An Institutional Review Board (FWA #00001435) authorized all recruitment and data collection procedures, and all participants gave signed informed consent. A detailed description of the parent project is provided elsewhere¹⁴ an abbreviated description therefore is provided here.

The sample design for the parent project called for a quota sample stratified by ethnicity (African American and white) and sex so that approximately 50 participants were recruited into each ethnic-sex group. A site-based procedure¹⁵ was used to recruit representative participants. Participants were recruited from 34 sites spanning a variety of social and economic contexts (e.g., senior centers, polling sites, congregate meal sites, senior housing complexes). In addition, recruitment included individuals who had participated in previous research studies, who were referred by other participants, and who were referred by community interviewers. Twelve individuals asked to participate refused, for a participation rate of 94.4%. However, individuals at specific sites could avoid being asked to participate. Therefore, the actual participation rate may be lower.

The data for this study were taken exclusively from the baseline survey for the parent project. All data were collected via interviewer-administered survey questionnaires by a team of trained interviewers. Baseline interviews were completed from April 2008 through May 2009. Baseline interviews ranged in duration from 45 minutes up to two hours. Participants were given an incentive valued at \$10 for completing the baseline interview.

Sample

A total of 200 African American and white older adults completed baseline interviews. Participants included 52 African American women, 48 African American men, 50 white women, and 50 white men. Approximately one-third (32%) of the sample was aged 65–69, 27.5% was aged 70–74, 17.5% was 75–79, and 23% was 80 or older. Over one-half of the sample (53%) had over a high school education, but one third (34%) did not earn a high school degree. Less than one-half of the sample (40.5%) was currently married. A thorough description of the sample is available.¹⁴

Measures

The Complementary and Alternative Medicine Beliefs Inventory (CAMBI)⁸ is the focal measure in this analysis. The CAMBI is a 20-item instrument that was designed to measure a comprehensive set of beliefs presumed to differentiate users of complementary and alternative medicine from nonusers. Bishop and colleagues used a web-based data collection procedure asking participants to respond to each item using a 7-point response set ranging from 1 ('strongly disagree'), through 4 ('neither agree nor disagree') to 7 ('strongly agree').

Factor analysis suggested the CAMBI assesses three primary sets of beliefs: the perceived value of *natural treatments*, respondents' preferences for *participation in treatments*, and orientations toward *holistic health*.⁸ Cronbach's alphas for each of the factors, as an estimate of internal consistency, were 0.75, 0.68, and 0.73, respectively. Bishop and colleagues also reported modest to moderate inter-correlations among summary measures of the three belief domains (r ranged from 0.18 to 0.47). The fielded version of the CAMBI in this study was comparable to that used in the original study; however, there were some modifications. First, we narrowed the response options such that participants responded on a five-point scale ranging from 1 (strongly disagree) to 3 (neither agree or disagree) to 5 (strongly agree) as opposed to a 7-point scale. Second, we expanded the use of the word "treatments" in several of the original items to the phrase "health-related treatments" to help ensure participants were considering health treatments when responding to the items. Finally, our items were interviewer-administered to accommodate vision and literacy issues that are not uncommon when conducting research with older adults.

Personal characteristics relevant to exploring the measurement attributes of the CAMBI include gender, ethnicity (African American, white), and age. Additionally, we differentiated users and non-users of CTs; individuals who reported using several herbals or supplements (i.e., flaxseed oil, fish oil, Omega-3 oil, coenzyme Q10, glucosamine sulfate, chondroitin), or one or more CT practitioners (e.g., chiropractor, physical therapist, massage therapists) or mind-body methods (i.e., relaxation or meditation) were coded as having been a CT user, zero otherwise.

Analyses

All analyses were conducted using SAS (SAS Inc., Cary, NC) and alpha of 0.05. Means, standard deviations, and Spearman correlations among individual CAMBI items were calculated using PROC CORR. A confirmatory factor analysis of our data to the Bishop et al. model was conducted using PROC CALIS on the overall sample, women only, whites only, and CT users only. Following established recommendations,¹⁶ we evaluated each model using one relative fit index and one noncentrality-based indicator of fit. We used the Bentler-Bonett Non-normed Fit Index (NFI), which is essentially the ratio of the model chi-square and the null model chi-square and degrees of freedom, as an indicator of relative fit. The NFI takes a value between 0 and 1 with good model fit approaching the value of 1. Root Mean Square Error of Approximation (RMSEA) was selected as a noncentrality-based indicator of fit. RMSEA values below 0.06 are considered "good" whereas values above 0.10 are considered "poor". Measures of variability for *natural treatments*, *participation treatments*, and *holistic health* were created by using the standard deviation of the items within each set of beliefs. Three multivariate models were examined using the measures of variability as the dependent variable and adjusting for gender, race, education (less than high school or high school or more), poverty status (yearly income above \$13,700 or not), and CT user.

