

Expectancy and Utilisation of Reflexology among Women with Advanced Breast Cancer

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Objective: Little is understood about patient expectations and use of complementary therapies (CT) during cancer treatment. A secondary analysis of an 11-week reflexology trial among women with breast cancer was conducted. We examined factors that predicted women's expectations about reflexology for symptom relief, factors that predicted utilisation of reflexology, and whether by the end of the trial they believed that reflexology had helped with symptom management. **Methods:** Women ($N = 256$) were interviewed at baseline and week 11. Friend or family caregivers in the reflexology group were trained to deliver standardised sessions to patients at least once a week for 4 weeks. Baseline and week-11 reflexology expectations were analysed using general linear models. Reflexology utilisation was analysed with generalised linear mixed effects models. **Results:** Patients who expected benefits from reflexology ("higher expectancy") at baseline were younger, had lower anxiety, higher education, higher spirituality, and greater CT use. Worsening symptoms over time were associated with greater utilisation of reflexology, but only when baseline expectancy was low. At week 11, expectancy was higher for those with greater symptom improvement. **Conclusions:** Assessing patterns of patient factors, expectancy, and change in symptoms can help determine who is likely to use reflexology, and when.

Keywords: cancer, expectancy, reflexology, self-care, self-management, spirituality, symptoms

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INTRODUCTION

When undergoing treatment for advanced breast cancer, more than 80 per cent of women use self-management strategies to deal with symptoms associated with cancer and its treatment (Boon, Verhoef, O'Hara, Findlay, & Majid, 2004). These self-management strategies include both conventional therapies (e.g. use of antiemetics and analgesics) as well as complementary therapies (CT). When therapies such as reflexology are used alongside, but not in place of, conventional medicine they are referred to as CTs.

The evidence base for the efficacy of CTs for self-management of symptoms during cancer treatment is growing (Brami, Bao, & Deng, 2015; Duncan et al., 2017; Greenlee et al., 2017; Klein, Schneider, & Rhoads, 2016; Wyatt et al., 2017). The ability to cope with symptoms by choosing and implementing self-management strategies is often associated with improved well-being and decreased symptom severity in cancer and other chronic conditions (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002; Cimprich et al., 2005; Donovan et al., 2013; McCorkle et al., 2011). Foot and hand reflexology is one of the most common CTs used by women with breast cancer (Lengacher et al., 2002). Foot reflexology involves applying pressure to specific areas of the feet called reflexes and is based on the premise that reflexes in the feet correspond to organs, glands, and systems of the body (Byers, 1996). A growing body of evidence suggests potential efficacy for reflexology in the management of symptoms (Ernst, 2009; Ernst, Posadzki, & Lee, 2011; Wyatt, Sikorskii, Rahbar, Victorson, & You, 2012).

This secondary analysis used data from a recently completed randomised controlled trial of reflexology delivered at home to women with advanced breast cancer by their friend or family caregivers. The trial supported overall efficacy of this therapy for symptom management (Wyatt et al., 2017). This secondary analysis focused on the factors that predict women's expectations about whether reflexology would relieve their symptoms and factors that predict their utilisation of reflexology for symptom self-management.

In conceptualising symptom self-management using reflexology, we relied upon a framework from cognitive psychology to understand how patients update beliefs about the efficacy of a medication as they take it and learn from their experiences (Rottman, Marcum, Thorpe, & Gellad, 2016; Figure 1). Though initially proposed for medications, this model is relevant to any self-management situation such as reflexology. It proposes that a person's initial expectations about their response to a therapy prior to use, referred to as response expectancy or just expectancy (Kirsch, 1985), affect initial utilisation. As individuals use the therapy, they monitor the effect on their symptoms, and as symptoms change, they update their beliefs about the therapy. Then, the new beliefs influence subsequent utilisation. The precise way that they update their beliefs about the usefulness of a therapy is an open question; however, the general framework of

belief updating (baseline expectancy beliefs → utilisation of therapy → symptom change → updated expectancy beliefs ...) as a cyclic process is an idea converged upon in cognitive and social psychology, computer science, and behavioral medicine.

This learning framework inspired the three specific questions addressed in this paper. First, what factors predict initial expectations about whether reflexology might help their symptoms—response expectancy? Second, what factors predict utilisation of reflexology in general, and whether dynamic needs such as changes in symptoms predict utilisation? Third, at the end of the trial, what factors predict whether a patient believed that reflexology was helpful for symptom management? The background for these questions is explored next.

