Published in final edited form as:
Psychol Assess. 2018 April ; 30(4): 486–499. doi:10.1037/pas0000483.

Self-Efficacy for Coping with Cancer: Revision of the Cancer Behavior Inventory (Version 3.0)

Thomas V. Merluzzi,
Department of Psychology, University of Notre Dame

Errol J. Philip,
Department of Psychology, University of Notre Dame

Carolyn A. Heitzmann Ruhf,
University Counseling Service, University of Southern California

Haiyan Liu,
Department of Psychology, University of Notre Dame

Miao Yang, and
Department of Psychology, University of Notre Dame

Claire Conley
Department of Psychology, The Ohio State University

Abstract

Based on self-regulation and self-efficacy theories, the Cancer Behavior Inventory (CBI; Merluzzi & Martinez Sanchez, 1997; Merluzzi et al, 2001; Heitzmann et al, 2011) was developed as a measure of self-efficacy strategies for coping with cancer. In the latest revision, CBI-V3.0, a number of psychometric and empirical advances were made: (1) reading level was reduced to 6th grade level; 2) individual interviews and focus groups were used to revise items; 3) a new spiritual coping subscale was added; 4) data were collected from four samples (total N=1405) to conduct an exploratory factor analysis (EFA) with targeted rotation, two confirmatory factor analyses (CFA), and differential item functioning (DIF); 5) item trimming was used to reduce the total number to 27; 6) internal consistency and test-retest reliability were computed; and 7) extensive validity testing was conducted. The results, which build upon the strengths of prior versions, confirm a structurally and psychometrically sound and unbiased measure of self-efficacy strategies for coping with cancer with a reduced number of items for ease of administration. The factors include: Maintaining Activity and Independence, Seeking and Understanding Medical Information, Emotion Regulation, Coping with Treatment Related Side Effects, Accepting Cancer/ Maintaining a Positive Attitude, Seeking Social Support, and Using Spiritual Coping. Internal consistency (α =.946), test-retest reliability (r=.890; four months) and validity coefficients with a variety of relevant measures indicated strong psychometric properties. The new 27-item CBI-V3.0 has both research utility and clinical utility as a screening and treatment planning measure of self-efficacy strategies for coping with cancer.

Correspondence concerning this article should be addressed to Thomas V. Merluzzi, Department of Psychology, University of Notre Dame, Notre Dame, IN 46556. tmerluzz@nd.edu.

Public Significance Statement: This study describes a comprehensive revision of the Cancer Behavior Inventory (CBI), a 27-item self-report survey that assesses strategies for coping with cancer. Higher scores on the CBI are associated with better adjustment to cancer, higher quality of life, and lower levels of emotional distress. The CBI may be useful in research (e.g., clinical trials) and in clinical settings to tailor therapies for patients and survivors based on the assessment of strengths and weaknesses in coping strategies.

Keywords

cancer; coping; self-efficacy; quality of life; Cancer Behavior Inventory

---

A cancer diagnosis represents a traumatic event for many individuals and can be associated with significant physical and emotional stress. This can include the need to manage acute, late and long-term effects of treatment in addition to psychosocial challenges, all of which can be associated with significant impairments in quality of life including functional limitations (Alfano & Rowland, 2006; Bayly & Lloyd-Williams, 2016; Mitchell, Ferguson, Gill, & Symonds, 2013; Stanton, Ganz, & Rowland, 2005; Stein, Syrjala, & Andrykowski, 2008). This evidence-base has reinforced the need to enhance our understanding of individuals' experiences and needs, along with which factors, singularly and collectively, may promote or hinder the ability of patients and survivors to manage cancer (Adler & Page, 2007; Hewitt, Greenfield, & Stovall, 2005; Kenzik, Kent, Martin et al, 2016). As a consequence of this increasing focus, the valid and reliable assessment of factors such as coping resources and strategies has become concomitantly important.

Coping with a disease like cancer can be incorporated into a general theory of self-regulation (Carver & Scheier, 1998) in which formal or informal goal setting involves engaging in behaviors that may lead to achieving those goals, or at least reducing the discrepancy between a desired goal and one's current state (Carver & Scheier, 1998). In this self-regulation process, the choice of coping behaviors or strategies and the effectiveness of those behaviors or strategies may be critical in achieving goals. Thus, an estimation of expectancy both in terms of the ability to engage in strategic coping behavior as well as the outcome is critical in moving closer to a goal. This dynamic process situates self-efficacy expectations (Bandura, 1997) as an integral part of self-regulation. For example, if a person with cancer has a goal of engaging in a modest schedule of exercise while on chemotherapy, there may be a need to orchestrate coping strategies to deal with side effects as well as to seek support and maintain a positive perspective. Thus, the expectancy a patient has to engage strategic coping behaviors may facilitate movement toward goals. This may be an iterative process but those with high self-efficacy expectations are expected to persist longer in goal seeking than those low in self-efficacy expectations (Bandura, 1997).

Confirmation of the role of self-efficacy expectations in a self-regulation model of coping with disease is evidenced by research in which individuals with high levels of self-efficacy have been found to effectively engage in exercise, weight-control efforts and pain management coping techniques, as well as to have fewer psychological symptoms and lower distress than those lower in self-efficacy (Bandura, 1997; Linde, Rothman, Baldwin, &

Jeffery, 2006; Marszalek, Price, Harvey, Driban, & Wang, 2016; Meredith, Strong, & Feeney, 2006). Moreover, compared to those cancer patients who have low efficacy for coping strategies, more efficacious patients are better able to manage challenges associated with cancer and are more likely to report a higher quality of life, less depression, and greater disease-adjustment (Liang, Chao, Tseng, Tsay, Lin & Tung, 2016; Merluzzi et al, 2001; Robb, Lee, Jacobsen, Dobbin, & Estermann, 2012; Weber et al, 2004). Further, a recent study noted self-efficacy as a particularly prominent predictor of depression among long-term cancer survivors, as well as a partial mediator of the impact of symptom burden on depression (Philip, Merluzzi, Zang, & Heitzmann, 2013). It is likely that many of these associations stem from the greater willingness of self-efficacious individuals to engage resources to promote their own well-being and adjustment (Bandura, 1997).

Given the strategic role of self-efficacy expectations in the process of adjusting to or recovering from disease, it is important to have psychometrically sound measures of self-efficacy expectations. The Cancer Behavior Inventory (CBI), a measure of self-efficacy strategies for coping with cancer, was developed by Merluzzi and Martinez Sanchez (1997; Version 1.0). The CBI has undergone one revision (Merluzzi, Nairn, Hedge, Martinez Sanchez, & Dunn, 2001; Version 2.0) and the development of a brief version (CBI-B; Heitzmann, Merluzzi, Jean-Pierre, Roscoe, Kirsh, & Passik, 2011). The CBI-V2.0 is a 33-item measure that includes seven subscales and the CBI-B is psychometrically sound 14-item brief version (Heitzmann et al, 2011) that may be appropriate for screening protocols that have been mandated by the American College of Surgeons’ Commission on Cancer (2016). The CBI-V2.0 has been used in a variety of correlational (e.g., Robb et al, 2012) and intervention studies (e.g., Carpenter, Stoner, Schmitz, McGregor, & Doorebos, 2014) indicating that CBI scores are associated with critical variables such as quality of life, fatigue, and depression and change in response to intervention. However, several developments in the field of psycho-oncology, as well as advancements in measurement technology, have prompted a reevaluation of the CBI and the identification of potential weaknesses. These included a lack of spiritual self-efficacy subscale, marginal psychometric quality of one scale of the CBI-V2.0, and a lack of clarity of items in that scale and several other items, setting the stage for a comprehensive revision of the CBI. The revision, the CBI-V3.0, includes new content (i.e., spirituality coping strategies), contains clarified items especially those in the Affective Regulation scale, and was subjected to much more rigorous psychometric analyses than was able to be conducted on the previous versions of the CBI.

Spiritual coping is a critical component of the cancer experience for many patients and a means by which many cope with the life-threatening nature of the disease (Merluzzi & Philip, in press). Spiritual coping is thus an important element that was incorporated into the revised CBI, with careful attention given to the development and testing of items to ensure excellent psychometric qualities. The addition of spirituality items was guided by recent meta-analytic research confirming the importance of religiosity and spirituality in the context of coping with cancer (e.g., Jim, Pustejovsky, Danhauer, et al, 2015; Park, Masters, Salsman, et al., 2016; Salsman, Fitchett, Merluzzi, Sherman, & Park, 2015; Salsman, Pustejovsky, Jim, et al, 2015; Sherman, Merluzzi, Pustejovsky, et al, 2015). The spiritual coping items were designed to evaluate individuals’ confidence in spirituality coping strategies by maintaining their spiritual beliefs and practices during the course of their disease. Thus, with the inclusion of a psychometrically sound spiritual coping subscale, the revised version of the CBI provides for a more comprehensive assessment of self-efficacy in the context of cancer.

