Open to Exploration? Association of Personality Factors With Complementary Therapy Use After Breast Cancer Treatment

Kirsti I. Toivonen, MSc1, Rie Tamagawa, PhD2, Michael Speca, PsyD2,3, Joanne Stephen, PhD2, and Linda E. Carlson, PhD2,3

Abstract

Purpose: Many cancer survivors seek complementary therapies (CTs) to improve their quality of life. While it is well-known that women who are younger, more highly educated, and have higher incomes are more likely to use CTs, individual differences such as personality factors have been largely unexplored as predictors of CT use. Methods: In a secondary analysis of a larger study, 270 women with stage I to III breast cancer completed self-report measures of demographic and illness-related information, personality variables, and use of several different types of CTs. A series of logistic regression models were used to explore whether demographic, illness-related, and personality variables predicted different types of CT use. Results: Prior relationships between education and CT use were replicated. There were no significant relationships between illness-related variables and different types of CT use. Of the 5 personality factors, only openness to experience was a significant predictor of multiple types of CT use. Conclusions: Openness to experience may represent an individual difference variable that predicts CT use among cancer survivors. CTs themselves may represent a form of intellectual curiosity and novelty seeking. Further studies are needed to replicate and examine the generalizability of the relationship between openness to experience and CT use in oncology populations.

Keywords: complementary therapies, personality, cancer survivor, openness to experience, integrative oncology

Submitted April 8, 2017; revised October 2, 2017; accepted October 30, 2017

Introduction

Cancer survivors use complementary and alternative medicine (CAM) significantly more often, and spend significantly more money on it, than individuals without cancer.1 CAM refers to health care systems, practices, and products that are generally not part of conventional medicine.2 It broadly describes several categories of practices, including alternative medical systems (eg, homeopathy), mind-body therapies, natural health products and supplements, manipulative body-based therapies, and energy therapies. While CAM encompasses both complementary therapies (CTs, which are practiced in conjunction with conventional medicine) and alternative therapies (practiced in lieu of conventional medicine), the terms are typically used interchangeably and true practice of alternative medicine is uncommon. Hence, while the term CAM has historically been used in the literature, we used the term CTs in our research to imply the use of these therapies in conjunction with conventional care rather than as an alternative, and use it throughout this article instead of CAM.

A meta-analysis published in 2012 estimated that 40% of cancer survivors worldwide use CTs, though estimates are slightly higher in North American countries (46%) and slightly lower in European countries (34%).3 Several recent
studies published since then have found similarly high rates of CT use or higher. Cancer survivors have reported several reasons for CT use, including alleviating side effects of treatment, improving health/health/immune function, wanting control, and improving emotional/psychological functioning. However, decision making regarding CT use is dynamic and tends to change throughout the trajectory of the illness. Despite the high prevalence of CT use, up to 77% of users do not discuss their CT use with their health care practitioners. Rather, family and friends are listed as the most common sources of information about CT use. This is problematic as some unconventional therapies may be ineffective or even harmful, and some may interfere with the effectiveness of conventional medications.

Many studies have aimed to delineate the factors associated with CT use among cancer survivors, for several reasons. For example, it is useful for health care practitioners to know which individuals are more likely to use CTs, particularly if rates of disclosure of CT use to practitioners are low. Furthermore, understanding who may be more willing to use CTs may aid practitioners in making recommendations, potentially improving adherence to therapeutic recommendations, and enhancing quality of care. Studies have consistently demonstrated that women, those with breast cancer diagnoses, those with higher education, those with higher incomes, and those who are younger are more likely to use CTs. There is some evidence that CT users tend to have greater symptom severity, including depressive and anxious symptoms, but evidence regarding the relationship between disease severity and CT use is mixed. While some studies have found higher rates of CT use related to more severe disease and more time since diagnosis, other studies have found higher rates of CT use among those with less severe disease progression or no relationship.