Results

There was substantial variability in responses to individual CAMBI items (Table 1). Among the items designed to assess the perceived value of *natural treatments*, average responses ranged from a high value of 4.10 (SD = 0.64) for "Health-related treatments should increase my natural ability to stay healthy," to a low value of 3.19 (SD = 1.04) for "Health-related treatments should only use natural ingredients." Turning to items designed to assess preferences for *participation in treatments*, average responses ranged from a high value of 4.28 (SD = 0.67) for "Patients should take an active role in their health-related treatments," to a low value of 3.19 (SD = 1.17) for a reverse scored item (i.e., "Health care providers should control what is talked about during a health visit."). Finally among items designed to

assess orientations toward *holistic health*, average responses ranged from a high value of 4.14 (SD 0.62) for “Health is about harmonizing your body, mind, and spirit” to a low value of 3.38 (SD = 1.05) for “I think my body has a natural ability to heal itself.”

Bivariate correlations among items within specific belief sets were generally weak (Table 2). The average bivariate correlation among items assessing the perceived value of *natural treatments* (i.e., the intra-cluster correlation) was 0.19, with specific correlations ranging from a high of 0.40 ($p < .01$) for the association of NT_1 (“Health-related treatments should have no negative side effects.”) with NT_2 (i.e., “It is important to me that health-related treatments are non-toxic.”) to the lowest within-cluster bivariate correlation (i.e., $r = 0.04$; $p > .05$). Turning to items assessing preferences for *participation in treatments*, the average bivariate correlation was 0.22, with specific correlations ranging from a high of 0.49 ($p < .01$) for the association of PT_9 with PT_11 (i.e., “Health care providers should make all decisions about treatment” with “Health care providers should control what is talked about during a health visit”), to a low of 0.04 ($p > 0.05$). Finally, the average correlation among items designed to assess orientations toward *holistic health* was 0.15, with specific correlations ranging from 0.41 ($p < 0.01$) for the association of HH_12 (i.e., “Health is about harmonizing your body, mind, and spirit”) with HH_15 (i.e., “Health-related treatments should focus on a person’s overall well-being”), to a low of -0.04 . The average inter-cluster correlation of items assessing the perceived value of *natural treatments* and preferences for *participation in treatments* was 0.06. Corresponding average inter-cluster correlations for items assessing the perceived value of *natural treatments* and orientations toward *holistic health*, and for items assessing preferences for *participation in treatments* and orientations toward *holistic health* were 0.06 and 0.18, respectively.

Results from confirmatory factor analyses indicated a poor fit of the a-priori measurement model to the obtained data (Table 3). Test statistics from the entire sample indicated that the three-dimensional measurement model proposed by Bishop and colleagues did not characterize the data ($\chi^2 = 332.46$, $df = 116$, $NFI=0.45$) with undesirable levels of residual error ($RMSEA=0.097$). Model re-specification based on the modification indices provided little meaningful improvement in model fit. Additional confirmatory factor analytic results using specific subsamples provided no significant improvements in model fit (Table 3), although the results from these subsamples should be interpreted with caution because the smaller sample sizes likely undermine the ability to achieve favorable goodness of fit statistics.¹⁷

A series of post-hoc analyses were undertaken to explore possible explanations for the poor fit of the a-priori measurement model for the CAMBI to the obtained data. Within each of the belief domains (i.e., perceived *value of natural treatments*, preferences for *participation in treatments*, and orientations toward *holistic health*), we constructed a variable reflecting an individual’s variation in responses to items within each belief domain. Concretely, the variation item reflects the standard deviation of each individual’s response to item set for each domain.

Age, race, gender and educational attainment all had a null association with variation in responses to items assessing the value of *natural treatments* (Table 4). African American participants had greater variability in their responses to items assessing preferences for *participation in health treatments*. African Americans, women, and those with less than a high education (trend level significance only) had greater variability in their responses to items assessing *orientations toward holistic health*, whereas users of CTs had significantly less variability in their responses to items assessing this domain.