The psychometric quality of the CBI has also been substantially enhanced. Internal consistency data from nine samples (Chirico, Lucidi, Mallia, D'Aiuto, & Merluzzi, 2015; Merluzzi, Philip, Yang, & Heitzmann, 2016; Merluzzi, Nairn et al, 2001; Merluzzi, Philip, Zhang, & Sullivan, 2015; Mosher, DuHamel, Egert, & Smith, 2010; Nairn & Merluzzi, 2003; Nairn, 2004; Pikler & Winterowd, 2003; Yeung, Lu, & Liu, 2014) indicated that the Affective Regulation scale of the CBI-V2.0 had problematic internal consistency coefficients ranging from .45 to .81, with an average coefficient of .698. Whereas that summary value may be only slightly below a marginal level of internal consistency, systematic qualitative evaluation of the items in the Affective Regulation scale yielded consistent information regarding problems with the interpretation of the items by cancer patients. Evidence generated from individual interviews and focus groups of cancer patients and research nurses, who administered the measure, suggested that interpretation of some items in the Affective Regulation scale was problematic. In many instances respondents interpreted items as negative strategies that, if highly endorsed, would exacerbate problems instead of alleviating them, which was not the intended meaning. Thus, a combination of values that were below marginal internal consistency and qualitative analysis confirming that items were not easy to decipher provided the impetus to revise items, especially those from the Affective Regulation scale of the CBI-V2.0, and to conduct a more extensive critical psychometric analyses of the revised CBI-V3.0 than had been conducted with any previous version.

Since its inception, the CBI has been developed and validated using strong psychometric and evidence-based statistical tools. Effective scale development is an iterative process of refinement and testing. This third version of the CBI represents a major step forward in this process, and included (1) the addition of a psychometrically sound and theoretically important spiritual coping subscale that is reflective of the cancer experience for many patients and survivors, (2) ongoing efforts to improve the reading level and item wording to ensure that items are understood correctly by all individuals, and (3) the utilization of rigorous, modern psychometric assessment such as extensive testing of structural elements, the examination of bias via differential item functioning, and broad-based validity analyses. Taken together, the revised CBI-V3.0 represents an important step forward in the assessment of self-efficacy in the cancer experience.

Further, in this revision, there was an emphasis on accruing African Americans in the participant samples in order to assure that the results were generalizable. In addition, rigorous scale development methodology was utilized, including multiple confirmatory factor analyses, state-of-the-art differential item functioning analysis combined with Classical Test Theory (CTT) approaches to reliability and validity, all of which enabled the examination of item-level and test-level information (Fan, 1998). Based on the factor structure in prior versions of the CBI (Merluzzi & Martinez Sanchez, 1997; Merluzzi et al, 2001), we hypothesized that 8 factors (seven from prior versions plus a new spiritual coping factor) would emerge in a factor analysis that utilized targeted rotation and be confirmed with multiple confirmatory factor analyses. We also hypothesized that there would be no Differential Item Functioning (DIF) bias, and that the revised version of the CBI would be reliable and valid by standards established in CTT.

Method

Participants

For exploratory and confirmatory analyses, this revision of the CBI used 4 datasets. These datasets were developed over a 6-year period from 2009–2015 from data collected from four separate samples. In addition, individual interviews and focus groups were conducted as an integral part of the process of managing the initial revision of items. The treatment of all participants was in accordance with the Ethical Principles of the American Psychological Association and the Health Information Portability and Accountability Act. All data collection procedures for this study were conducted with the approval of two institutional review boards. The authors have no conflict of interests in any aspect of this research.

Samples and Procedures—For the sake of conservation of space, descriptive information about each sample is only presented in Table 1. In all samples, persons with a diagnosis of cancer were given the opportunity to participate by responding to ads in newspapers and media outlets in various cities in midwestern, western, and southern states in the US, by being members of support groups in those same regions whose leaders had been contacted to offer the members participation, or by being patients in a regional clinical oncology practice in north central Indiana and southwest Michigan or in the radiation oncology service of a northern Indiana regional medical center. Except for the clinical oncology and radiation oncology practices, participants were sent materials via mail and returned them in stamped envelopes that were provided. For clinical oncology and radiation oncology patients, research nurses, with the permission of physicians, approached patients who were receiving treatment. They explained the study to the patients and, if they chose to participate, gave patients the option of completing the materials after their visit or having the materials mailed to them. In virtually all instances, patients completed the materials in a private space in the clinics.

Special attempts were made to accrue African American participants, who constituted 18.3% of the participants across samples; a percentage that is greater than the national average of those who identify as African American including those who identify as more than one race. The special efforts in recruitment included advertising in newspapers that are published in major cities and marketed to the African American community (e.g., The Chicago Defender), contacting support groups for African American cancer patients (e.g., Sisters Network) and offering participation, and working with the alumni associations of historically African American colleges and universities to enlist older alumni.

Although the CBI has previously been used with cancer survivors (e.g., Philip & Merluzzi, 2016) most of the participants in the present study were in treatment. Because the CBI is cast in self-efficacy theory, the responses are about expectancies, not whether the coping strategy has been accomplished. In fact, the respondents are instructed to rate the items even if they have not had occasion to use the coping strategy in the past. Thus, the CBI may also be used for cancer survivors, that is, those who have transitioned off active curative medical treatments.

Measures

Cancer Behavior Inventory: Version 3.0—The revision of the CBI included preliminary quantitative and qualitative work to improve some items.

Quantitative data: Data was from 9 separate studies and datasets that included the CBI-V2.0 (cited in the Introduction) were compiled to confirm the marginal internal consistency of the Affective Regulation scale scores. Those values ranged from .45 to .81 with a mean value of .698. Although that mean value is just short of marginally acceptable, the broad range of internal consistency coefficients for Affective Regulation scores compared to the consistently narrower ranges for the scores from other scales of the CBI-V2.0, signaled an issue with that scale that was not present in any other scale.

Qualitative data: Based on variable and marginal cross-sample reliability estimates of the Affective Regulation scale scores and the consistent anecdotal feedback from cancer patient respondents and research nurses that patients found items difficult to understand, we developed a formal protocol to collect data about all of the items of the CBI-V2.0. Qualitative information was collected from individual cancer patients, seven research nurses, and two focus groups of patients. Initial qualitative interviews with 10 persons diagnosed with cancer, who had previously participated in studies conducted by the authors and volunteered to participate, were conducted in which the interviewer questioned the patient on the meaning of each item in the CBI-2.0. The goal of these initial interviews was to identify items that were not easily or correctly understood by patients in terms the intent of the item. The participants were also asked to offer suggestions to improve clarity. The interviews with the research nurses followed the same format but in a more collegial manner. The first three authors used these initial data to reword the items that were consistently identified by both patients and research nurses as ambiguous, confusing, or difficult to understand. For example, “using denial” was changed to “putting things out of my mind at times.” Whereas the two items are not exactly theoretically interchangeable, in contrast to the original wording, interviews with five additional cancer patients established that the reworded items were more easily understood, not perceived as negative as suggested in the initial interviews, and were more in line with the intent of the meaning of the original item. Other items were enhanced for clarity and meaning. For example “maintaining activities” was augmented to “maintaining activities (e.g., work, home, hobbies, social).”

From a list of patients who had participated in prior studies conducted by the authors, and who agreed to be contacted, the first and third authors invited 20 local residents to participate in focus groups about coping with cancer. Fifteen responded affirmatively but based on scheduling five could not participate. The remaining 10 were assigned to two groups based on their ability to attend a scheduled session. Item by item, the two groups discussed the final rewording of the items in the CBI-V3.0. In a rotating fashion, one person was asked to describe the meaning of the item, followed by discussion by the group. A consensus process was used to make changes to the items. Only minor changes to wording were made after reviewing notes and watching videos of the sessions.

In all, 11 of 33 items were modified through rewording or augmentation including all five items from the Affective Regulation scale. Of the 11 items, six were ultimately included in the V3.0 based on an Exploratory Factor Analysis with targeted rotation, two Confirmatory Factor Analyses, and item trimming procedures (see Results section). Two of the six items were from the Affective Regulation scale.

Spiritual coping strategy items: New content in the form of items that focused on spiritual coping strategies were included in the revision of the CBI-2.0. Based on interviews with patients, the extant literature on religious/spiritual coping, and consultation with colleagues with expertise in this area, 10 items were constructed for initial testing. In a preliminary EFA with all 10 items, a single dimension emerged and five items (corresponding to the number of items in each of the other scales of CBI V2.0) with the highest factor loadings were selected to be included in the EFA with targeted rotation for the current revision of the CBI. Based on the CFAs and item trimming (see Results section) four items were ultimately chosen for inclusion in CBI-V3.0 (Table 3).

