The benefits of expressive writing among newly diagnosed mainland Chinese breast cancer patients

**Li-li Ji[1] · Qian Lu[2,3] · Li-juan Wang[4] · Xiang-lian Sun[4] ·
Hui-dong Wang[4] · Bing-xue Han[5] · Yu-feng Ma[5] ·
Guo-hua Lu[5]**

Abstract   The study aimed to evaluate the effects of an expressive writing intervention on quality of life (QoL) among mainland Chinese breast cancer patients. A total of 118 Chinese breast cancer patients were randomly assigned to one of four groups: a cancer-facts writing condition (CTL group), an emotional disclosure writing condition (EMO group), a self-regulation writing condition (SR group), or a neutral control condition with no writing tasks (CON group). QoL was assessed by FACT-B at baseline, 3-, and 6-month follow-ups. A repeated measure analysis of variance revealed significant effects of time (F = 13.9, $P < 0.001$, $\eta^2 = 0.20$) and the time × group interaction (F = 3.5, $P < 0.01$, $\eta^2 = 0.08$) on QoL. Residualized change models showed that the CTL, EMO and SR groups reported higher levels of QoL than the CON group at the 6-month follow-up. The EMO group had a higher level of QoL than the SR group. The CTL group had higher level of physical well-being compared to the SR group. Mainland Chinese breast cancer patients shortly after diagnosis benefit from expressive writing. They benefited more from cancer-facts and emotional disclosure compared

to self-regulation. The study indicated that the impact of expressive writing may differ due to stage of cancer survivorship, social, and cultural context.

Background

Breast cancer has become the most frequently diagnosed cancer in Chinese women (Fan et al., 2014; Ferlay et al., 2015). In 2012, the age-standardized incidence rate in China was 18.7/100,000, accounting for 11.2% of all newly diagnosed breast cancers worldwide (Ferlay et al., 2015). The active use of cancer treatments in China has increased the number of breast cancer survivors, but the side effects of cancer treatments have also brought physical and psychosocial problems, influencing the quality of life of Chinese breast cancer survivors (So et al., 2010). A recent study showed that breast cancer patients in China had a lower quality of life compared to those in the U.S. (Lu et al., 2016). However, few interventions have focused on improving quality of life among Chinese breast cancer survivors. The present study is thus designed to examine the effect of an expressive writing intervention on quality of life among Chinese breast cancer patients.

Expressive writing is a brief intervention instructing participants to write their deepest thoughts and feelings about a stressful life event (Pennebaker & Beall, 1986). Previous research has demonstrated that writing as little as 15–20 min for 3 days can lead to improvements in both psychological (Richards et al., 2000) and biological health (Petrie et al., 1995). Researchers have documented the physical and psychological benefits of expressive writing among non-patient

✉ Qian Lu
qlu@mdanderson.org

✉ Guo-hua Lu
ghluu1@163.com

[1]   Department of Medical Nursing, Weifang Medical University, Wei Fang, China

[2]   Department of Psychology, University of Houston, Houston, USA

[3]   Department of Health Disparities Research, The University of Texas MD Anderson Cancer Center, Houston, USA

[4]   Department of Breast Surgery, Weifang People's Hospital, Wei Fang, China

[5]   Department of Psychology, Weifang Medical University, Wei Fang, China

(Burton & King, 2008; Sloan & Marx, 2004) and patient populations (Stanton et al., 2002; Zakowski et al., 2004). A recent meta-analysis of 11 randomized controlled trials revealed that expressive writing reduced negative somatic symptoms in breast cancer patients in ≤3-month follow-ups (Zhou et al., 2015). Psychological health improvements have also been reported among breast cancer patients after expressive writing interventions (Lu et al., 2012, 2017 Stanton et al., 2000, 2002). Contrary to the above studies that have demonstrated benefits of expressive writing, a recent meta-analysis of 16 randomized controlled trials did not find evidence for benefits of expressive writing on psychological, physical, or quality of life outcomes among cancer patients (Zachariae & O'Toole, 2015). However, the review suggested that those who experience low levels of emotional support may benefit from expressive writing.