Initial Response Expectancy about Reflexology

Response expectancy has often been shown to have a powerful influence on patients’ actual response to treatment. Expectancies often affect the response to CT treatments (Montgomery et al., 2010), mediate the strength of the placebo effect in sham treatments (Linde et al., 2007; Price et al., 1999), sometimes influence the success of standard medical treatments (Di Blasi, Harkness, Ernst, Georgiou, & Kleijnen, 2001), and can influence the severity of treatment-related side-effects (Sohl, Schnur, & Montgomery, 2009). Though little is known about the factors that influence expectancy for reflexology in particular, some studies have investigated these factors for other CTs, especially acupuncture. People who have used CTs tend to have greater expectancy for acupuncture (Bauml et al., 2014; Kirsch, 1985; Mao et al., 2014; Mao, Xie, & Bowman, 2010). Thus, we hypothesised that reflexology expectancy would be correlated with prior utilisation of other CTs, and with other established predictors of CT use.

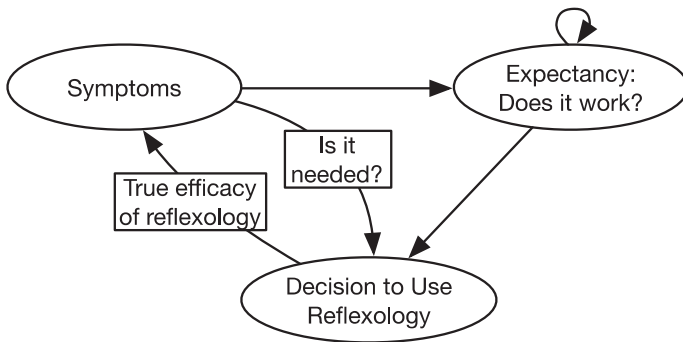


FIGURE 1. Framework to conceptualise symptom self-management with reflexology.

CT utilisation is often found to be highest in middle age, though it is unclear if this is an effect of age or generation (McFarland, Bigelow, Zani, Newsom, & Kaplan, 2002; Metcalfe, Williams, McChesney, Patten, & Jetté, 2010). CT use has been positively correlated with higher education (Metcalfe et al., 2010) and poor health (Wyatt, Sikorskii, Siddiqi, & Given, 2007). There are conflicting findings on the relationship between CT use and spirituality (Metcalfe et al., 2010). Similarly, willingness to be in a CT study was associated with younger age, higher education, presence of comorbidities, and worse symptoms (Mao et al., 2014; Mao et al., 2010). We therefore investigated which of these variables plus some other likely candidates predicted baseline reflexology expectancy, including the following: age, education, comorbidities, presence of metastases, CT use, symptom severity, anxiety, and spirituality.

Use of Reflexology

Our second research question was about the utilisation of reflexology by those randomised to the reflexology group and has two aspects. First, do the factors that predict expectancy also predict utilisation? The second aspect of this question has to do with dynamic factors that predict utilisation. Because reflexology is something that the patient and caregiver can choose to do “as needed” (i.e. if they feel that their symptom burden is high and believe that reflexology may help) without guidance from the health care team, it is important to understand factors associated with this self-management behavior.

Based on Figure 1, we hypothesised that women would use reflexology more if they felt it was necessary due to increasing symptoms, and if they expected reflexology to reduce their symptoms. However, changes in symptoms and expectancy could have complex interactions. For example, even if a woman has low expectancy, but her symptoms have been increasing, she may try or continue to use reflexology out of desperation. Alternatively, if a woman previously expected reflexology to work, but her symptoms increased while using it, she may decide that it is not helpful, and stop. To begin to understand these relations, we tested for an influence of baseline expectancy, weekly changes in symptom severity, and the interaction on utilisation.

Changes in Final Beliefs about Efficacy of Reflexology

Our third research question was identifying factors that predicted beliefs about the efficacy of reflexology at the end of the 11-week trial among those randomised to the reflexology group, and is important for two reasons. First, after the end of the study, the women could choose to continue to use reflexology to manage their symptoms associated with cancer or treatment. That decision would likely be influenced by their final or new beliefs. Second, studying their

final beliefs addresses how women update their initial beliefs while trying reflexology.

We analysed three factors. First, as argued earlier, the initial expectancy beliefs often have long-term influences on outcomes; thus, we hypothesised that patients' beliefs about the efficacy of reflexology at the end of the trial may still be influenced by initial beliefs. In Figure 1, this is represented by the circular link on the expectancy node. Second, we tested the hypothesis that patients' eventual efficacy beliefs would be correlated with the amount of change in their symptoms as they used reflexology. For example, one study on electro-acupuncture found that subjects who reported that their joint pain had improved also exhibited increased expectancy over time (Bauml et al., 2014). Third, we investigated predictors of the initial beliefs, considered in the first research question, to determine if they explain final beliefs.