Reading level analysis: The instructions and items in the CBI-V3.0 were subjected to reading level analysis (http://www.online-utility.org/english/readability_test_and_improve.jsp) and modified to reduce the grade level or difficulty to the lowest level possible while retaining necessary information to complete the measure. These indices of readability represent the number of years of education needed to be able to comprehend the text easily with a single reading. The following results were obtained on the final version of the CBI-V3.0: Coleman Liau Index: 5.92; Flesch Kincaid Grade Level: 6.79; Automated Readability Index: 4.43; SMOG: Grade 6 (raw score = 9.08). Based on these scores the mean grade level was 5.785, thus, approximately a 6th grade reading level.

Additional Measures—Validity analyses of the scale scores, which were derived from the factors, and the total score of the CBI-V3.0 were conducted using a variety of scores from measures and scales of measures that fell into broad categories corresponding to the factors of the CBI-V3.0. These measures included physical and functional well-being scores (*FACT – Quality of Life*; Cella, Tulsky, Gray, et al, 1993; Cella, 1997; *Quality of Life Assessment for Cancer Survivors*, Avis, Smith, McGraw, Smith, Petronis, & Carver, 2005), disease impact scores (*Sickness Impact Profile*, Bergner, Bobbit, Carter & Gilson, 1981; *Patient Adjustment to Illness Scale*, Derogatis & Derogatis, 1990), emotional well-being (*FACT*, Cella et al, 1993; *Center for Epidemiologic Studies - Depression*, Radloff, 1997; *Hospital Anxiety and Depression Scale*, Zigmond & Snaith, 1983), symptoms (*Quality of Life Assessment for Cancer Survivors*, Avis et al, 2005), types of coping (*Brief COPE Scale*, Carver, 1997; *Distress Screening Schedule* (DSS), Merluzzi, Philip, & Heitzmann, 2016), social support (*Inventory of Socially Supportive Behaviors*, Barrera, Sandler, & Ramsay, 1981; Finch, Barrera, Okun, Bryant, Pool, & Snow-Turek, 1997), spiritual well-being (*FACT Spirituality*, Peterman, Fitchett, Brady, Hernandez, & Cella, 2002), religious coping (*Religious Coping Scale*, Pargament, Smith, Koenig, & Perez, 1998), and general self-efficacy (*General Self-Efficacy Scale*, Schwartzer & Jerusalem, 1995). These measures are very well-established, well-used, and psychometrically sound. The Distress Screening Schedule (Merluzzi et al, 2016) was added which assesses distress (depression and anxiety) as well as functional capacity, social support, coping, and satisfaction with health care. Its factor structure has been confirmed and based on convergent validity data tailored to each scale (Philip, 2013), it is highly valid. All of these measures were chosen due to their quality and relevance to test the validity of the scale scores of the CBI-V3.0.

Data Analytic Plan

There were six steps in the data analyses: 1) An EFA was computed on dataset 1 scores (cf., Table 1) with Targeted Oblique Rotation, which used the previously well-established factor structure of CBI-V2.0 as a starting point. 2) To confirm the factor structure established in the EFA + Targeted Rotation, two CFAs were computed on datasets 2 and 3 (cf., Table 1). 3) Items were trimmed based on commonly accepted decision rules to reduce the number of items. 4) Differential item functioning (DIF) using the MIMIC model was conducted on the combination of scores from samples 1, 2, 3 and 4 (N=1405) to provide a comprehensive analysis of DIF and the impact of DIF on the overall CBI-V3.0 scores. Finally, 5) to test the psychometric properties of the CBI-V3.0, reliability (internal consistency and test-retest) and tailored validity analyses were conducted on the scale scores and on the overall total score of the CBI-V3.0.

For the EFA + Targeted Rotation, we used a test of close fit (Browne & Cudeck, 1993), for which the null hypothesis is RMSEA≤0.05 and the alternative is RMSEA>0.05. Initial results showed that when the number of factors was 7 or more, the close fit assumption would not be rejected at the 0.10 significance level. Thus, we anticipated retaining 8 factors because: (1) a previous version of CBI (V2.0) supported 7 factors and a new spiritual coping scale was added to CBI-V3 and (2) more factors would possibly lead to superfluous overfactoring. After determining the number of factors, we used Targeted Oblique Rotation to obtain the factor structure. Targeted Rotation was originally proposed by Browne (1972 a,b) for EFA that has a known, established starting factor structure. That is, the basic idea of Targeted Rotation is to rotate the factor pattern to a prior established factor structure (Brown, 2001). The idea is very similar to CFA because values for factor loadings have to be specified in advance. However, as argued in Browne (2001), there is a salient difference between the two in that CFA strictly restricts the factor structure to be the pre-specified one whereas targeted rotation does not. In targeted rotation, the factor structure is rotated according to the target matrix, but the final structure may change if the targeted one does not provide good fit (Asparouhov & Muthen, 2009). Thus, the EFA + Targeted Rotation was a good choice as the starting point given the addition of new spiritual coping items and the revision of other items, many of which were concentrated in one factor of the CBI-V2.0. Finally, targeted rotation has also been included in MPLUS for exploratory structural equation modeling (Asparouhov & Muthen, 2009), which has the same underlying rationale as the EFA + Targeted Oblique Rotation used in this study.

Differential item functioning—The Multiple Indicators Multiple Causes (MIMIC; Jones, 2006) model is a widely-used DIF method. Differential item functioning (DIF) occurs when the response to items of people from different groups with the same latent trait have different probability distributions. For example, if there is only one latent factor (e.g., Factor 1 of the CBI – Maintaining Activity and Independence), which is measured by 4 items (CBI1, CBI4, CBI9, CBI25), an item (e.g., CBI1) has gender DIF if the probability distribution of the item score was different for men and women even if they have the same ability on the latent factor. Thus, the group association may cause biases/differences on item scores. Using the MIMIC method, the latent factor MA is regressed on an observed grouping variable (G), which is also called the background/cause variable, to test for group mean differences on the factor. To detect DIF, a test is conducted to determine whether there is a significant path from the grouping variable to each item (i.e., CBI1, CBI4, CBI9, CBI25) after controlling for the level of the latent factor (i.e., MA). In the current study, DIF was computed for the following four grouping variables: Sex (Male/Female), Ethnicity/Race (African American/Caucasian), Income (<=$40,000/>$40,000), and Education (high school degree or less/more than high school degree). With four grouping variables, the basic premise is the same as the simpler scenario described. The MIMIC approach has at least two advantages. First, unlike methods that require a separate covariance matrix to be estimated for each group, the MIMIC approach only needs to estimate the additional paths from the grouping variable to the latent factor and items. Second, with this approach, it is easy to detect the presence of DIF for more than two groups.

The stages of identifying potential DIF using the MIMIC model are as follows: 1) Fit the MIMIC model with all the paths of the grouping variable set to 0. In this way, the MIMIC model is essentially the same as a confirmatory factor model. Thus, this step is just a re-check of the factor model that was confirmed in the previous two CFAs. 2) Allow for the paths from the grouping variable (G) to the latent factor to vary while the paths from the grouping variable to items are still constrained to 0. 3) Check modification indices. 4) Add direct paths from the grouping variable to items for items with highest modification indices and rerun model. 5) Repeat steps 3 and 4 until there are no further significant modification indices. When the modification index of a path was larger than 3.84, it was included it in the model, otherwise it was not included. This decision rule is based a critical value of χ^2; 3.84 is significant at the 0.95 level.

Results

Exploratory Factor Analysis (EFA) Plus Targeted Rotation on Sample 1

EFA plus Targeted Oblique Rotation was performed to examine the underlying factor structure of the items in CBI-V3.0 using generalized least square (GLS) estimation (Jöreskog & Goldberger, 1972). With Targeted Rotation (Browne, 1972) the initial rotation matrix coincided with the original factor structure of the CBI-V2.0, thus optimizing the existing, well-established factor structure of the prior version of the CBI. EFA+Targeted Rotation results showed that item 35 had a very small loading on all factors and was eliminated from further analyses. Also, because one factor had only one item (item 16), we eliminated that factor by adding that sole item to the factor that had the largest correlation with the one-item factor (Factor 3), and renumbered the Factors 1-7. Thus, as opposed to the hypothesized 8 factors, only 7 viable factors emerged. Because item 16 was the sole item to emerge on a factor in the EFA + Targeted Rotation and other reworded items from the Affective Regulation scale loaded on Factor 3, it was logical to reassign it to Factor 3.