Compared to individuals from Western societies, Chinese individuals, in general, are less likely to disclose their emotions and psychological distress. This may be because Chinese culture prioritizes collectivism and social harmony over individual expression (Wu & Tseng, 1985). In Chinese culture, displaying strong emotions is considered to be a weakness and was traditionally even thought to be a cause of illness (Wu & Tseng, 1985). The cultural values of emotional restraint and harmony have been associated with reluctance to solicit support from family and friends (Chang, 2014) and have led to higher levels of ambivalence over emotion expression (AEE) in Chinese breast cancer patients compared to European Americans and Chinese Americans in the United States (Ji et al., 2019). Expressive writing is a private intervention that facilitates emotional expression without damaging harmony with others and may be especially suitable for Chinese. Indeed, studies have found that Asian Americans with higher levels of AEE benefit more from expressive writing compared to those with lower levels of AEE (Lu & Stanton, 2010).

Previous studies of expressive writing on cancer patients have mainly been conducted among non-Hispanic Whites (Stanton et al., 2002; Zakowski et al., 2004) and only a few have been conducted among Asians in the U.S. (Lu et al., 2017, 2018). A typical expressive writing experiment usually requires participants to write about their deepest thoughts and feelings related to their cancer experience, but this has been found to be beneficial for Europeans but not Asians (Knowles et al., 2011; Lu & Stanton, 2010). This may be because Asians are not comfortable diving into emotions directly due to Asian cultures' valuing emotional control and restraint over emotional expression (Lu et al., 2017). Correspondingly, Lu and Stanton (2010) developed a self-regulation model of expressive writing to emphasize the essential role of cognitive reappraisal on stressful events and the facilitating

role of emotional disclosure in producing health benefits. The model was tested and shown to be particularly relevant for Asians (Lu & Stanton, 2010; Lu et al., 2017), suggesting that the cognitive component might be a more important ingredient than the emotional component for the expressive writing paradigm to benefit Asians. A cancer-facts writing condition to write about facts related to cancer diagnosis and treatment was always conceptualized as a control condition in previous studies, but it was found to be more beneficial than the self-regulation and emotional disclosure conditions for Chinese Americans in a recent randomized controlled trial (Lu et al., 2017). Asians tend not to openly talk about their cancer diagnosis and experience (Papadopoulos et al., 2010), and, as such, the opportunity to describe cancer in the cancer-facts writing task may be therapeutic because it provides an opportunity for them to process suppressed thoughts (Lu et al., 2017). These studies suggest that the effects of expressive writing may vary depending on writing instructions and population characteristics. As such, it is imperative to determine what types of expressive writing can deliver health benefits among mainland Chinese breast cancer patients.

However, to date, there has been only one study that tested the efficacy of expressive writing among breast cancer patients in mainland China (Lu et al., 2019). This study tested the effect of a positive thinking condition, a self-regulation condition, and a cancer-facts condition of expressive writing on mainland Chinese breast cancer patients undergoing chemotherapy. Participants in the cancer-facts condition and positive thinking condition had higher quality of life compared with the self-regulation condition from baseline to both the 1-month and 2-month follow-ups. Self-regulation was shown to be particularly relevant for Asians (Lu & Stanton, 2010; Lu et al., 2017). However, this study failed to test the benefits of self-regulation since there was no neutral control condition. Given that the cancer-facts control condition was found to be more beneficial for Chinese (Lu et al., 2017, 2019), it is essential to add a neutral control condition in future studies to better understand the potential benefits of expressive writing among mainland Chinese breast cancer patients.

Therefore, the current study aimed to investigate the effects of expressive writing on quality of life with a neutral control condition among mainland Chinese breast cancer patients. We hypothesized that the three experimental conditions (i.e., self-regulation, emotional disclosure, and cancer facts) would improve in QOL compared to the neutral control condition. We additionally explored the differences in QOL between the three experimental conditions and hypothesized that the self-regulation condition and the cancer-facts condition would have better QOL compared to the emotional disclosure condition.