METHODS

The reflexology trial enrolled 256 patient-caregiver dyads, who were interviewed at baseline and randomised to either 4 weeks of reflexology or attention control. The necessary dose of 4 weekly reflexology sessions and its efficacy for reduction in symptoms has been addressed in past research (Wyatt et al., 2012; Wyatt et al., 2017). Follow-up interviews were conducted at week 5 (immediately after the 4-week reflexology protocol) and at week 11 (Wyatt et al., 2017). Though this randomised controlled trial had a control condition, the only data used in this secondary analysis from the control group are data collected prior to randomisation because the focus is on expectancy and utilisation of reflexology. Thus, the control condition is not discussed further. Informed consent was obtained from both the patient and caregiver. Institutional Review Board approvals were obtained from all recruitment sites.

Participants

Patient inclusion criteria were: (1) age ≥ 21 ; (2) stage III or IV breast cancer; (3) willing to engage in reflexology, (4) able to perform basic activities of daily living; (5) undergoing chemotherapy, targeted, or hormonal therapy. Patient exclusion criteria were: (1) diagnosis of major mental illness; (2) residing in a nursing home; (3) receiving regular reflexology; or (4) symptoms of deep vein thrombosis or painful foot neuropathy. Friend/family caregiver inclusion criteria were: (1) age ≥ 18 ; (2) willing to provide at least one reflexology session per week for 4 consecutive weeks; (3) willing to demonstrate their ability to conduct a reflexology session according to protocol to a trainer. Both patients and caregivers had to: (1) be naive to reflexology, meaning it was not a therapy they currently used, though they may have heard of it; (2) be able to speak and understand English;

(3) have access to a telephone; (4) be able to hear normal conversation; and (5) be cognitively oriented to time, place, and person according to the recruiter.

Procedures

In the intervention group, caregivers were trained to conduct a validated cancer-specific reflexology protocol during two home visits by a reflexologist (Wyatt et al., 2012). All study reflexologists had completed a training program in reflexology and many were certified by the national organisation. All study reflexologists were trained by the lead reflexologist, and passed a standardised scored return-demonstration before being assigned to study dyads.

The first home visit with a dyad was used to demonstrate the study protocol and train the caregiver to stimulate the nine protocol reflexes on the feet. The caregiver was asked to deliver at least one 30-minute session at home to their patient during the subsequent 4 weeks. The dyad was provided with illustrated directions and a contact number to support independent delivery of sessions. The number of sessions was not restricted, but were monitored and recorded through weekly calls from the study office. During the second week, the reflexologist visited the home to observe the session and offer adjustments in technique as needed. During study weeks 3 and 4, sessions were delivered by the caregiver to the patient without the reflexologist being present.

Data Collection

Trained interviewers collected data from patients at baseline, weeks 5 and 11 via telephone and included questions about demographic factors, comorbidity, symptoms, expectancy, spirituality, and CT use. During weeks 1–4, brief calls were made to all patients to assess their symptoms (both groups) and to record the number of reflexology sessions they received during the week (intervention group only). During weeks 5–11, the dyads could continue reflexology sessions, but calls were not made.

In this secondary analysis, we used baseline data from both groups prior to randomisation to study the factors that predict baseline expectancy about reflexology. Post randomisation, only data from the intervention group were used, because these analyses investigated utilisation of and expectancy about reflexology among those who used reflexology.

Measures

Demographic and Clinical Characteristics. Demographic information collected at baseline included age, race, ethnicity, education level, and relationship to the caregiver. Cancer stage, metastases, and type of medical treatments were obtained from the medical records.

Expectancy. Patients' response expectancy was assessed at baseline and week 11 using a tool (Devilly & Borkovec, 2000) adapted for this trial. This tool has six items on logical thinking and feelings related to expectations of therapy use. At baseline, patients were asked how logical the therapy seemed to them; how successful they thought it would be in reducing symptoms; how confident they were about recommending the therapy to someone with similar symptoms on a scale from 1 = not at all to 9 = very much. Patients were also asked how much they thought the therapy would improve their quality of life by the end of the study (0% to 100%), and their answers were recorded on a 0–10 scale as 0 = 0 per cent, 1 = 10 per cent, and so on, 10 = 100 per cent. After patients were asked about what they *thought*, they were also asked how much they *felt* that the therapy would reduce their symptoms and by how much their quality of life would be improved. Patients in the reflexology group answered the same questions at week 11. The average score across the six items was computed, with higher scores reflecting higher expectancy, and the potential range was from 0.67 to 9.33. Cronbach's alpha was .88 at baseline, and .94 at week 11. Also explored was dichotomising the expectancy score near the median as <6 (low) or ≥6 (Murray et al., 2010).

Comorbid Conditions. The number of comorbid conditions out of 20 common conditions was assessed at baseline with the Bayliss tool (Bayliss, Ellis, & Steiner, 2009). Cancer was omitted since all patients had cancer. Internal consistency was not applicable to a checklist.