The names of the factors (and the items) that emerged from the EFA are as follows: Factor 1: Maintaining Activity and Independence (1, 4, 9, 25, 26); Factor 2: Seeking and Understanding Medical Information (6, 10, 17, 22, 34); Factor 3: Emotion Regulation (7, 13, 14, 16, 20); Factor 4: Coping with Treatment Related Side Effects (12, 15, 27, 29, 31, 36, 37, 38); Factor 5: Accepting Cancer/ Maintaining a Positive Attitude (2, 3, 28, 32); Factor 6: Seeking Social Support (8, 19, 30); and, Factor 7: Using Spiritual Coping (5, 11, 18, 24, 33). Thus, the consolidation of revised items from the Affective Regulation scale with the Managing Stress scales of the CBI-V2.0 to constitute a factor (Factor 3: Emotion Regulation) of the CBI-V3.0 reflected a common theme of regulating emotional reactions. Except for consolidating those items into the Emotion Regulation scale, the factor structure of the CBI-V3.0 was identical to that of the CBI-V2.0.

Confirmatory Factor Analysis (CFA) on Samples 2 and 3

CFA, using weighted least square (WLS) estimation methods (Muthén, 1984), was performed to validate the factor structure obtained from the EFA + Targeted Rotation. Two fit indices were used to assess the model fit: 1) comparative fit index (CFI), where values of .95 or greater suggest adequate fit and, 2) root mean square error of approximation (RMSEA), where values of 0.08 or less suggest adequate fit. For datasets 2 and 3, the CFIs were 0.98 and 0.957, respectively, and RMSEAs (and 95% confidence intervals) were 0.062 (0.054, 0.069) and 0.074 (0.069, 0.079), respectively. Because the CFIs, the RMSEAs, and their 95% confidence intervals all met the criteria for adequate fit, we concluded that the 7-factor model fit both samples well. Standardized factor loadings for the CFAs are contained in Table 2.

Item Trimming

In order to derive a measure with excellent reliability and validity, while, at the same time trimming items to reduce the burden for clinical patients and research participants, items were judiciously trimmed to reduce the number of items per scale while retaining strong psychometric properties. In trimming items the following were considered: 1) strong association of the item with a factor, 2) similar meaning among items on any one factor, and 3) stability across datasets. Using these standard rules, in Factor 1 (Maintaining Activity and Independence), item 26 (“ Getting away from it all, at times”) was deemed as not as good as other items because it had different meaning from other items in that factor and had the smallest factor loading. In Factor 2 (Seeking Medical Information), all five items were consistent in meaning; however, item 22 (“Seeking information about cancer or cancer treatments”) was less stable than the others because it had very small loadings in both CFAs. For Factor 3 (Emotion Regulation), item 20 (“Trying to be calm while waiting at least on hour for my appointment”) was trimmed because it had smaller loadings than others in both CFAs, and on the EFA it had very similar and modest loadings on both Factors 3 and 4. Because there were many good items on Factor 4 (Coping with Treatment Related Side Effects) the decision strategy was based on choosing items with consistently high factor loadings as well as consistency in meaning (i.e., 15, 29, 36, 37). In Factor 5 (Accepting

Cancer/Maintaining a Positive Attitude), despite item 3 having a smaller loading on both CFAs, it was deemed acceptable in light of there being only four items in that factor. All three items in Factor 7 (Seeking Social Support) were considered very acceptable for inclusion. Finally, in Factor 7 (Using Spiritual Coping), item 5 was removed because it had the smallest loadings in both CFAs and the EFA. The final items and scales of the CBI-V3.0 are contained in Table 3.

Differential Item Functioning: MIMIC model

In order to arrive at more stable findings, the DIF model testing was compiled over the four samples of mixed diagnoses cancer patients (*N*= 1405) as opposed to individual samples. DIF emerged on 10 items (X^2>3.84, p<.05) scattered across all seven factors. Critical to this analysis is how significant DIF items affected scoring and interpretation. Cohen's *d* was computed on those 10 items and only two values exceeded .30 [item 8 (Factor 6, Grouping Variable=Sex, *d*=.384) and item 32 (Factor 5, Grouping Variable=Race, *d*=.349)], and were confined to two items representing different grouping variables and factors. Thus, in spite of the statistical significance of grouping-variable paths on 10 items, the absolute magnitude of the bias was very small in terms of effect size.

Reliability

Internal consistency was computed for the each of the scales of the CBI-V3.0 as well as the total scale score based on dataset 4 (Table 3). Also, test-retest reliability for the total score (*r* =. 890) was computed using a randomly chosen sample (*n*=29) of patients from dataset 4 with an interval of four months between administrations. For that test-retest interval, reliability coefficients for each scale score ranged from .563 to .921 (Table 3). The level of the test-retest coefficients was acceptable based on the fact that self-efficacy varies as a function of many situational variables (e.g. negative side effects of treatments) and internal states (e.g. fatigue). A more stringent assessment of test-retest reliability would include a series of shorter intervals (e.g., 1 week, 1 month, 2 months and 4 months). Internal consistency (Cronbach's α) for the total CBI-V3.0 score was .946. The Cronbach's αs and test-retest reliabilities for the scale scores are as follows: Factor 1: Maintaining Activity and Independence, α=0.891, *r*=0.921; Factor 2: Seeking and Understanding Medical Information, α=0.814, *r*=0.746; Factor 3: Emotion Regulation, α=0.855, *r*=0.719; Factor 4: Coping with Treatment Related Side Effects, α=0.862, *r*=0.770; Factor 5: Accepting Cancer/ Maintaining a Positive Attitude, α=0.812, *r*=0.682; Factor 6: Seeking Social Support, α=0.813, *r*=0.563; and, Factor 8: Using Spiritual Coping, α=0.970, *r*=0.637.

Validity

In order to present a concise summary of the validity of the CBI-V3.0, the authors chose strategic comparisons. Measures or scales were chosen based on their expected relationship with a scale of the CBI-V3.0. This approach does not obviate the fact that the same measure scores might correlate with scores from several factors of the CBI-V3.0; however, the assignment was based on the conceptual relevance of the measure for each scale. The validity coefficients are presented in Table 4. With just a few exceptions, the validity coefficients were very strong with all strategic validity tests ranging from medium to large effect sizes for correlations (.30 and above). In addition, discriminant validity coefficients were computed with time since diagnosis, age, education, and income. In all instances, these correlations were modest, lower than the validity coefficients, and in the small effect size range (.10–30).

Discussion

Based on the rigorous and comprehensive approach to the revision of the CBI, the CBI-V3.0 emerges as a robust measure of self-efficacy behaviors for coping with cancer that has both research and clinical utility. The theoretical basis for the measure and the use of state-of-the-art psychometric analyses provide assurances of the quality of the CBI-V3.0. The EFA + Targeted Rotation and CFAs supported the continuation of a robust factor structure from the CBI-V2.0 to the CBI-V3.0. The seven scales that were derived from the CFAs confirmed six of the original seven factors of the CBI-V2.0 and the merging of conceptually related items that resulted in the Emotion Regulation factor. The new seventh factor that is contained in the CBI-V3.0 is the result of additional content reflecting spiritual coping efficacy, an important element of the cancer experience for many patients and survivors. Revised items from the Affective Regulation scale in CBI-V2.0 that were somewhat confusing to patients and contributed to lower internal consistency scores than on the other scales, loaded on Factor 3 of CBI-V3.0. This merging made conceptual sense in that the items focus on emotion regulation, and as such, provided a clearer, more coherent, and robust scale compared to the Affective Regulation scale in the CBI-V2.0. Based on this merger of CBI-V2.0 stress management and affect regulation scales, that factor in V3.0 was labeled Emotion Regulation.

The CBI-V3.0 was strategically trimmed to 27 items even with the addition of the Using Spiritual Coping factor. At the same time, the internal consistency scores of the scale scores and the total score remained at least as strong as V2.0. In addition, more extensive validity testing compared to V2.0 provided strong support for the validity of the scores obtained in V3.0. The first scale, Maintenance of Activity and Independence, has emerged as a critical factor in all three versions of the CBI. A high score on this scale would indicate that the person is attempting to mitigate the loss of activity and independence as a function of cancer and its treatments, which for many people represents a transition that would require major readjustment with regard to lifestyle and quality of life. The second factor, Seeking and Understanding Medical Information contained items that reflect coping strategies that are consistent with collaborative approaches to health care and the empowerment of patients. The ability to pose questions to medical personnel and being a part of medical decision-making may contribute to a better sense of physical and functional well-being. The ability to manage emotional reactions and to reduce depression and anxiety in the context of cancer are the essential components of the third factor, Emotion Regulation. Factor 4, Coping with Treatment-Related Side-Effects, represents strategically coping with physical changes and physical limitations (e.g., lack of energy, pain, fatigue) to mitigate their impact on quality of life. The fifth factor, Accepting Cancer/ Maintaining Positive Attitude, reflects the paradox of maintaining hope and accepting the reality of cancer and its treatments. Factor 6, Seeking Support, contains items that reflect an agentic approach to social support in which patients seek out people in order to adjust better to cancer. Based on optimal matching theory (Cutrona & Russell, 1990; Merluzzi et al, 2016), social support is optimized when there is compatibility between the patient’s needs and the social support provided. Thus, seeking social support might presume some search for that optimal matching versus the acceptance of support, which may or may not be needed or helpful.