While most studies that characterize CT users include demographic and illness-related variables, relatively few studies have attempted to characterize CT users in terms of psychological and individual difference variables such as personality characteristics. A study by Lo-Fo-Wong and colleagues examined CT use in 176 women with breast cancer in the Netherlands and included a measure of the personality factor “openness to experience.” The authors found a relationship between openness to experience and CT use and posited that those who are more open may be more willing to experiment with CT, perhaps due to “holistic or proactive health motivations.” However, they did not assess the influence of any other personality factors. Another study by Olchowska-Kotala examined willingness to use CTs in 49 patients (36 female) in Poland that were heterogeneous in terms of cancer type and progression, and included a measure of “The Big 5” personality factors (openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism). Olchowska-Kotala found that greater extraversion, greater neuroticism, and lower openness to experience were related to CT use. While the inverse relationship between openness to experience and CT use was unexpected, the author speculated that healthy patients may be more willing to experiment with CTs while cancer patients might be more pragmatic about treatment options. While Lo-Fo-Wong et al examined whether openness was related to both provider-directed and self-directed CTs, neither of these studies examined the association between personality factors and specific types of CTs (eg, alternative medical systems, mind-body therapies).

In sum, there is scarce, conflicting literature on personality factors and CT use among cancer survivors and a lack of specificity of CT types investigated to date. The present study reports exploratory analyses examining associations between personality factors and use of different types of CTs in a sample of distressed, posttreatment breast cancer survivors. Illness-related variables were also examined in light of the inconsistent findings reported in the literature. Demographic variables were included to replicate prior research.

Methods
Participants
The present study is based on secondary analysis of baseline data from individuals participating in a randomized controlled trial examining Mindfulness-Based Cancer Recovery and Supportive-Expressive Therapy (the MINDSET study; NCT00390169). The study was approved by the University of British Columbia and British Columbia Cancer Agency REB (#H0603309), and the Conjoint Health REB of the University of Calgary (#E-20444). Inclusion criteria were (a) women who had been diagnosed with stage I to III breast cancer, (b) had completed treatment at least 3 months previously, (c) and were experiencing emotional distress, indicated by a score ≥4 on the Distress Thermometer.

Materials
Participants provided demographic and illness-related information, including age, education, cancer stage, and months since cancer diagnosis. Information regarding CT use and personality was also collected through self-report questionnaires. While education is presented as a categorical variable in Table 1, a separate continuous variable that measured years of education was used for analyses.

Complementary Therapy Use. Individuals were asked whether they used several different types of CTs in the past month, and whether they used supplements 4 or more times
per week in the past month. Types of CTs were categorized afterward into mind-body therapies (ie, meditation, relaxation techniques, yoga), manipulative body-based therapies (ie, chiropractic, reflexology, massage), alternative medical systems (ie, homeopathy, naturopathy), energy therapies (ie, acupuncture, spiritual healing), and supplements (eg, vitamin A, fish oil, green tea). For each of the 5 CT types, use was dichotomized such that 0 represented no use and 1 represented any use of one or more therapies of that type in the past month.

**Personality.** The 60-item NEO Five Factor Inventory (NEO-FFI) was used as a measure of personality. Based on the Five Factor Model of personality, it assesses dimensions of openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Internal consistency in this data set was high for the NEO subscales neuroticism (α = .82); but lower for agreeableness (α = .62). Openness (α = .71), and conscientiousness (α = .82); but lower for agreeableness (α = .62). Raw NEO-FFI scores were used in analyses.

**Analyses**

A series of exploratory logistic regression models was used to examine whether the demographic, illness-related, and personality variables predicted each type of CT use. The demographic/illness-related variables age, education, cancer stage, and months since diagnosis were entered together into models (see Table 3) to curb type I error and examine the independent contribution of each predictor. For the same reasons, the personality factors neuroticism, extraversion, openness, agreeableness, and conscientiousness were entered together into models (see Table 4).

**Results**

Of the 277 women who participated in the MINDSET study, 270 women provided information about their CT use and represent the sample in the present study. On average, women were 55 years old; had completed college, university, or technical school (57%); were married or cohabiting (64%); had been diagnosed with stage I (40%) or II (36%) breast cancer; and were 26 months after diagnosis at the time of the survey. Illness-related variables were later confirmed by chart examination. Little’s MCAR (missing completely at random) test showed data were missing at random ($P = .92$). The strength of association between predictor variables was $r = -.44$ or lower, thus multicollinearity was not an issue. Table 1 outlines the demographic and illness-related characteristics. Most (94%) women had used at least one type of CT in the past month. The most commonly used CT was supplements (88%), followed by manipulative body-based therapies (32%), mind-body therapies (27%), energy therapies (11%), and alternative medical systems (8%). See Table 2 for specific prevalence of use of each specific therapy examined in the questionnaire. Raw NEO-FFI scores for neuroticism ($M = 34.54$, $SD = 8.13$), extraversion ($M = 39.18$, $SD = 6.94$), openness ($M = 41.57$, $SD = 5.9$), agreeableness ($M = 44.96$, $SD = 4.77$), and conscientiousness ($M = 45.54$, $SD = 6.64$) were used.