Complementary Therapy Utilisation. Use of complementary therapies was measured at baseline with a survey that assesses patients' prior use of 24 CTs (e.g. acupuncture, hypnosis, herbal remedies) (Wyatt, 1993). The total number of "yes" responses was used as the measure of total number of CTs used. Internal consistency was not applicable to a checklist.

Symptoms. Symptoms from cancer and treatment were measured with the M.D. Anderson Symptom Inventory (MDASI) (Cleeland et al., 2000) at baseline, weeks 1–5, and 11. MDASI evaluates the severity of 13 common cancer symptoms (pain, fatigue, nausea, disturbed sleep, distress, shortness of breath, difficulty remembering, decreased appetite, drowsiness, dry mouth, sadness, vomiting, numbness/tingling) from 0 = not present to 10 = as bad as you can imagine, and their interference with daily life from 0 = does not interfere to 10 = completely interferes. Because the 13 different symptoms do not form a scale, internal consistency was not applicable; the summed score is an index that summarises the symptom experience (Cleeland et al., 2000). Change in symptoms from week to week was evaluated by subtracting one week's score from the prior score; a positive change reflected symptom improvement.

State Anxiety. Anxiety was measured at baseline with the state subscale from the State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), which has 20 items. The alpha coefficient was .94 at baseline.

Spirituality. Spirituality was measured at baseline with the spirituality subscale from the Long-term Quality of Life (LTQL) instrument (Wyatt & Friedman, 1996; Wyatt, Kurtz, Friedman, Given, & Given, 1996). It contains 11 items using a 5-point scale, where 0 = not at all and 4 = very much; a higher score indicates more spirituality. Internal consistency was .86.

Utilisation. During calls for weeks 1–4, data on reflexology utilisation were collected. Per trial protocol, they were analysed as none versus one or more sessions in a given week.

Data Analysis

To address the first research question, a general linear model (GLM) was fit for all patients prior to randomisation into two groups, with baseline expectancy as the outcome and the following predictors: age, level of education, comorbidity, presence of metastases, CT use, MDASI summed severity score, anxiety, and spirituality at baseline.

For the second and third research questions, only data for those in the reflexology group were analysed. For the second question, we used a generalised linear mixed effect (GLME) model with binary errors to study reflexology utilisation. This GLME generalises logistic regression and allows for repeated measures of the outcome nested within a woman, data missing at random, and time-varying covariates. All women with at least one week of utilisation data were included in this analysis. The model included the same predictors of baseline expectancy. This model also analysed the effects of dynamic change in the MDASI symptom severity scores in the prior week on reflexology utilisation during the subsequent week. Specifically, utilisation of reflexology in weeks 2, 3, and 4 were each predicted by the change in symptom severity over the prior week. For example, utilisation in week 3 was predicted by the change during week 2. The model also included the baseline expectancy by the MDASI change interaction. For this analysis, baseline expectancy was dichotomised as low (<6) versus high (≥6). Since the change in symptoms depends on where in the range it occurs, we also controlled for the MDASI symptom severity score during each week as a time-varying covariate.

For the third research question, week 11 expectancy was analysed using a GLM with the baseline expectancy, change in the MDASI symptom severity score from baseline to week 11, and the same predictors used in the model for baseline expectancy. In all models, continuous predictors were centered on the grand sample means.

RESULTS

The characteristics of the sample by trial group are presented in Table 1. The results of the first research question on the predictors of baseline response expectancy are summarised in Table 2. Out of 256 participants, all but three had data on all variables. Expectancy declined as age increased and as level of education increased, reaching statistical significance for women with a 4-year college degree or higher versus those with a high school education or less. Metastases and higher anxiety predicted lower baseline expectancy. Conversely, higher spirituality and CT use predicted higher baseline expectancy. The number of comorbid conditions and the severity of cancer- and treatment-related symptoms were not significantly predictive of expectancy over and above other explanatory variables in the model. Given the available sample size of $N = 253$ for the first research question, the effect size f -squared as small as 0.04 was detectable with power ≥ 0.80 in two-sided tests at $\alpha = .05$.

Regarding the second research question, out of the 128 women randomised to the reflexology group, the number completing weekly calls were $N = 101$ in week 1, $N = 91$ in week 2, $N = 88$ in week 3, and $N = 83$ in week 4. A total of 15 women dropped out and did not complete any of the four weekly calls. Compared to the 113 women who completed at least one weekly call, the drop-outs had higher prevalence of metastasis (87% vs. 59%, $p = .04$). Drop-outs were somewhat younger ($M = 53$, $SD = 13$ vs. $M = 59$, $SD = 11$ years); more anxious ($M = 38$, $SD = 11$ vs. $M = 34$, $SD = 12$); had higher MDASI symptom severity at baseline ($M = 54$, $SD = 22$ vs. $M = 43$, $SD = 25$); and used on average one more CT ($M = 3.5$, $SD = 2.3$ vs. $M = 2.5$, $SD = 3.5$). However, none of these differences reached significance. Baseline expectancy and spirituality had virtually identical means for the drop-outs and those completing at least one weekly call. Since we have controlled for these factors as covariates in the longitudinal GLME models, no bias was introduced due to missing data under the missing at random (MAR) mechanism.