Finally, the Using Spiritual Coping scale represents a very coherent assessment of the patient’s perceived ability to use spirituality in the process of adjusting to cancer and its treatments. Importantly, the items in this factor would be optional for those for whom religion and spirituality are not important in their coping strategy repertoire; clear instructions are now included for both those administering and completing the CBI-V3.0. Thus, for some patients and survivors, for example atheists and agnostics, this scale would be excluded and the items not included in the total CBI score. Because these instructions were not clear in earlier versions of the CBI, we conducted follow-up analyses (not reported) and found that there were no significant differences in the Using Spiritual Coping factor scores based on endorsement of a faith group or the ‘other’ or ‘no response’ categories for those for whom data were available. Moreover, given that most people who endorsed “no response” to the religion categories completed the spirituality items and choosing to not respond to the items signaled lack of utility of those items for some, the missing data had no impact in the context of the current psychometric study. That is, the items are useful for those for whom spiritual coping strategies are important. Moving forward, in circumstances in which the spirituality subscale is excluded, the remaining six factors that would constitute a total score and still provide a robust and compressive assessment of coping self-efficacy. In sum, the CBI-V3.0 taps some of the most important dimensions of strategic coping behaviors with cancer with psychometrically robust scales derived from a stable factor structure.

The relationship between the CBI-V3.0 scale scores and scores from other measures relevant to strategically coping with cancer support the validity of the 27-item CBI-V3.0. Scale scores of the CBI-V3.0 correlated significantly with measures chosen to converge on the content of each scale. Consistent with self-efficacy theory and self-regulation theory (Carver & Scheier, 1998) cancer patients who are highly efficacious may perceive some causal relationship between their behaviors and valued goals or outcomes. Thus, those who engage in coping strategies with an active, agentic style, which includes the perception of control of outcomes, should adjust more positively than those with an avoidant coping style (Merluzzi, Philip, Zhang, & Sullivan, 2015). Finally, The CBI-V3.0 scale scores have low correlations with measures of time since diagnosis, age, education, and income, which confirmed the MIMIC DIF analyses. Thus, these demographic and disease variables provide minimal bias on CBI-V3.0 scores and are evidence of discriminant validity. However, future research could focus on other discriminant variables such as socially desirable responding and self-deception to provide further evidence of discriminant validity.

With respect to test-retest reliability, the factors do represent different aspects of coping with cancer, and as such, may not be expected to be uniformly stable over time. There were no a priori hypotheses about how the coefficients might vary. However, given the relatively long inter-test interval, the values are respectable and the value for the total scale was .89. Given that efficacy expectations may vary even minute to minute based on one’s confidence to perform the behavior, the lower values for maintaining positivity and seeking support may reflect the ebb and flow of one’s ability to keep an even approach to coping with cancer. Also, when cast in the self-regulation model, self-efficacy expectations may vary as a function of goal modification. Thus, given the time interval and the nature of expectations, some lower test-retest values may be expected. Further assessment of temporal stability might include systematically comparing reliability for shorter intervals.

Despite the extensive and comprehensive revision there may be some limitations worth noting. Whereas CBI-V3.0 builds upon the prior version and most of the structure was replicated, it will need to be used in clinical trials research to determine if it is responsive to interventions to improve coping behaviors and its relation to outcomes such a quality of life, depression, and anxiety. Also, although the data sets included individuals from a broad geographic area (midwest, west, south) and all datasets included diversity with respect to gender, ethnicity, and diagnosis, the samples were convenience not random or epidemiological samples and may be prone to selection bias, which can, in the case of the CBI, result in higher scores than in the broader population of cancer patients and survivors. Thus, more representative data would help to confirm what was reported in this revision. Whereas this 27-item version of the CBI-V3.0 is shorter than the last, there would be utility in developing a very brief version that may be used in clinical settings where time is an issue in terms of having patients or participants complete measures or for screening to determine the need for referral for supportive services. Finally, as new medical treatments are tested (e.g., immunotherapies) against traditional approaches, coping efficacy along with quality of life may be important adjuncts to the assessment of the effectiveness of those innovations in cancer care.

Future research should also focus on the clinical utility of the CBI-V3.0 in the context of clinical trials that focus on improving psychological and medical outcomes. Complementing quality of life measures, the CBI-V3.0 could be administered at intervals during the course of medical treatments to assess if a consequence of treatment is the erosion, enhancement, or maintenance of confidence in coping strategies across the course treatments (e.g., high intensity chemotherapy regimens, the combination of chemotherapy and radiation, or Brachytherapy). Also, future research might include the use of the CBI-V3.0 to detect early changes in coping that may be precursors to other changes such as quality of life and emotional well-being. Finally, the clinical utility of the CBI-V3.0 for practitioners could include the development of profiles of strengths and weaknesses in strategic coping that lead to tailored interventions to help the individual endure, recover, or even thrive in the face of the challenges that are endemic to cancer and its treatments.

In sum, the CBI-V3.0 emerged from this comprehensive, critical analysis as a stronger and more complete measure of self-efficacy than the previous version. The revision of items to remedy marginal internal consistency, adjustment of reading level, inclusion of new robust content, replication of CFAs, greater scrutiny of items with differential item functioning, more extensive validity analyses, and a reduction in items with no decrement in psychometric quality are all significant improvements in this version and provide further evidence of the importance of iterative scale development and utilization of modern psychometric analyses.

Acknowledgments

This research was supported by a grant from the National Cancer Institute (CA94914). The authors would like to thank the patients and survivors from around the country who participated in this study as well as the physicians and staff of Michiana Hematology-Oncology, the Northern Indiana Cancer Research Consortium, and Memorial Hospital's Regional Cancer Center, South Bend, Indiana.

References

Adler, NE., Page, AE., editors. Cancer care for the whole patient: Meeting psychosocial health needs. Washington D.C.: National Academies Press; 2007.

Alfano CM, Rowland JH. Recovery issues in cancer survivorship: a new challenge for supportive care. Cancer Journal. 2006; 12:432–43.

American College of Surgeons. Cancer program standards: Ensuring patient-centered care. 2016. Retrieved 10/3/2016 from https://www.facs.org/~/media/files/quality%20programs/cancer/coc/2016%20coc%20standards%20manual_interactive%20pdf.ashx

Asparouhov T, Muthén B. Exploratory Structural Equation Modeling. Structural Equation Modeling: A Multidisciplinary Journal. 2009; 16(3):397–438. http://doi.org/10.1080/10705510903008204.

Avis NE, Smith KW, McGraw S, Smith RG, Petronis VM, Carver CS. Assessing quality of life in adult cancer survivors (QLACS). Quality of life Research. 2005; 14:1007–1023. [PubMed: 16041897]

Bandura, A. Self-efficacy: The exercise of control. New York: Freeman; 1997.

Barrera M, Sandler IN, Ramsay TB. Preliminary development of a scale of social support: Studies on college students. American Journal of Community Psychology. 1981; 9:435–447.

Bayly JL, Lloyd-Williams M. Identifying functional impairment and rehabilitation needs in patients newly diagnosed with inoperable lung cancer: a structured literature review. Support Care in Cancer. 2016; 24:2359–2379. DOI: 10.1007/s00520-015-3066-1

Bergner M, Bobbit RA, Carter WB, Gilson BS. The Sickness Impact Profile: Development and final revision of a health status measure. Medical Care. 1981; 19:787–805. DOI: 10.1097/00005650-198108000-00001 [PubMed: 7278416]

Browne MW. Oblique Rotation to a Partially Specified Target. British Journal of Mathematical and Statistical Psychology. 1972a; 25(2):207–212. http://doi.org/10.1111/j.2044-8317.1972.tb00492.x.

Browne MW. Orthogonal Rotation to a Partially Specified Target. British Journal of Mathematical and Statistical Psychology. 1972b; 25(1):115–120. http://doi.org/10.1111/j.2044-8317.1972.tb00482.x.

Browne MW. An Overview of Analytic Rotation in Exploratory Factor Analysis. Multivariate Behavioral Research. 2001; 36(1):111–150. http://doi.org/10.1207/S15327906MBR3601_05.