Methods

Participants

Inclusion criteria: (1) being diagnosed with breast cancer between stage 0–III; (2) being within 2 years post-breast cancer diagnosis; (3) being able to read and write Chinese.

Based on the Lu et al. (2018) study and the assumption that women undergoing treatment may experience enhanced benefits of expressive writing, 26 participants per group were needed to detect d = − 0.8 between-group differences. Recruitment took place in the breast surgery ward in the Weifang People's Hospital. Breast cancer patients who were receiving treatments for cancer or had follow-up visits were introduced to the study by being given a study flier by the nurses. The benefits of expressive writing and the procedure of the present study were briefly introduced in the flier. One hundred thirty-five patients who indicated an interest in the study were contacted by the research stuff to assess their eligibility. Among these patients, 2 did not meet the inclusion criteria, and 15 declined to participate because they were busy or because the tasks were too tedious. The remaining 118

women completed the baseline questionnaires and were randomized to the self-regulation condition (SR group, n = 31), the emotional disclosure condition (EMO group, n = 30), the cancer-facts writing condition (CTL group, n = 27), or the neutral control condition (CON group, n = 30) at the time of recruitment. Among the 118 participants, 103 completed the writing intervention (27 from the SR group, 23 from the EMO group, 23 from the CTL group, and 30 from the CON group) and 15 dropped out (see Fig. 1).

Sample characteristics are shown in Table 1. Participants enrolled in the present study had a mean age of 48.0 years (SD = 8.8 years; range 28–75 years). 97.5% of the participants were within one year of receiving their cancer diagnosis and 2.5% were within 1–2 years. Average diagnosis duration was 3.6 months (SD = 2.8 months; range 1–17 months). 3.4% were diagnosed with stage 0 (carcinoma in situ) breast cancer, 20.5% with stage I, 47.0% with stage II, and 29.1% with stage III. 88.1% of participants had received a mastectomy and 11.9% a breast conservation. Most (71.2%) had undergone chemotherapy, and only 5.1% had undergone radiotherapy.
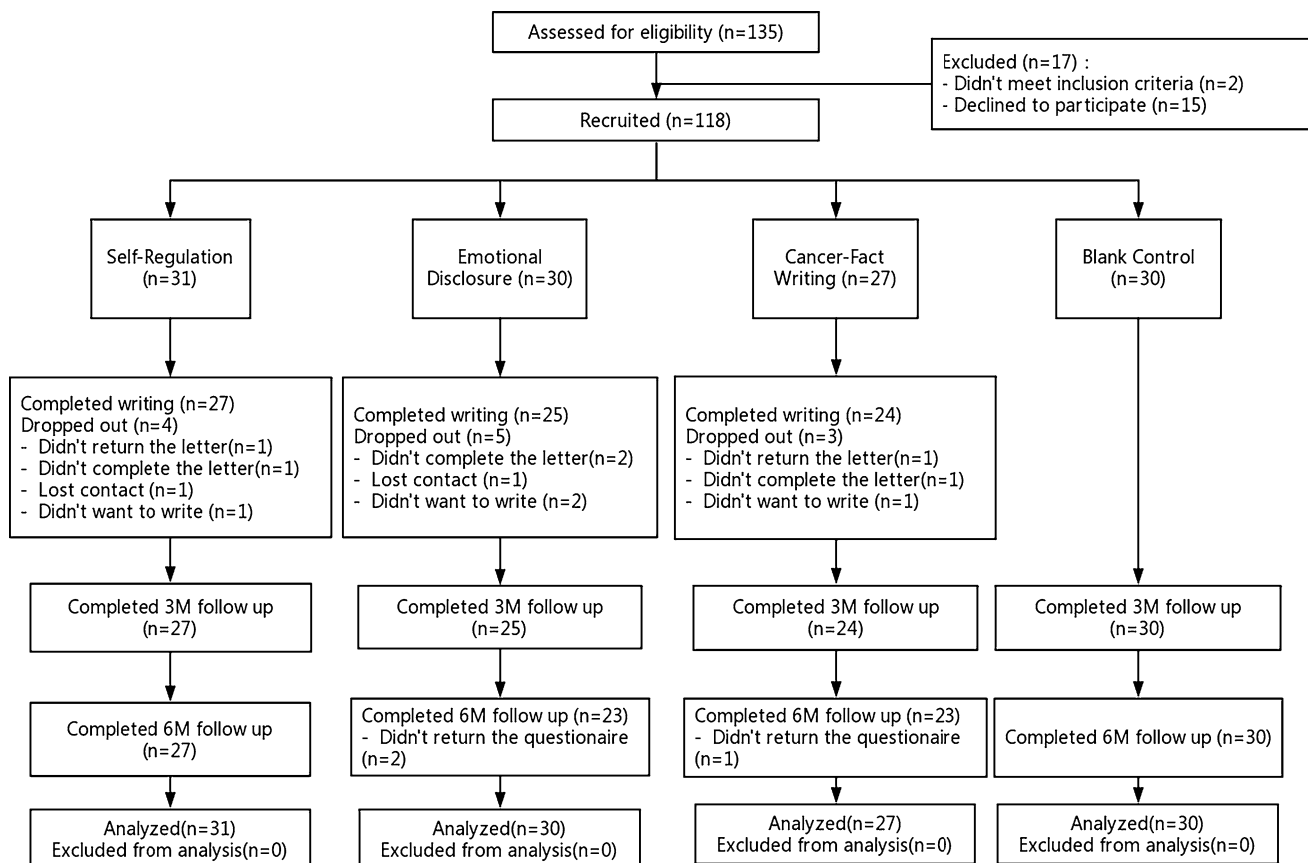