Among women completing weekly calls, reflexology was utilised at least once per week by 72 per cent in week 1, 90 per cent in week 2, 87 per cent in week 3, and 82 per cent in week 4. The majority of dyads completed one or two sessions, with approximately 6 per cent completing three or more sessions during each week. Table 3 presents the explanatory variables for utilisation of reflexology during weeks 2–4, dichotomised as at least one session completed (as required per trial protocol and consistent with the distribution described above) versus none in relation to change in symptoms, baseline expectancy, and its baseline predictors.

Model coefficients in Table 3 are for the log-odds of utilising reflexology at least once. Log odds equal to zero reflect a 50–50 chance of using or not using reflexology; negative coefficients in Table 3 reflect lower probability (and log-odds) of utilisation.

TABLE 1
Demographic Characteristics and Baseline Values of the Outcomes by Trial Arm

<i>Characteristic</i>	<i>Both groups</i>	<i>Reflexology group</i>
	<i>(Question 1)</i> N = 256 N (%)	<i>(Questions 2 and 3)</i> N = 128 N (%)
Education		
High school graduate, GED, or less	58 (23)	29 (23)
Some college or 2-year degree	73 (28)	35 (27)
4-year college graduate	63 (25)	30 (24)
More than a 4-year college degree	61 (24)	33 (26)
Race		
White	212 (83)	105 (83)
Black or African American	26 (10)	13 (10)
Other	16 (7)	9 (7)
Ethnicity		
Hispanic or Latino	11 (4)	5 (4)
Not Hispanic or Latino	245 (96)	123 (96)
Caregiver is		
Spouse or partner	141 (55)	70 (55)
Child or stepchild	42 (16)	21 (16)
Friend	28 (11)	11 (9)
Other	45 (18)	26 (20)
Metastatic cancer		
Yes	161 (63)	80 (62)
No	95 (37)	48 (38)
Treatment type		
Chemo. or targeted ± hormonal therapy	210 (82)	105 (82)
Hormonal therapy only	26 (18)	23 (18)
	M (SD)	M (SD)
Age in years	56.44 (11.07)	58.09 (11.62)
# of comorbid conditions	4.39 (2.95)	4.00 (2.54)
# of complementary therapies used	2.53 (2.49)	2.60 (2.52)
MDASI summed symptom severity	43.50 (23.49)	44.49 (24.40)
Anxiety score	34.33 (11.67)	34.27 (11.81)
Spirituality score	35.17 (6.98)	34.96 (7.70)
Expectancy score	6.49 (1.69)	6.54 (1.75)

Note:: MDASI = M.D. Anderson Symptom Inventory. Chemo. = Chemotherapy.

Patients who were younger, less spiritual, and had metastatic disease were less likely to utilise reflexology; whereas education, number of comorbid conditions, baseline anxiety, and number of CTs used were not predictive. The interaction of the MDASI change with baseline expectancy was significant ($F(1, 112) = 3.94, p = .04$); that is, when expectancy was low, a recent improvement in symptoms was associated with less subsequent utilisation as reflected by a

TABLE 2
 General Linear Model for Baseline Therapy Expectancy: Coefficients for the Explanatory Variables (*b*), their Standard Errors (*SEs*), and *p*-values

<i>Explanatory variable</i>	<i>b (SE)</i>	<i>t</i>	<i>p</i>
Intercept	7.19 (0.25)	28.92	<.01
Age in years	-0.02 (0.01)	-2.26	.02
Education: 4-year college or more	-0.61 (0.26)	-2.40	.02
Education: 2-year college	-0.25 (0.28)	-.88	.38
Education: high school or less (Reference)	-	-	-
Number of comorbid conditions	0.02 (0.04)	.49	.62
Metastatic cancer: yes	-0.53 (0.20)	2.59	.01
Metastatic cancer: no (Reference)	-	-	-
MDASI symptom severity score	0.008 (0.005)	1.75	.08
Anxiety score	-0.02 (0.01)	-2.20	.03
Spirituality score	0.05 (0.01)	3.28	<.01
Number of CTs used	0.16 (0.04)	3.82	<.01

Note: R-squared = 0.19 Reference = Reference Group. MDASI = M.D. Anderson Symptom Inventory. CT = Complementary Therapy. *N* = 253 because 3 women were missing one or more covariates from the baseline.