Browne, MW., Cudeck, R. Alternative ways of assessing model fit. In: Bollen, KA., Long, JS., editors. Testing structural equation models. Newbury Park, CA: Sage; 1993. p. 136-162.

Carpenter K, Stoner S, Schmitz K, McGregor B, Doorenbos A. On line stress management workbook for breast cancer. Journal of Behavioral Medicine. 2014; 37:458–468. [PubMed: 23212928]

Carver CS. You want to measure coping but your protocol's too long: Consider the brief COPE. International Journal of Behavioral Medicine. 1997; 4:92–100. DOI: 10.1207/s15327558ijbm0401_6 [PubMed: 16250744]

Carver, CS., Scheier, MF. On the Self-regulation of behaviour. Cambridge University Press; New York: 1998.

Cella, D. F A C I T: Manual of the Functional Assessment of Chronic Illness Therapy Scales. Center on Outcomes, Research and Education (CORE); Evanston, IL.: 1997.

Cella DF, Tulsky DS, Gray G, Sarafian B, Linn E, Bonomi A, Silberman M, Yellen SB, Winicour B, Brannon J. The functional assessment of cancer therapy scale: Development and validation of the general measure. Journal of Clinical Oncology. 1993; 11:570–579. [PubMed: 8445433]

Chirico A, Lucidi F, Mallia L, D'Aiuto M, Merluzzi TV. Indicators of distress in newly diagnosed breast cancer patients. PeerJ. 2015; 21:e1107.doi: 10.7717/peerj.1107

Cutrona, C., Russell, D. Type of social support and specific stress: Toward a theory of optimal matching. In: Sarason, B.Sarason, I., Pierce, G., editors. Social support: An interactional view. New York: Wiley; 1990. p. 319-366.

Derogatis, LR., Derogatis, MF. The Psychosocial Adjustment to Illness Scale (PAIS & PAIS-SR): Administration, scoring, and procedures manual II. Clinical Psychometric Research; Towson, MD: 1990.

Finch JF, Barrera M Jr, Okun MA, Bryant WHM, Pool GJ, Snow-Turek AL. Factor structure of received social support: Dimensionality and the prediction of depression and life satisfaction. Journal of Social and Clinical Psychology. 1997; 16:323–342.

Fan X. Item response theory and classical test theory: an empirical comparison of their items/person statistics. Educational and Psychological Measurement. 1998; 58(3):357–381.

Heitzmann CA, Merluzzi TV, Jean-Pierre P, Roscoe JA, Kirsh KL, Passik D. Assessing self-efficacy for coping with cancer: development and psychometric analysis of the brief version of the Cancer Behavior Inventory (CBI-B). Psychooncology. 2011; 20:302–12. [PubMed: 20878830]

Hewitt, M.Greenfield, S., Stovall, E., editors. From cancer patient to cancer survivor: Lost in transition. Institute of Medicine and National Research Council; 2005.

Jim HSL, Pustejovsky J, Park CL, Danhauer SC, Sherman AC, Fitchett G, Merluzzi TV, Munoz AR, George L, Snyder MA, Salsman JM. Religion, spirituality, and physical health in cancer patients: A meta-analysis. Cancer. 2015; 121:3760–3768. [PubMed: 26258868]

Jones RN. Quantitative issues and approaches: Differential item functioning (DIF). Medical Care. 2006; 44:S124–S133. DOI: 10.1097/01.mlr.0000245250.50114.0f [PubMed: 17060819]

Jöreskog KG, Goldberger AS. Factor analysis by generalized least squares. Psychometrika. 1972; 37(3):243–260.

Kenzik KM, Kent EE, Martin MY, et al. Chronic condition clusters and functional impairment in older cancer survivors: a population-based study. Journal of Cancer Survivorship. 2016; doi: 10.1007/s11764-016-0553-4

Liang S, Chao T, Tseng L, Tsay S, Lin K, Tung H. Symptom-management self-efficacy mediates the effects of symptom distress on the quality of life among Taiwanese oncology outpatients with breast cancer. Cancer Nursing. 2016; 39:67–73. DOI: 10.1097/NCC.0000000000000244 [PubMed: 25730592]

Linde JA, Rothman AJ, Baldwin AS, Jeffery R. The impact of self-efficacy on behavior change and weight change among overweight participants in a weight loss trial. Health Psychology. 2006; 25:282–92. [PubMed: 16719599]

Marszalek J, Price L, Harvey W, Driban J, Wang C. Outcome expectations and osteoarthritis: Perceived benefits of exercise are associated with self-efficacy and depression. Arthritis Care & Research. 2016; doi: 10.1002/acr.22969

Meredith P, Strong J, Feeney JA. Adult attachment, anxiety, and pain self-efficacy as predictors of pain intensity and disability. Pain. 2006; 123:146–54. [PubMed: 16644132]

Merluzzi TV, Martinez Sanchez MA. Assessment of self-efficacy and coping with cancer: Development and validation of the cancer behavior inventory. Health Psychology. 1997; 16:163–170. [PubMed: 9269887]

Merluzzi TV, Nairn RC, Hedge K, Sanchez MA, Dunn L. Self-efficacy for coping with cancer: Revision of the Cancer Behavior Inventory (Version 2.0). Psycho-Oncology. 2001; 10:206–217. DOI: 10.1002/pon.511.abs [PubMed: 11351373]

Merluzzi TV, Philip EJ. Letting Go - From ancient to modern perspectives on relinquishing personal control: Focus on religion and coping with cancer. Journal of Religion and Health. (in press).

Merluzzi TV, Philip EJ, Heitzmann CA. The Distress Screening Schedule: A multidimensional screening instrument for cancer patients and survivors. 2016 Unpublished manuscript.

Merluzzi TV, Philip EJ, Zhang Z, Sullivan C. Perceived discrimination, coping, and quality of life for African-American and Caucasian persons with cancer. Cultural Diversity and Ethnic Minority Psychology. 2015; 21(3):337–44. DOI: 10.1037/a0037543 [PubMed: 25090144]

Merluzzi TV, Philip EJ, Yang M, Heitzmann CA. Matching of received social support with need for support in adjusting to cancer and cancer survivorship. Psycho-Oncology. 2016

Mitchell AJ, Ferguson DW, Gill J, Paul J, Symonds P. Depression and anxiety in long-term cancer survivors compared with spouses and healthy controls: A systematic review and meta-analysis. Lancet Oncology. 2013; 14:721–32. [PubMed: 23759376]

Mosher CE, DuHamel KN, Egert J, Smith MY. Self-efficacy for coping with cancer in a multiethnic sample of breast cancer patients: Associations with barriers to pain management and distress. Clinical Journal of Pain. 2010; 26:227–234. [PubMed: 20173437]

Nairn RC. Improving coping with cancer utilizing Mastery Enhancement Therapy. ProQuest Information and Learning. 2004:620637745.

Nairn RC, Merluzzi TV. The role of religious coping in adjustment to cancer. Psycho-Oncology. 2003; 12:428–441. [PubMed: 12833556]

Pargament KI, Smith BW, Koenig HG, Perez L. Patterns of positive and negative religious coping with major life stressors. Journal for the Scientific Study of Religion. 1998; 37:710–724.

Park CL, Masters KS, Salsman JM, et al. Advancing our understanding of religion and spirituality in the context of behavioral medicine. Journal of Behavioral Medicine. 2016; doi: 10.1007/s10865-016-9755-5

Peterman AH, Fitchett G, Brady MJ, Hernandez L, Cella D. Measuring spiritual well-being in people with cancer: The functional assessment of chronic illness therapy— spiritual well-being scale (FACIT-Sp). Annals of Behavioral Medicine. 2002; 24:49–58. DOI: 10.1207/S15324796ABM2401_06 [PubMed: 12008794]

Philip EJ. The 6th vital sign in medicine: Evaluation of a comprehensive model of distress in cancer care. ProQuest Information & Learning. 2013; 2012:AAI3480064.

Philip EJ, Merluzzi TV. Symptom burden and psychosocial stressors in post-treatment cancer survivors: Desire for support and challenges in identifying individuals in need. Journal of Psychosocial Oncology. 2016; 34:223–239. [PubMed: 26939620]

Philip EJ, Merluzzi TV, Zhang Z, Heitzmann CA. Depression and cancer survivorship: importance of coping self-efficacy in post-treatment survivors. Psychooncology. 2013; 22:987–94. [PubMed: 22573371]

Pikler V, Winterowd C. Racial and body image differences in coping for women diagnosed with breast cancer. Health Psychology. 2003; 22:632–637. DOI: 10.1037/0278-6133.22.6.632 [PubMed: 14640861]

Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. Applied Psychological Measurement. 1997; 3:385–401.