Fig. 1 Flowchart

Table 1 Sample characteristics

	Total sample (n = 118)	SR (n = 31)	EMO (n = 30)	CTL (n = 27)	CON (n = 30)	F/χ^2	P
Age (years)	48.0 ± 8.8	46.2 ± 8.7	49.5 ± 8.1	49.0 ± 8.0	47.6 ± 10.1	0.86	0.46
Educational level						5.87	0.75
Elementary school or lower	5 (1.4%)	2 (6.5%)	0 (0%)	2 (7.4%)	1 (3.3%)		
Middle school	51 (14.4%)	17 (54.8%)	12 (40.0%)	10 (37.0%)	12 (40.0%)		
High school	38 (10.7%)	7 (22.6%)	10 (33.3%)	10 (37.0%)	11 (36.7%)		
College or higher	24 (20.3%)	5 (16.1%)	8 (26.7%)	5 (18.5%)	6 (20.0%)		
Employment						9.99	0.62
Full-time or part-time job	39 (33.3%)	8 (25.8%)	11 (37.9%)	7 (25.9%)	13 (43.3%)		
Retired	22 (18.8%)	6 (19.4%)	6 (20.7%)	5 (18.5%)	5 (16.7%)		
Housewife	31 (26.5%)	8 (25.8%)	7 (24.1%)	10 (37.0%)	6 (20.0%)		
Unemployed	19 (16.2%)	7 (22.6%)	4 (13.8%)	2 (7.4%)	6 (20.0%)		
Others	6 (5.1%)	2 (6.5%)	1 (3.4%)	3 (11.1%)	0 (0.0%)		
Household income (monthly, ¥)						7.75	0.56
< 2000	21 (18.1%)	8 (25.8%)	2 (6.9%)	5 (19.2%)	6 (20.0%)		
2000–4000	46 (39.7%)	13 (41.9%)	13 (44.8%)	7 (26.9%)	13 (43.3%)		
4000–6000	22 (19.0%)	4 (12.9%)	7 (24.1%)	5 (19.2%)	6 (20.0%)		
> 6000	27 (23.3%)	6 (19.4%)	7 (24.1%)	9 (34.6%)	5 (16.7%)		
Practicing a religion						2.3	0.51
Yes	27 (23.1%)	7 (22.6%)	5 (17.2%)	9 (33.3%)	6 (20.0%)		
No	90 (76.9%)	24 (77.4%)	24 (82.8%)	18 (66.7%)	24 (80.0%)		
Marital status						12.1	0.21
Unmarried	2 (1.7%)	1 (4%)	0 (0%)	0 (0%)	2 (6.7%)		
Married	114 (96.6%)	30 (96.8%)	30 (100%)	26 (96.3%)	28 (93.3%)		
Separated	1 (0.8%)	0 (0%)	0 (0%)	1 (3.7%)	0 (0%)		
Divorced	1 (0.8%)	1 (3.2%)	0 (0%)	0 (0%)	0 (0%)		
Time since the first diagnosis (months)	3.6 ± 2.8	4.6 ± 4.1	3.2 ± 2.9	3.3 ± 1.7	3.2 ± 1.6	1.78	0.16
Stage						5.19	0.82
0	4 (3.4%)	0 (0%)	1 (3.4%)	1 (3.7%)	2 (6.7%)		
I	24 (20.5%)	6 (19.4%)	5 (17.2%)	7 (25.9%)	6 (20.0%)		
II	55 (47.0%)	16 (51.6%)	14 (48.3%)	14 (51.9%)	11 (36.7%)		
III	34 (29.1%)	9 (29.0%)	9 (31.0%)	5 (18.5%)	11 (36.7%)		
Surgery						0.53	0.91