negative coefficient for the MDASI change in Table 3. The nature of the interaction between baseline expectancy and symptom change is further illustrated in Figure 2. When expectancy is low, the line in Figure 2 has a negative slope reflective of the negative coefficient for symptom improvement. In contrast, when baseline expectancy was high, this effect disappeared; patients utilised reflexology with the same estimated probability of approximately .82 (log-odds of 1.48 in Figure 2) regardless of whether their symptoms improved or not. For this analysis, under MAR in GLME, women with at least two completed consecutive weeks were included (*N* = 86) so that the change in MDASI from a previous contact was defined. Given the sample size, the detectable effect size for continuous predictors in discriminating those utilising reflexology versus not (average over time) was 0.80 of the standard deviation.

Finally, the results for the third research question (Table 4) found that expectancy at week 11 was predicted both by expectancy at baseline and by the amount of change in MDASI symptom severity between baseline and week 11; when symptoms got worse, expectancy decreased, and when symptoms got better, expectancy increased. In Table 4, positive symptom change refers to symptoms getting better. Other potential predictors were non-significant. With the available sample size of *N* = 79 for this question (89 completed the week 11 interview, and of these 79 had data for all of the necessary variables), the effect of baseline expectancy beliefs on final beliefs as small as *f*-squared of .10 was detectable.

TABLE 3
 Longitudinal Model for Reflexology Utilisation during Weeks 1–4: Coefficients for the Explanatory Variables (*b*), their Standard Errors (*SEs*), and *p*-values

<i>Explanatory variable</i>	<i>b (SE)</i>	<i>t</i>	<i>p</i>
Intercept	4.26 (1.30)	3.28	<.01
Age in years	0.08 (0.03)	2.76	<.01
Education: 4-year college or more	-0.26 (0.84)	-0.29	.85
Education: 2-year college	-1.55 (0.93)	-1.65	.10
Education: high school or less (Reference)	–	–	–
Number of comorbid conditions	-0.11 (0.12)	-0.87	.39
Metastatic cancer: yes	-1.41 (0.70)	-2.02	.04
Metastatic cancer: no (Reference)	–	–	–
MDASI symptom severity score	0.01 (0.02)	0.57	.57
Baseline anxiety score	-0.02 (0.04)	-0.59	.56
Baseline spirituality score	-0.16 (0.06)	-2.69	<.01
Number of CTs used	-0.01 (0.12)	-0.07	.95
Time: Week 2 (Reference)	–	–	–
Time: Week 3	-0.72 (0.61)	-1.19	.24
Time: Week 4	-0.93 (0.62)	-1.49	.14
Baseline expectancy high	0.25 (0.75)	0.33	.74
Baseline expectancy low (Reference)	–	–	–
MDASI change	-0.07 (0.04)	-2.19	.03
Baseline expectancy high*MDASI change	0.07 (0.03)	1.99	.04
Baseline expectancy low*MDASI change (Reference)	–	–	–

Note: Generalised chi-square divided by degrees of freedom = 0.82. *N* = 86. Reference = Reference Group. MDASI = M.D. Anderson Symptom Inventory. CT = Complementary Therapy.

DISCUSSION

This analysis examined the factors that predict initial beliefs about whether reflexology might help symptoms (response expectancy), utilisation of reflexology, and whether by the end of the trial a patient believed that reflexology was helpful for symptom management or not. The main findings are as follows. First, prior use of CTs, high spirituality, and low anxiety was predictive of expecting that reflexology would be helpful at baseline. Second, when baseline expectancy was low, improvement in symptoms was associated with less utilisation and a worsening of symptoms with more utilisation. Finally, baseline expectancy and improvement in symptoms were predictive of patients' final judgment of the usefulness of reflexology.

Explanations for Question 1 about Baseline Expectancy

The findings regarding baseline expectancy support prior research that middle-age women are more likely to hold a positive belief about CTs compared to older women (McAuley, Szabo, Gothe, & Olson, 2011). We also found that low