Robb C, Lee A, Jacobsen P, Dobbin K, Extermann M. Health and personal resources in older patients with cancer undergoing chemotherapy. Journal of Geriatric Oncology. 2012; 4:166–173. DOI: 10.1016/j.jgo.2012.12.002

Salsman JM, Fitchett G, Merluzzi TV, Sherman AC, Park CL. Religion, spirituality, and health outcomes in cancer: A case for a meta-analytic investigation. Cancer. 2015; 121:3754–3759. [PubMed: 26258400]

Salsman JM, Pustejovsky JE, Jim HSL, Munoz AR, Merluzzi TV, George L, Park CL, Danhauer SC, Sherman AC, Snyder MA, Fitchett G. A meta-analytic approach to examine the relationship between religion/spirituality and mental health in cancer. Cancer. 2015; 121:3769–3778. [PubMed: 26258536]

Schwartzer, R., Jerusalem, M. Generalized Self-Efficacy Scale. In: Weinman, J.Wright, S., Johnston, M., editors. Measures in health psychology: A user's portfolio - causal and control beliefs. Windsor, UK: NFER-NELSON; 1995. p. 35-37.

Sherman AC, Merluzzi TV, Pustejovsky JE, Park CL, George L, Fitchett G, Jim HSL, Munoz AR, Danhauer SC, Snyder MA, Salsman JM. A meta-analytic review of religious or spiritual involvement and social health among cancer patients. Cancer. 2015; 121:3779–3788. [PubMed: 26258730]

Stanton AL, Ganz PA, Rowland JH, Meyerowitz BE, Krupnick JL, Sears SR. Promoting adjustment after treatment for cancer. Cancer. 2005; 104(11 Suppl):2608–2613. [PubMed: 16247779]

Stein KD, Syrjala KL, Andrykowski MA. Physical and psychological long-term and late effects of cancer. Cancer. 2008; 112(11 Suppl):2577–2592. [PubMed: 18428205]

Weber BA, Roberts BL, Resnick M, Deimling G, Zauszniewski JA, Musil C, et al. The effect of dyadic intervention on self-efficacy, social support, and depression for men with prostate cancer. Psycho-oncology. 2004; 13:47–60. [PubMed: 14745745]

Yeung NCY, Lu Q, Lin W. Specificity may count: Not every aspect of coping self-efficacy is beneficial to quality of life among Chinese cancer survivors in China. International Journal of Behavioral Medicine. 2014; 21:629–637. DOI: 10.1007/s12529-014-9394-6 [PubMed: 24570036]

Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. Acta Psychiatrica Scandinavica. 1983; 67:361–370. http://dx.doi.org/10.1111/j.1600-0447.1983.tb09716. [PubMed: 6880820]

Table 1

Demographic and medical information for Sample 1, 2, 3, and 4.

		Sample 1(N=560)		Sample 2(N=151)		Sample 3(N=287)		Sample 4(N=407)		Combined(1405)	
Age	Range(Mean)	24–89		22–86		26–90		26–90		22–90	
	Mean	63.1		63.0		64.1		63.3		63.53	
	No response	29	5.2%	4	2.6%	8	2.8%	15	3.7%	56	4.0%
Income	<15,000	69	12.3%	9	6%	25	8.7%	42	10.3%	145	10.3%
	15,000–24,999	69	12.3%	14	9.3%	37	12.9%	49	12%	169	12.0%
	25,000–40,000	92	16.4%	28	18.5%	50	17.4%	67	16.5%	237	16.9%
	>40,000	254	45.4%	89	58.9%	146	50.9%	206	50.6%	695	49.5%
	No response	76	13.6%	11	7.3%	29	10.1%	43	10.6%	159	11.3%
Education	Some grade school	5	0.9%	0	0%	5	1.7%	5	1.2%	15	1.1%
	Completed grade school	8	1.4%	3	2%	1	0.3%	1	0.2%	13	0.9%
	Some high school	27	4.8%	5	3.3%	14	4.9%	22	5.4%	68	4.8%
	Completed high school	159	28.4%	37	24.5%	67	23.3%	109	26.8%	372	26.5%
	Some college	141	25.2%	47	31.1%	81	28.2%	106	26%	375	26.7%
	Completed college	89	15.9%	23	15.2%	50	17.4%	68	16.7%	230	16.4%
	Some graduate work	31	5.5%	11	7.3%	18	6.3%	23	5.7%	83	5.9%
	Graduate degree	72	12.9%	23	15.2%	45	15.7%	59	14.5%	199	14.2%
	No response	28	5%	2	1.3%	6	2.1%	13	3.2%	49	3.5%
Sex	Male	160	28.6%	54	35.8%	62	21.6%	93	22.9%	369	26.3%
	Female	373	66.6%	95	62.9%	185	64.5%	265	65.1%	918	65.3%
	No response	27	4.8%	2	1.3%	40	13.9%	49	12%	118	8.4%
Martial	Never married	43	7.7%	14	9.3%	24	8.4%	32	7.9%	113	8.0%
	Married	339	60.5%	101	66.9%	173	60.3%	248	60.9%	861	61.3%
	Divorced/separated/widowed/other	157	28%	35	23.2%	86	30%	118	29%	396	28.2%
	No response	21	3.8%	1	0.7%	4	1.4%	9	2.2%	35	2.5%
Ethnicity	African American	88	15.7%	24	15.9%	71	24.7%	74	18.2%	257	18.3%
	White/European American	415	74.1%	116	76.8%	198	69%	299	73.5%	1028	73.2%
	Other (Asian, Native American, Latino)	22	3.9%	7	4.6%	9	3.1%	12	2.9%	50	3.6%

		Sample 1(N=560)		Sample 2(N=151)		Sample 3(N=287)		Sample 4(N=407)		Combined(1405)	
	No response	35	6.2%	4	2.6%	9	3.1%	22	5.4%	70	5.0%
Employment	Employed	174	31.1%	67	44.4%	92	32.1%	134	32.9%	467	33.2%
	Unemployed	65	11.6%	2	1.3%	27	9.4%	43	10.6%	137	9.8%
	Retired	239	42.7%	71	47%	138	48.1%	182	44.7%	630	44.8%
	Full time homemaker	32	5.7%	8	5.3%	16	5.6%	20	4.9%	76	5.4%
	On leave from employment	20	3.6%	0	0%	5	1.7%	13	3.2%	38	2.7%
	No response	30	5.4%	3	2%	9	3.1%	15	3.7%	57	4.1%
Cancer	Breast	63	11.2%	65	43%	140	48.8%	179	44%	447	31.8%
	Lung	35	6.2%	3	2%	7	2.4%	15	3.7%	60	4.3%
	Prostate	39	7%	27	17.9%	24	8.4%	25	6.1%	115	8.2%
	Colorectal	41	7.3%	3	2%	14	4.9%	30	7.4%	88	6.3%
	Lymphoma	24	4.3%	2	1.3%	8	2.8%	8	2%	42	3.0%
	Other	347	62%	47	31.1%	86	30%	138	33.9%	618	44.0%
	Diagnosis not provided	11	2%	4	2.6%	8	2.8%	12	2.9%	35	2.5%
Religion	Protestant	274	48.9%	71	47%	109	38%	154	37.8%	608	43.3%
	Catholic	148	26.4%	56	37.1%	86	30.0%	111	27.3%	401	28.5%
	Muslim	39	7%	0	0%	0	0%	0	0%	39	2.8%
	Jewish	5	0.9%	3	2.0%	4	1.4%	7	1.7%	19	1.4%
	Other	45	8.0%	17	11.3%	71	24.7%	100	26.3%	233	16.6%
	No response	49	8.8%	4	2.6%	17	5.9%	35	8.6%	105	7.5%
Surgery	Yes	387	69.1%	121	80.1%	218	76%	293	72%	1019	72.5%
	No	160	28.6%	24	15.9%	65	22.6%	103	25.3%	352	25.1%
	Missing	13	2.3%	6	4%	4	1.4%	11	2.7%	34	2.4%
Chemo	Yes	417	74.5%	90	59.6%	196	68.3%	294	72.2%	997	71.0%
	No	129	23%	50	33.1%	84	29.3%	97	23.8%	360	25.6%
	Missing	14	2.5%	11	7.3%	7	2.4%	16	3.9%	48	3.4%
Radiation	Yes	316	56.4%	92	60.9%	180	62.7%	238	58.5%	826	58.8%
	No	226	40.4%	53	35.1%	101	35.2%	154	37.8%	534	38.0%
	Missing	18	3.2%	6	4%	6	2.1%	15	3.7%	45	3.2%