Mastectomy	104 (88.1%)	28 (90.3%)	27 (90.0%)	23 (85.2%)	26 (86.7%)		
Breast conservation	14 (11.9%)	3 (9.7%)	3 (10.0%)	4 (14.8%)	4 (13.3%)		
Treated with chemotherapy	84 (71.2%)	26 (83.9%)	19 (63.3%)	17 (63.0%)	22 (73.3%)	4.29	0.23
Treated with radiotherapy	6 (5.1%)	3 (9.7%)	1 (3.3%)	2 (7.4%)	0 (0%)	3.45	0.33
Quality of life (total)	91.5 ± 20.3	86.7 ± 18.1	95.6 ± 19.6	94.0 ± 24.0	89.9 ± 19.2	1.19	0.32
PWB	16.8 ± 6.0	16.2 ± 5.2	15.3 ± 5.9	16.9 ± 7.4	18.0 ± 5.6	0.58	0.63
SWB	19.7 ± 5.1	18.1 ± 5.8	21.1 ± 3.3	19.7 ± 6.4	20.1 ± 4.2	1.83	0.15
EWB	15.7 ± 5.1	15.0 ± 4.6	17.7 ± 4.3	15.7 ± 5.6	14.4 ± 5.5	2.51	0.06
FWB	15.9 ± 6.7	14.8 ± 6.2	16.8 ± 6.4	16.8 ± 7.2	15.3 ± 7.1	0.69	0.56
BCS	23.3 ± 5.8	22.6 ± 6.4	23.7 ± 5.6	25.0 ± 5.7	22.0 ± 5.2	1.42	0.24

SR Self-regulation group, *EMO* emotional disclosure group, *CTL* cancer-facts writing group, and CON control group

Procedure

This trial has been registered with trial number ChiCTR1900022045. Ethical approval (NO. 2014-317) was obtained from the Research Ethics Committee at Weifang Medical University following Chinese "Ethical review of biomedical research involving human beings" (Li, 2016). Eligible women who agreed to participate were asked to sign a consent form and complete a baseline questionnaire, and were then randomized to one of four conditions: SR, EMO,

CTL, or CON. Simple randomization was conducted using a computerized random number generator. The first author conducted the randomization procedure and put group assignments into an envelope. After the participants completed the baseline questionnaire, the research staff opened the envelope and assigned participants to the corresponding condition. Participants in the experimental conditions were not aware of whether they were assigned to the SR, EMO or CTL condition, but participants in the CON condition knew they were assigned to the control group since there were no writing tasks for them.