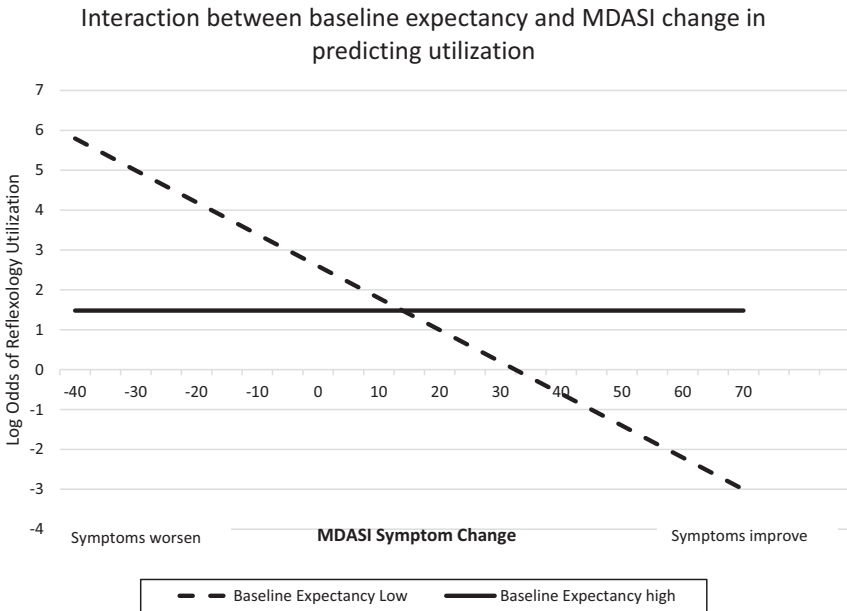


FIGURE 2. Log-odds of reflexology utilisation in relation to previous change in symptoms by level of baseline expectancy. *Note:* MDASI = M.D. Anderson Symptom Inventory.

anxiety predicted higher expectancy for the usefulness of reflexology at baseline. The relationship between anxiety and other cancer symptoms is complex; anxiety is both a common symptom of cancer and cancer treatment, and can also worsen other symptoms and side-effects including nausea, vomiting, and fatigue (Stark & House, 2000). There are several plausible explanations for the finding of a negative association between anxiety and expectancy. First, if anxiety is viewed as a plausible target of reflexology, patients with low levels of anxiety might have expected that reflexology could help, but patients with high anxiety might have expected reflexology to be insufficient to improve extreme anxiety. Second, high-anxiety patients may have felt that reflexology was too complicated to add into their life (and therefore not effective). Third, in research on the placebo effect, the largest placebo response occurs through an interaction between high expectations and low anxiety, suggesting that they may share a common mechanism (Staats, Staats, & Hekmat, 2001). There are important follow-up questions about the relation between expectancy and anxiety such as whether there are cyclic relations (Morton et al., 2009) and whether expectancy mediates the relation between anxiety and placebo response. In sum, though it is not surprising that anxiety and expectancy are negatively related, it is nevertheless important.

TABLE 4
 General Linear Model for Week-11 Therapy Expectancy: Coefficients for the
 Explanatory Variables (*b*), their Standard Errors (*SEs*), and *p*-values

<i>Explanatory variable</i>	<i>b</i> (<i>SE</i>)	<i>t</i>	<i>p</i>
Intercept	6.46 (0.53)	0.52	<.01
Age in years	-0.01 (0.02)	-0.66	.51
Education: 4-year college or more	0.06 (0.57)	0.11	.92
Education: 2-year college	-0.25 (0.64)	-0.40	.69
Education: high school or less (Reference)	-	-	-
Number of comorbid conditions	0.04 (0.09)	0.45	.66
Metastatic cancer: yes	0.15 (0.46)	0.32	.75
Metastatic cancer: no (Reference)	-	-	-
Baseline anxiety score	-0.03 (0.02)	-1.31	.19
Baseline spirituality score	0.05 (0.03)	1.91	.06
Number of complementary therapies used	0.09 (0.09)	0.98	.32
Baseline expectancy	0.41 (0.13)	3.02	<.01
MDASI change	0.03 (0.01)	2.19	.03
Baseline MDASI	-0.01 (0.02)	-0.55	.59

Note: R-squared = 0.35. *N* = 79. MDASI = M.D. Anderson Symptom Inventory. Reference = Reference Group.

Explanations for Question 2 about Utilisation

Question 2 was about how patients coped with their symptoms by utilising or not utilising reflexology. We found some evidence suggesting that utilisation of reflexology was related to changes in symptoms, which can be viewed as dynamic self-management behavior. When expectancy was low, improvement in symptoms was associated with lower utilisation, and a worsening of symptoms was associated with higher utilisation. This pattern makes sense if women used reflexology when their symptoms got worse in order to manage the symptoms, and stopped using it when their symptoms improved because they felt that it was no longer necessary. This finding also somewhat fits with prior research that patients are more likely to try a CT when symptoms are worse (Wyatt et al., 2007). When expectancy was high, patients used reflexology at the same rate, regardless of symptom changes; this could be viewed as a perpetuation of the initial belief that reflexology would work. In sum, these findings suggest that the relations between expectancy and use of reflexology are highly dynamic. The explanations for these effects are speculative and point to a need for more research to understand the relations between expectancy, utilisation, and symptoms, and how these relationships change over time.