Table 3 presents the demographic and illness-related predictors of different types of CTs. Among the demographic variables, higher education was a small but significant predictor of manipulative body-based therapy (odds ratio [OR] = 1.14, confidence interval [CI] =1.04-1.26, $P < .01$), mind-body therapy (OR = 1.11, CI = 1.01-1.22, $P = .03$), and energy therapy use (OR = 1.15, CI = 1.01-1.32, $P = .04$). Age was only significantly related to supplement use, such that older age predicted supplement use (OR = 1.06, CI = 1.01-1.12, $P = .02$). Of the illness-related variables, there were no significant relationships between cancer stage or months since diagnosis and use of any of the CT types.

Table 4 outlines the relationships between the 5 personality factors and 5 CT types. Among the personality factors, openness to experience was the only significant predictor of any CT type, such that greater openness to experience predicted use of manipulative body-based therapies (OR = 1.08, CI = 1.03-1.13, $P = .01$), energy therapies (OR = 1.08, CI = 1.01-1.16, $P = .03$), and alternative medical systems (OR = 1.17, CI = 1.07-1.28, $P < .001$). Consistent with this
pattern, openness to experience was also a near-significant predictor of mind-body therapy use (OR = 1.05, CI = 1.00-1.10, \( P = .05 \)).

**Discussion**

The present study examined use of 5 different types of CTs among breast cancer survivors and relationships with demographic, illness-related, and personality variables. The prevalence of CT use in the present study (94%) was much higher than the prevalence reported in the 2012 meta-analysis, though similar to prevalence rates reported in recent studies from the United States.\(^{10-12}\) This could be related to self-selection of study participants who enrolled in a study that included mind-body therapies. Furthermore, the demographic characteristics of the present sample—female sex and breast cancer diagnoses—are both linked to higher rates of CT use.\(^{9,13,15}\) The meta-analysis by Horneber et al\(^3\) in 2012 described higher prevalence rates of CTs in studies where individuals were presented a list of options to choose from and when no types of CTs were excluded. Thus, the present study’s use of a predetermined list of CT types, including several types of supplements, may also have contributed to the high prevalence rate. Finally, the inclusion criteria of emotional distress in the present study may have contributed to the high prevalence rate. Additionally, those with higher education may be more knowledgeable about the availability of CTs.\(^{13,15}\) Although the relationship between younger age and CT use has been well established, in the present study older age was unexpectedly related to supplement use, and no other CT types were significantly related to age. The relationship between older age and supplement use might be explained by the broad inclusion of supplement types, some of which individuals may have used for reasons unrelated to cancer symptom management. For example, the most commonly used supplements were calcium (used by 60%) and vitamin D (used by 67%), which are also recommended for promotion of bone health among older adult women.\(^{30}\)

The lack of any significant relationships between age and any other type of CT use in the present study might have been due to insufficient range of ages to detect differences, as the women in the present study on average appear to be somewhat younger than women in other studies that have reported an association between younger age and CT use.\(^{23,31,32}\) Similarly, as the inclusion criteria for the present study specified cancer stages I to III, there may have been insufficient range in cancer stage to detect any significant relationship between illness stage and CT use. The prior studies that reported relationships between CT use and disease progression included participants with more advanced tumors or late-stage illness.\(^{4,5,20,23}\)