Discussion

The overall pattern of results in this study suggests the CAMBI may not be a useful tool for use in studies of community-based samples of older adults. Univariate statistics indicated substantial variation in average responses to items within each belief domain of the CAMBI, and bivariate statistics indicated modest correlations among items within the same belief domain. Finally, results from a confirmatory factor analysis of the measurement model indicated that the a-priori factor structure of the CAMBI⁸ fit the collected data poorly.

The relatively poor fit of our data to the original measurement model likely reflects the substantial demographic and cultural diversity of our sample relative to the sample used in the original validation study⁸ and subsequent studies with the CAMBI.^{9,10} Specifically, the current sample was older, more balanced in terms of men and women, more ethnically diverse, and less educated. Recognizing that age, race, and education can shape item interpretation in questionnaires,¹⁸ the overall pattern of results suggests that participants in our sample, relative to those in previous research,^{8–10} had difficulty understanding the CAMBI items and responding in a consistent manner. Results indicated that African Americans had greater variability in their responses to items about preference for *participation in treatments* and orientations toward *holistic health*, and individuals with less than a high school education had greater variability in responses to items about orientations toward *holistic health*. These results along with those from previous measurement analyses suggest that the CAMBI may benefit from the use of cognitive testing techniques with diverse groups to ensure consistent interpretation of item content.

Our sample was also more heterogeneous than Bishop and colleagues' various samples with regard to use of CTs. Bishop and colleagues' samples in their original validation study and their prospective study were existing users of CTs such as aromatherapy, massage, herbal medicines, meditation and homeopathy. By contrast, the CTs used by older, rural dwelling adults in this sample (and the broader population of rural dwelling older adults) tended to be prayer, home and folk remedies, and natural or unprocessed herbs.^{14,19} Results from this study indicated that recent use of CTs similar to those reported by Bishop and colleagues' samples had less variable responses to items assessing orientations toward holistic health. These results suggest that CT users may read and interpret belief items more consistently than nonusers. If this is the case, additional scale development efforts are needed to refine items with ambiguous language (e.g., "...harmonizing body, mind and spirit" or "...concerned with natural healing powers"). Refinements such as this will be essential to create instruments that validly measure beliefs in diverse populations.

The results and suggested procedures for refining the CAMBI need to be interpreted in light of the study's limitations. The current sample is unique, in that participants were older adults living in a rural region of the southeastern US. However, a substantial number of older adults live in rural areas, and evidence suggests that a sizeable percentage of rural dwelling older adults use CTs.¹⁴ Thus, while the unique sample may raise questions about generalizability of study findings, it nevertheless represents a segment of society for which a valid and reliable measure of health and healing beliefs are needed for understanding use of CTs. A second limitation of our study is the relatively modest sample size, particularly in the subgroup analyses, because larger samples are more conducive to favorable goodness of fit statistics.¹⁷ Another limitation of the study is our inability to discern specific reasons for the less than ideal performance of the CAMBI. It is possible that our narrowed response options may have undermined the instruments performance. Additional measurement evaluation needs to be undertaken to refine and improve the instrument's performance in community-based studies of CT use.

Limitations notwithstanding, the results of this study contribute to the complementary and alternative medicine literature. Our results suggest the CAMBI, as it is currently available, is not well suited for measuring beliefs about health and healing in diverse, community-based samples. Indeed, we found systematic differences in the consistency of item response with belief domains by race, as well as some differences by educational attainment and CT use. Although it is not immediately clear why there were significant between-group differences in response consistency to items assessing the same latent concept, it is possible that interpretation of item content differed between groups. Additional item refinement targeting the use of terms that can be consistently understood by study participants will likely enable the CAMBI in achieving its goal, and assist researchers in understanding the differential uptake and continued use of CTs.

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Table 1

Descriptive statistics for CAMBI items, by domain of belief.

		M	SD
Natural Treatments items			
NT_1	Health-related treatments should have no negative side effects.	3.53	1.03
NT_2	It is important to me that health-related treatments are non-toxic.	3.76	1.01
NT_3	Health-related treatments should only use natural ingredients.	3.19	1.04
NT_4	It is important for health-related treatment to boost my immune system.	3.90	0.75
NT_5	Health-related treatments should enable my body to heal itself.	3.86	0.78
NT_6	Health-related treatments should increase my natural ability to stay healthy.	4.10	0.64
Preference for Participation in Health Treatments items			
PT_7	Health care providers should treat patients as equal partners.	4.06	0.77
PT_8	Patients should take an active role in their health-related treatments.	4.28	0.67
PT_9	Health care providers should make all decisions about treatment.(r)	3.54	1.04
PT_10	Health care providers should help patients make their own decisions about treatments.	3.86	0.81
PT_11	Health care providers should control what is talked about during a health visit.(r)	3.19	1.17
Orientation toward Holistic Health items			
HH_12	Health is about harmonizing your body, mind, and spirit.	4.14	0.62
HH_13	Imbalances in a person's life are a major cause of illness.	3.82	0.85
HH_14	Health-related treatments should concentrate only on symptoms rather than the whole person.(r)	3.50	1.08
HH_15	Health-related treatments should focus on a person's overall well-being.	4.10	0.60
HH_16	I think my body has a natural ability to heal itself.	3.38	1.05
HH_17	There is no need for health-related treatments to be concerned with natural healing powers.(r)	3.59	0.94