Some of the baseline variables (number of comorbid conditions, metastatic cancer) had consistent relations (or lack of relations) with expectancy and utilisation. Other demographic characteristics and other baseline variables had different effects on expectancy and utilisation. Some of these variables that were

significant for baseline expectancy (education, anxiety, number of CTs used) became non-significant for predicting utilisation when controlling for baseline expectancy; it is possible that the role that these play for utilisation is through expectancy. Other variables actually switched directions (age, spirituality) after controlling for baseline expectancy. One hypothesis is that if older women have more time to do reflexology, then even if they have lower expectancy, once expectancy is controlled for, a positive relation could emerge between age and utilisation. For spirituality, though there may be an overall positive relation with expectancy, once expectancy is controlled for, it might reveal a residual negative relation with utilisation; in fact, one observation in recruitment was that some women felt that their Christian faith was in conflict with reflexology.

Explanations for Question 3 about Expectancy at the End of the Study

The women's baseline expectancy still predicted their final beliefs about efficacy of reflexology 11 weeks later. This matches research showing that expectancy beliefs can be highly auto-correlated across time (Brown et al., 2014). Additionally, the amount of improvement in patients' symptoms predicted their final expectancy beliefs. One explanation is that women interpreted a positive change in symptoms as evidence that reflexology was helpful for symptom management, which fits with a similar finding for electro-acupuncture (Bauml et al., 2014). More broadly, it also fits with literature in cognitive psychology showing that people often (though not always) accurately learn about the effects of their choices (Rottman, Marcum, Thorpe, & Gellad, 2016). Technically, even though the randomised controlled trial (Wyatt et al., 2017) showed an average beneficial effect of reflexology, determining whether reflexology was effective for an individual woman in the study is impossible because for a single person other factors inevitably change over time (e.g. treatment, natural course of disease), which could be responsible for symptom changes. Attempts to attribute symptom changes to a treatment for a given patient have been unreliable (Cleeland et al., 2013aa, 2013bb; Hillman et al., 2010). Still, if there is some degree of stability in these processes, it would make sense to infer that changes in symptoms could be due to trying reflexology.

Study Limitations

There are a number of limitations with the current research and refinements that could be included in future research. First, this study only measured expectancy at the beginning and end of the study. In future research, having more fine-grained measures, perhaps using intensive longitudinal designs (e.g. smartphone apps), could help further elaborate the nature of how patients dynamically choose to use reflexology to cope with changing symptom burden.

Second, since reflexology was performed by a patient's caregiver, in reality the treatment utilisation decision is a product of their relationship. It is possible that the caregivers' beliefs and motivations could also affect utilisation, although caregivers' expectancy was not measured in the present study. Furthermore, reflexology could have a different impact on platonic vs. intimate relationships. Indeed, non-sexual physical affection such as touching has different effects on cardiovascular arousal in romantic vs. platonic relations (Diamond, 2000), and more generally physical affection including massage is related to relationship satisfaction (Gulledge, Gulledge, & Stahmann, 2003). Future research on reflexology interventions could examine whether relationship satisfaction mediates changes in symptoms and or expectancy.

Third, it is likely that different patients judge the efficacy of reflexology in different ways. First, different patients might believe that reflexology has an impact on their anxiety, or pain, or other symptoms. Second, patients might have different beliefs about how much time reflexology takes to work, for example, later the same day or that it has a cumulative effect across a week or two, which could lead them to assess efficacy in different ways (Rottman et al., 2016). Third, there may also be heterogeneity in the efficacy of reflexology; it may work better for patients with certain types of symptoms. For all these reasons, it is challenging to develop a model for how patients develop expectations and if they are correct in their judgment.

CONCLUSIONS

This project advances the understanding of how patients utilise and adapt their expectations about reflexology. In particular, this study represents the first attempt to empirically study the cyclic process of coping: utilising a self-management therapy, learning whether it makes a difference, and deciding whether or not to continue the therapy (Rottman et al., 2016).

We found that it is not easy to predict utilisation because it appears to be highly dynamic—as would be expected when patients are learning about the usefulness of a new therapy such as reflexology. Still, we found that younger women and more spiritual women were less likely to use reflexology after controlling for baseline expectancy. By contrast, a large representative study in Canada (Metcalfe et al., 2010) found decreased utilisation of CAM more generally within the middle-aged sample studied. Health providers may want to consider encouraging women with these characteristics to try reflexology if they experience high symptom burden, especially if future studies continue to confirm its efficacy.

More broadly, symptom self-management is a tricky endeavor. For example, should a patient continue to use reflexology even after their symptoms have subsided to prevent the symptoms from coming back, or should they stop because it is no longer needed? How well is an individual patient able to accurately

ascertain the benefits of reflexology for treating their symptoms? These questions are important for understanding how well people can adaptively manage their own symptoms.

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