| Complementary Therapies       | % (n) Who Used |
|-------------------------------|---------------|
| Any supplement use\(^a\)      | 88.1 (237)    |
| Vitamin D                     | 67.3 (181)    |
| Calcium                       | 60.2 (162)    |
| Multivitamin                  | 46.8 (126)    |
| Vitamin C                     | 27.5 (74)     |
| Fish oil                      | 22.7 (61)     |
| Green tea                     | 19.0 (51)     |
| Vitamin B\(_6\)              | 16.7 (45)     |
| Vitamin B\(_{12}\)           | 13.4 (36)     |
| Vitamin E                     | 11.5 (31)     |
| Vitamin A                     | 10.4 (28)     |
| Coenzyme Q10                  | 10.0 (27)     |
| Glucosamine                   | 9.7 (26)      |
| Garlic                        | 6.7 (18)      |
| Folic acid                    | 5.6 (15)      |
| Selenium                      | 5.6 (15)      |
| Zinc                          | 4.8 (13)      |
| Ginger                        | 3.0 (8)       |
| β-Carotene                    | 2.6 (7)       |
| Peppermint                    | 1.5 (4)       |
| Echinacea                     | 1.1 (3)       |
| Essiac                        | 0.7 (2)       |
| Ginkgo biloba                 | 0.7 (2)       |
| Ginseng                       | 0.4 (1)       |
| Shark cartilage               | 0 (0)         |
| St. John’s Wort               | 0 (0)         |
| Any manipulative body-based   | 31.5 (85)     |
| therapy use                   |               |
| Massage therapy               | 25.2 (68)     |
| Chiropractic                  | 8.9 (24)      |
| Reflexology                   | 2.6 (7)       |
| Any mind-body therapy use     | 27.4 (74)     |
| Yoga                          | 14.4 (39)     |
| Relaxation                    | 12.2 (33)     |
| Meditation                    | 11.5 (31)     |
| Any energy therapy use        | 11.1 (30)     |
| Acupuncture                   | 7.8 (21)      |
| Spiritual healing             | 4.4 (12)      |
| Any alternative medical system | 7.8 (21)      |
| Naturopathy                   | 6.3 (17)      |
| Homeopathy                    | 2.6 (7)       |

\(^{a}\)Supplement use was measured as use 4 or more times per week in the past month.
The present study found greater openness to experience related to use of multiple CTs, namely manipulative body-based therapies, alternative medical systems, and energy therapies. This is consistent with the findings of Lo-Fo-Wong et al.,24 who also studied women diagnosed with breast cancer. The present findings contradict those of Olchowska-Kotala,25 who reported willingness to use CTs to be associated with extraversion and neuroticism. However, this study was small; heterogeneous in terms of sex, cancer type, and cancer stage; and did not examine actual CT use. Extraversion or neuroticism in relation to CT use may merit further investigation, as any conclusion would be premature. Openness to experience has been found to relate to CT use in prior studies of noncancer-specific samples.19,33 This could be because these individuals are more curious and enjoy experimenting, thus may be more likely to try different therapies as part of a holistic and proactive approach.33 Intuitively, openness to experience makes sense as a predictor of CT use, as this personality factor is characterized by intellectual curiosity, variety seeking, and holding of unconventional values.34 By definition CTs are unconventional and therefore their use may represent a form of intellectual curiosity and novelty seeking.

On average, the women in the present study scored higher on openness (M = 41.57, SD = 5.9) than the NEO-FFI normative sample of nonclinical adult women (M = 30.18, SD = 6.09).35 Another study examining personality traits in women with breast cancer also reported openness scores (M = 35.55, SD = 5.83)36 higher than the NEO-FFI norms, but lower than in the present study. Thus, while breast cancer survivors may be more open to experience than nonclinical adult women in general, the women in the present study were particularly more open to new experiences. This could reflect the nature of the study, which required willingness to participate in either Mindfulness-Based Cancer Recovery or Supportive Expressive Therapy.

The present study adds to a sparse literature concerning personality variables and CT use in cancer survivors. The main strength of the present study is the large sample, homogeneous in terms of sex, cancer type, cancer stage, distress, and completion of active treatment. The main limitation is that the nature of the study required willingness to be randomized to a mind-body therapy, which may already be associated with more openness to experience than average. This is likely reflected in the relatively higher openness scores that were observed in the present study. Thus, it is not clear at present whether results would be generalizable to other groups of cancer survivors who would have more diversity in the trait openness to experience. Furthermore, the measurement of supplement use may have been too broad in the present study, and may be inflated to reflect reasons for use beyond those related to coping with cancer or treatment side effects. Future studies

---

Table 3. Demographic and Illness-Related Predictors of Complementary Therapy (CT) Use.