(r) indicates reverse coded items

Table 2

Spearman correlations among CAMBI belief items assessing perceived value of natural treatments (NT), preference for participation in health treatments (PT), and orientations toward holistic health (HH).

	NT_1	NT_2	NT_3	NT_4	NT_5	NT_6	PT_7	PT_8	PT_9	PT_10	PT_11	HH_12	HH_13	HH_14	HH_15	HH_16
NT_1	1.00															
NT_2	0.40**	1.00														
NT_3	0.30**	0.20**	1.00													
NT_4	0.15*	0.04	0.17*	1.00												
NT_5	0.14	0.17*	0.08	0.30**	1.00											
NT_6	0.13	0.05	0.12	0.27**	0.36**	1.00										
PT_7	0.08	0.05	0.10	0.02	0.32**	0.42**	1.00									
PT_8	0.06	0.18*	-0.12	0.01	0.27**	0.32**	0.43**	1.00								
PT_9	-0.09	0.01	-0.26**	-0.11	0.03	0.07	0.04	0.23**	1.00							
PT_10	0.02	0.02	-0.00	0.12	0.26**	0.12	0.21**	0.22**	0.20**	1.00						
PT_11	0.04	0.17*	-0.13	-0.13	0.07	-0.02	0.07	0.23**	0.49**	0.20**	1.00					
HH_12	-0.03	0.07	-0.03	0.02	0.17*	0.25**	0.31**	0.30**	0.21**	0.25**	0.10	1.00				
HH_13	-0.02	0.02	-0.06	0.04	0.13	0.14	0.09	0.31**	0.19**	0.25**	0.19*	0.26**	1.00			
HH_14	-0.08	0.13	-0.22**	-0.02	-0.03	0.11	0.02	0.10	0.32**	0.04	0.43**	0.13	0.11	1.00		
HH_15	0.19*	0.11	-0.01	0.16*	0.27**	0.30**	0.28**	0.28**	0.16	0.25**	0.15*	0.41**	0.16*	0.17*	1.00	
HH_16	0.03	0.03	0.04	-0.03	0.21**	0.18*	0.22**	0.29**	0.21**	0.19**	0.16*	0.14*	0.15*	0.12	0.23**	1.00
HH_17	-0.10	-0.02	-0.07	0.10	0.05	0.11	0.06	-0.08	0.14*	-0.08	0.10	0.07	0.11	0.30**	-0.03	-0.04

* p < .05

** p < .01 (two-tailed)

Table 3

Confirmatory factor analysis results for the entire sample, and selected subsamples

	<i>n</i>	χ^2	<i>df</i>	Bentler & Bonnet's Non-normed Index (NFI)	RMSEA
Sample	199	332.46	116	0.4510	0.0973
Women only	102	238.09	116	0.3857	0.1026
Whites only	102	230.53	116	0.5364	0.0994
CT Users only	95	206.53	116	0.5039	0.0911

Table 4

Multivariate models predicting variability in responses to items in CAMBI subscales

	Natural Treatments		Participation Treatments		Holistic Health	
	b	SE	b	SE	b	SE
Age	-0.01	0.00	0.01	0.01	-0.01	0.00
Gender (REF=Male)	-0.05	0.06	-0.02	0.07	0.20	0.06***
Race (REF=White)	-0.03	0.06	0.20	0.07**	0.13	0.06*
Education (REF=>High School)	0.03	0.07	0.06	0.08	0.11	0.06 [†]
Poverty indicator (REF=>\$13K/year)	-0.10	0.08	-0.10	0.09	-0.09	0.07
CT User(REF= Not at all)	0.03	0.07	-0.04	0.07	-0.15	0.06*

[†] p < .10

* p < .05

** p < .01 (two-tailed)