Table 2

Standardized Factor loadings from the CFAs for Samples 2 and 3

Factor 1	**CBI1**	**CBI4**	**CBI9**	**CBI25**	**CBI26**			
Sample 2	1.00	1.04	1.10	1.11	0.97			
Sample 3	1.00	1.06	1.11	1.13	0.97			
Sample 2	0.83	0.87	0.92	0.92	0.81			
Sample 3	0.78	0.83	0.87	0.89	0.76			
Factor 2	**CBI6**	**CBI10**	**CBI17**	**CBI22**	**CBI34**			
Sample 2	1.00	0.99	1.04	🟥	1.01			
Sample 3	1.00	1.32	1.43		1.3			
Sample 2	0.91	0.95	0.90	0.69	0.92			
Sample 3	0.65	0.86	0.94	0.67	0.85			
Factor 3	**CBI7**	**CBI13**	**CBI14**	**CBI16**	**CBI20**			
Sample 2	1.00	0.96	0.99	0.99	🟥			
Sample 3	1.00	1.09	1.12	1.19				
Sample 2	0.89	0.86	0.88	0.88	0.78			
Sample 3	0.73	0.80	0.82	0.87	0.70			
Factor 4	**CBI12**	**CBI15**	**CBI27**	**CBI29**	**CBI31**	**CBI36**	**CBI37**	**CBI38**
Sample 2	1.00	1.29	1.12	1.19	1.26	1.21	1.21	1.28
Sample 3	1.00	1.51	1.32	1.39	1.48	1.37	1.22	1.47
Sample 2	0.70	0.90	0.79	0.83	0.88	0.85	0.85	0.90
Sample 3	0.59	0.89	0.78	0.82	0.87	0.81	0.72	0.87
Factor 5	**CBI2**	**CBI3**	**CBI28**	**CBI32**				
Sample 2	1.00	🟥	1.00	1.05				
Sample 3	1.00		1.03	1.08				

Factor 1	**CBI1**	**CBI4**	**CBI9**	**CBI25**	**CBI26**			
Sample 2	0.85	0.72	0.86	0.90				
Sample 3	0.83	0.63	0.85	0.89				
Factor 6	**CBI8**	**CBI19**	**CBI30**					
Sample 2	1.00	0.95	1.08					
Sample 3	1.00	0.98	1.12					
Sample 2	0.87	0.82	0.94					
Sample 3	0.78	0.76	0.87					
Factor 7	**CBI5**	**CBI11**	**CBI18**	**CBI24**	**CBI33**			
Sample 2	1.00	1.11	1.10	1.10	1.07			
Sample 3	1.00	1.03	1.04	1.04	1.03			
Sample 2	0.88	0.97	0.97	0.97	0.94			
Sample 3	0.93	0.95	0.97	0.96	0.96			

Note: Factor 1: Maintaining Activity and Independence; Factor 2: Seeking and Understanding Medical Information; Factor 3: Emotion Regulation; Factor 4: Coping with Treatment Related Side Effects; Factor 5: Accepting Cancer/Maintaining a Positive Attitude; Factor 6: Seeking Social Support; and, Factor 7: Using Spiritual Coping

Table 3

Final Factor Structure of the Cancer Behavior Inventory (Version 3) Based on EFA (Generalized Least Squares Estimation), CFA (Weighted Least Squares Estimation), and Item Trimming

Factor 1: Maintaining Activity and Independence (α=.891; Test-retest .921)	
1	Maintaining independence
4	Maintaining activities (work, home hobbies, social)
9	Maintaining a daily routine
25	Keeping busy with activities
Factor 2: Seeking and Understanding Medical Information (α= .814; Test-retest .746)	
6	Asking nurses questions
10	Asking my health care professionals questions
17	Actively participating in treatment decisions
34	Asking physicians questions
Factor 3: Emotion Regulation (α= .855; Test-retest .719)	
7	Trying to be calm throughout treatments and not allowing scary thoughts to upset me
13	Putting things out of my mind at times
14	Trying to be calm while receiving treatment (chemotherapy, radiation)
16	Learning to “let things go” at times
Factor 4: Coping with Treatment Related Side Effects (α= .862; Test-retest .770)	
15	Coping with physical changes
29	Accepting physical changes or limitations caused by cancer treatment
36	Coping with aches and pains
37	Managing nausea and vomiting (whether or not I have had these problems in the past)
Factor 5: Accepting Cancer/Maintaining a Positive Attitude (α= .812; Test-retest .682)	
2	Maintaining a positive attitude
3	Accepting that I have cancer
28	Maintaining a sense of humor
32	Maintaining hope
Factor 6: Seeking Social Support (α= .813; Test-retest .563)	
8	Seeking support from people and groups outside the family
19	Sharing my worries or concerns with others
30	Seeking social support
Factor 7: Using Spiritual Coping (α= .970; Test-retest .637)	
11	Using spiritual/religious beliefs as a source of coping
18	Using spirituality/religion to give my life meaning
24	Maintaining hope using spirituality/religion
33	Using spiritual/religious beliefs to understand my reasons for living/surviving

Note: Item numbers are from the longer version of the CBI-V3 before item trimming. Items trimmed: 5, 12, 20, 22, 26, 27, 31, 38. Please refer to the section on item trimming. Total Scale α= .946; Test-retest .890).

Table 4

Validity coefficients based on conceptual relevance of the measures for the factors of the CBI-V3

Factor 1: Maintaining Activity and Independence (α = .891; *r* = .921)			
Sample 1	Sample 2	Sample 3	
.567**	.566**	.684**	FACT: Physical Well Being
.691**	.728**	.773**	FACT : Functional Well Being
−.733**	−.684**	−.752**	DSS: Functional
		−.713**	PAIS: Total Score
.104*			Time since diagnosis
.251**			Annual Income
Factor 2: Seeking and Understanding Medical Information (α = .814; *r* = .746)			
−.418**			PAIS: Health Care Orientation
.505**	.426**	.315**	DSS Satisfaction with Health Care
.153**			Level of Education
.212**			Annual Income
Factor 3: Emotion Regulation (α = .855; *r* = .719)			
491**	.466**	.631**	FACT : Emotional Well Being
	.396**		QLACS: Positive Feelings
		−.776**	PAIS: Psychological Distress
−.518**	−.467**	−.691**	DSS: Emotional
−.535**		−.517**	CESD
	−.426**		HADS: Anxiety
	−.360**		HADS: Depression
.130**			Age
.109*			Annual Income
Factor 4: Coping with Treatment Related Side Effects (α = .862; *r* = .770)			
.588**	.609**	.700**	DSS: Coping
.356**	.319**	.578**	FACT: Physical Well-Being
.450**	.493**	.579**	FACT : Functional Well Being
−.230**	−.270**		SIP
	−.328$^{2\,**}$		QLACS: Pain
	−.319**		QLACS: Energy/Fatigue
.107*			Age
.112*			Annual Income
Factor 5: Accepting Cancer/ Maintaining a Positive Attitude (α = .812; *r* = .682)			

−.590**		−.296**	CESD
	−.422**		HADS: Anxiety
	−.535**		HADS: Depression
	−.376[2] **	−.132NS	COPE: Disengagement
	.396**	.364**	COPE: Acceptance
	.603**		QLACS: Positive Feelings;
	.300**		QLACS: Benefit Finding
.131**			Annual Income
Factor 6: Seeking Social Support (α = .813; *r* = .563)			
	.310**		COPE: Social Support/Advice Seeking
.367**	.424**	.691**	FACT : Social/Family Well-Being
.397**	.487**	.648**	DSS: Support
		.252**	ISSB: Total Received Support
.144**			Level of Education
.124*			Annual Income
Factor 7: Usina Spiritual Copina (α = .970; *r* = .637)			
.475**			FACT Spirituality: Peace
.409**			FACT Spirituality: Meaning
.745**			FACT Spirituality: Faith
.735**			COPE: Religion
.171*			RCS: Positive
−.373**			RCS: Negative
.129^			Time since diagnosis
.124*			Age
Total Score (α = .946; *r* = .890)			
	.580**		GSES
.112*			Level of Education
.161**			Annual Income

Note

** $p<.01$

* $p<.05$ NS not significant. For discriminant variables (age, income, education, time since diagnosis) only statistically significant values are reported.

FACT= Functional Assessment of Cancer Therapy – Quality of Life; DSS= Distress Screening Schedule; PAIS= Patient Adjustment to Illness Scale; QLACS= Quality of Life Assessment for Cancer Survivors; CESD= Center for Epidemiological Studies – Depression Scale; HADS = Hospital Anxiety and Depression Scale; SIP = Sickness Impact Profile; ISSB = Inventory of Socially Supportive Behaviors; COPE = Brief COPE Scale; RCS = Religious Coping Scale; GSES = General Self-Efficacy Scale