| CT Type                     | Predictor          | Odds Ratio | Lower Limit | Upper Limit | P         |
|-----------------------------|--------------------|------------|-------------|-------------|-----------|
| Supplements                 | Age                | 1.06       | 1.01        | 1.12        | .02*      |
|                             | Education          | 1.15       | 0.99        | 1.34        | .07†      |
|                             | Cancer stage       | 1.31       | 0.87        | 1.96        | .20       |
|                             | Months since diagnosis | 0.99   | 0.98        | 1.00        | .16       |
| Manipulative body-based therapies | Age                | 0.98       | 0.95        | 1.01        | .22       |
|                             | Education          | 1.14       | 1.04        | 1.26        | <.01**    |
|                             | Cancer stage       | 0.95       | 0.75        | 1.20        | .64       |
|                             | Months since diagnosis | 1.00  | 0.98        | 1.01        | .58       |
| Mind-body therapies         | Age                | 0.99       | 0.97        | 1.02        | .66       |
|                             | Education          | 1.11       | 1.01        | 1.22        | .03*      |
|                             | Cancer stage       | 1.00       | 0.79        | 1.27        | .98       |
|                             | Months since diagnosis | 1.00  | 0.99        | 1.01        | .69       |
| Energy therapies            | Age                | 0.96       | 0.91        | 1.00        | .07†      |
|                             | Education          | 1.15       | 1.01        | 1.32        | .04*      |
|                             | Cancer stage       | 0.65       | 0.42        | 1.01        | .061†     |
|                             | Months since diagnosis | 1.01  | 1.00        | 1.02        | .24       |
| Alternative medical systems | Age                | 0.98       | 0.93        | 1.04        | .51       |
|                             | Education          | 1.00       | 0.85        | 1.18        | .99       |
|                             | Cancer stage       | 0.60       | 0.34        | 1.05        | .081†     |
|                             | Months since diagnosis | 1.00  | 0.99        | 1.02        | .79       |

*Significant relationships are in boldface.
†P < .10, *P < .05, **P < .01.
should consider individual difference variables, particularly openness to experience, as predictors of CT use among cancer patients. Replication of these findings is needed in samples with different cancer types, samples with a broader range of openness scores, and studies that are not related to participation in any other type of CT before generalizability can be established. Additionally, hypotheses that are determined a priori and sample sizes that are appropriately powered are needed, as the present study was exploratory. Better characterizing which cancer survivors are most likely to use CTs or are most receptive to using CTs beyond broad demographic factors can help inform provision of cancer care.

**Authors’ Note**

The sources of funding played no role in the analyses, writing, or decision to submit this manuscript.

**Declaration of Conflicting Interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Table 4. Personality Predictors of Complementary Therapy (CT) Use.

| CT Type                  | Predictor     | Odds Ratio | Lower Limit | Upper Limit | P  |
|--------------------------|---------------|------------|-------------|-------------|----|
| Supplements              | Neuroticism   | 1.01       | 0.96        | 1.07        | .62|
|                          | Extraversion  | 0.98       | 0.92        | 1.05        | .60|
|                          | Openness      | 0.99       | 0.93        | 1.06        | .85|
|                          | Agreeableness | 1.00       | 0.91        | 1.08        | .91|
|                          | Conscientiousness | 0.99     | 0.93        | 1.05        | .74|
| Manipulative body-based therapies | Neuroticism   | 1.04       | 1.00        | 1.08        | .09†|
|                          | Extraversion  | 1.04       | 1.00        | 1.09        | .06†|
|                          | Openness      | 1.08       | 1.03        | 1.13        | <.01**|
|                          | Agreeableness | 0.96       | 0.90        | 1.02        | .21|
|                          | Conscientiousness | 1.00 | 0.96        | 1.05        | .91|
| Mind-body therapies      | Neuroticism   | 1.01       | 0.97        | 1.05        | .80|
|                          | Extraversion  | 0.99       | 0.95        | 1.04        | .75|
|                          | Openness      | 1.05       | 1.00        | 1.10        | .05†|
|                          | Agreeableness | 0.97       | 0.91        | 1.03        | .29|
|                          | Conscientiousness | 0.98 | 0.94        | 1.02        | .34|
| Energy therapies         | Neuroticism   | 1.03       | 0.98        | 1.09        | .25|
|                          | Extraversion  | 1.00       | 0.94        | 1.06        | .99|
|                          | Openness      | 1.08       | 1.01        | 1.16        | .03*|
|                          | Agreeableness | 1.04       | 0.95        | 1.14        | .42|
|                          | Conscientiousness | 1.03 | 0.97        | 1.10        | .32|
| Alternative medical systems | Neuroticism   | 1.06       | 0.99        | 1.13        | .12|
|                          | Extraversion  | 0.98       | 0.91        | 1.06        | .66|
|                          | Openness      | 1.17       | 1.07        | 1.28        | <.001**|
|                          | Agreeableness | 1.02       | 0.91        | 1.14        | .73|
|                          | Conscientiousness | 1.04 | 0.96        | 1.12        | .33|

*Significant relationships are in boldface.

†P < .10, *P < .05, **P < .01.

**Funding**

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: L. E. Carlson holds the Enbridge Research Chair in Psychosocial Oncology, cofunded by the Canadian Cancer Society Alberta/ NWT and the Alberta Cancer Foundation. K. I. Toivonen is supported by a Canadian Institutes of Health Research Doctoral Award. The current study is examining baseline data collected from the MINDSET study, which was supported by a grant from the Canadian Breast Cancer Research Alliance.

**ORCID iD**

Kirsti I. Toivonen [https://orcid.org/0000-0002-5195-415X](https://orcid.org/0000-0002-5195-415X)

**References**

1. John GM, Hershman DL, Falci L, Shi Z, Tsai WY, Greenlee H. Complementary and alternative medicine use among US cancer survivors. *J Cancer Surviv*. 2016;10:850-864.

2. National Centre for Complementary and Integrative Health. Complementary, alternative, or integrative health: what’s in a name? [https://nccih.nih.gov/health/integrative-health](https://nccih.nih.gov/health/integrative-health). Accessed December 15, 2016.
3. Horneber M, Bueschel G, Dennert G, Less D, Ritter E, Zwahlen M. How many cancer patients use complementary and alternative medicine: a systematic review and meta-analysis. *Integr Cancer Ther.* 2012;11:187-203.

4. Hack CC, Fasching PA, Fehm T, et al. Interest in integrative medicine among postmenopausal hormone receptor-positive breast cancer patients in the EvAluate-TM Study. *Integr Cancer Ther.* 2017;16:165-175.

5. Loquai C, Dechent D, Garzarollo M, et al. Use of complementary and alternative medicine: a multicenter cross-sectional study in 1089 melanoma patients. *Eur J Cancer.* 2017;71:70-79.

6. Wortmann JK, Bremer A, Eich HT, et al. Use of complementary and alternative medicine by patients with cancer: a cross-sectional study at different points of cancer care. *Med Oncol.* 2016;33:78.

7. King N, Balneaves LG, Levin GT, et al. Surveys of cancer patients and cancer health care providers regarding complementary therapy use, communication, and information needs. *Integr Cancer Ther.* 2015;14:515-524.

8. Kumar D, Goel NK, Pandey AK, Sarpal SS. Complementary and alternative medicine use among the cancer patients in northern India. *South Asian J Cancer.* 2016;5:8-11.

9. Edwards GV, Aherne NJ, Horsley PJ, et al. Prevalence of complementary and alternative therapy use by cancer patients undergoing radiation therapy. *Asia Pac J Clin Oncol.* 2014;10:346-353.

10. Strizich G, Gammon MD, Jacobson JS, et al. Latent class analysis suggests four distinct classes of complementary medicine users among women with breast cancer. *BMC Complement Altern Med.* 2015;15:411.

11. Luo Q, Asher GN. Complementary and alternative medicine use at a comprehensive cancer center. *Integr Cancer Ther.* 2017;16:104-109.

12. Judson PL, Abdallah R, Xiong Y, Ebbert J, Lancaster JM. Complementary and alternative medicine use in individuals presenting for care at a comprehensive cancer center. *Integr Cancer Ther.* 2017;16:96-103.

13. Verhof MJ, Balneaves LG, Boon HS, Vroegindeweij A. Reasons for and characteristics associated with complementary and alternative medicine use among adult cancer patients: a systematic review. *Integr Cancer Ther.* 2005;4:274-286.

14. Akpunar D, Bebis H, Yavan T. Use of complementary and alternative medicine in patients with gynecologic cancer: a systematic review. *Asian Pac J Cancer Prev.* 2015;16:7847-7852.

15. Wanchai A, Armer JM, Stewart BR. Complementary and alternative medicine use among women with breast cancer: a systematic review. *Clin J Oncol Nurs.* 2010;14:E45-E55.

16. Weeks L, Balneaves LG, Paterson C, Verhoef M. Decision-making about complementary and alternative medicine by cancer patients: integrative literature review. *Open Med.* 2014;8:e54-e66.

17. Davis EL, Oh B, Butow PN, Mullan BA, Clarke S. Cancer patient disclosure and patient-doctor communication of complementary and alternative medicine use: a systematic review. *Oncologist.* 2012;17:1475-1481.

18. Frenkel M, Abrams DI, Ladas EJ, et al. Integrating dietary supplements into cancer care. *Integr Cancer Ther.* 2013;12:369-384.

19. Honda K, Jacobson JS. Use of complementary and alternative medicine among United States adults: the influences of personality, coping strategies, and social support. *Prev Med.* 2005;40:46-53.

20. Fouladbaksh JM, Stommel M, Given BA, Given CW. Predictors of use of complementary and alternative therapies among patients with cancer. *Oncol Nurs Forum.* 2005;32:1115-1122.

21. Nilsson J, Kallman M, Ostlund U, Holgersson G, Bergqvist M, Bergström S. The use of complementary and alternative medicine in Scandinavia. *Anticancer Res.* 2016;36:3243-3251.

22. Fouladbaksh JM, Stommel M. Gender, symptom experience, and use of complementary and alternative medicine practices among cancer survivors in the US cancer population. *Oncol Nurs Forum.* 2010;37:E7-E15.

23. Tautz E, Momm F, Hasenburg A, Guethlin C. Use of complementary and alternative medicine in breast cancer patients and their experiences: a cross-sectional study. *Eur J Cancer.* 2012;48:3133-3139.

24. Lo-Fo-Wong DN, Ranchar AV, de Haes HC, Sprangers MA, Henselmans I. Complementary and alternative medicine use of women with breast cancer: self-help CAM attracts other women than guided CAM therapies. *Patient Educ Couns.* 2012;89:529-536.

25. Olchowska-Kotala A. Individual differences in cancer patients’ willingness to use complementary and alternative medicine. *Adv Clin Exp Med.* 2013;22:855-860.

26. Carlson LE, Doll R, Stephen J, et al. Randomized controlled trial of mindfulness-based cancer recovery versus supportive expressive group therapy for distressed survivors of breast cancer. *J Clin Oncol.* 2013;31:3119-3126.

27. Carlson LE, Tamagawa R, Stephen J, Drysdale E, Zhong L, Speca M. Randomized-controlled trial of mindfulness-based cancer recovery versus supportive expressive group therapy among distressed breast cancer survivors (MINDSET): long-term follow-up results. *Psychooncology.* 2016;25:750-759.

28. National Comprehensive Cancer Network. NCNN distress thermometer and problem list for patients. https://www.nccn.org/patients/resources/life_with_cancer/pdf/nccn_distress_thermometer.pdf. Updated July 25, 2016. Accessed December 15, 2016.

29. Costa PT, MacCrae RR. Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI): Professional Manual. Odesa, FL: Psychological Assessment Center; 1992.

30. National Institutes of Health. Calcium fact sheet for health professionals. https://ods.od.nih.gov/factsheets/Calcium-HealthProfessional/. Updated November 17, 2016. Accessed December 15, 2016.

31. Nagel G, Hoyer H, Katenkamp D. Use of complementary and alternative medicine by patients with breast cancer: observations from a health-care survey. *Support Care Cancer.* 2004;12:789-796.
32. Hamilton AS, Miller MF, Arora NK, Bellizzi KM, Rowland JH. Predictors of use of complementary and alternative medicine by non-Hodgkin lymphoma survivors and relationship to quality of life. Integr Cancer Ther. 2013;12:225-235.

33. Sirois FM, Purc-Stephenson RJ. Personality and consultations with complementary and alternative medicine practitioners: a five-factor model investigation of the degree of use and motives. J Altern Complement Med. 2008;14:1151-1158.

34. Connelly BS, Ones DS, Chernyshenko OS. Introducing the special section on openness to experience: review of openness taxonomies, measurement, and nomological net. J Pers Assess. 2014;96:1-16.

35. McCrae RR, Costa PT Jr. A contemplated revision of the NEO Five-Factor Inventory. Pers Individ Diff. 2004;36:587-596.

36. van der Steeg AF, De Vries J, Roukema JA. Anxious personality and breast cancer: possible negative impact on quality of life after breast-conserving therapy. World J Surg. 2010;34:1453-1460.