Participants in the SR, EMO, CTL conditions were given two copies of a calendar and three sealed envelopes with corresponding writing instructions based on their condition assignment. They were asked to schedule three weekly writing sessions on the calendar, keep one copy of the calendar as a reminder, and give one copy back so that researchers could remind them of the next writing session. The three sealed envelopes given to the participants were labeled as "week 1," "week 2," and "week 3" with writing instructions for the corresponding week. On the scheduled writing day, researchers called the participants to remind them of the writing task. Participants were asked to only open the corresponding envelope at the scheduled writing time and to write continuously for up to 30 min or until they completed one page of writing.

Participants in the EMO condition were asked to write about their deepest thoughts and feelings about their cancer experience for 3 weeks. Participants in the CTL condition were asked to objectively write about their cancer diagnosis and treatment in detail for 3 weeks. Participants in the SR condition were asked to write about their deepest feelings and thoughts related to their breast cancer experience at week one, their coping strategies to deal with stressors caused by breast cancer at week two, and positive thoughts and feelings regarding their breast cancer experience at week three. Complete writing instructions are available from the online supplemental materials.

After each writing session, participants sealed their writing envelopes and brought them back to the research staff at their next clinic visit. At 3 and 6 months after the final writing, participants received follow-up questionnaires by mail. They were asked to complete and then mail the follow-up questionnaires back.

Measures

Functional assessment of cancer therapy-breast cancer

The Functional Assessment of Cancer Therapy-Breast cancer (FACT-B) version 4 was used to assess quality of life (QoL) of the participants. The FACT-B consists of 37 Likert-type questions covering five domains: physical well-being

(PWB, 7 items), social/family well-being (SWB, 7 items), emotional well-being (EWB, 6 items), functional well-being (FWB, 7 items), and additional concerns for breast cancer (BCS, 10 items). The instrument asked respondents to rate how true each statement was for the last 7 days. Response scales ranged from 0 (not at all) to 4 (very much). Negatively worded items were recorded such that a higher score indicated a better QoL. The FACT-B total score is the sum of the scores from all five subscales. The psychometric properties of the FACT-B are well documented, and it was validated in Chinese (Wan et al., 2007). Cronbach α was 0.59–0.85 in the Chinese version of FACT-B (Wan et al., 2007).

Essay ratings

An independent rater unaware of writing group assignment read the essays in random order and judged whether each essay conformed to the writing instructions.

Linguistic analysis

To analyze essays written in Chinese, we used SCLIWC, a Chinese language psychological analysis system inspired by LIWC 2007 and C-LIWC (Gao et al., 2013). SCLIWC is a text analysis software program that calculates the degree to which people use different categories of words across a wide array of texts. The SCLIWC dictionary was developed and validated by Gao et al. from the traditional Chinese version of the LIWC dictionary (C-LIWC dictionary), which has been widely used in analyzing medical patients' writing. Each lexical item in the C-LIWC dictionary was checked and validated manually to guarantee the accuracy of SCLIWC dictionary. The categories of the SCLIWC dictionary are compatible to C-LIWC. The reliability and validity of SCLIWC have been found to be good (Gao et al., 2013; Zhao et al., 2016).

Statistical analysis

Analyses were conducted using SPSS 22 as intent-to-treat analyses to include all randomized participants (n = 118). Expectation maximization procedures were used to accommodate missing data. Preliminary multivariate analyses of variance for continuous variables and Chi square analyses for categorical variables were conducted on demographic variables, cancer-related parameters, and dependent variables at baseline. Repeated measures analysis of variance was used to investigate the main effect (time) and the interaction effect (time × group) on QoL and its subdimensions. Three sets of regression models were then specified to evaluate the effects of group on QoL and its subdimensions at the final assessment while controlling for baseline data. For these models, QoL and its subdimension scores at

the final assessment were regressed on baseline data, with three dummy code variables representing condition. We conducted three models in which the neutral control condition, cancer-facts condition, and emotional disclosure condition were specified as the reference condition, respectively, so as to permit comparisons between all four groups.

Results

Sample characteristics

Participant characteristics at the beginning of the study are shown in Table 1. Fifteen of the 118 participants dropped out the study, leaving 7.6% missing data. A Little's MCAR test revealed that the data were missing at random ($\chi^2 = 532.5$, $df = 515$, $P = 0.29$). The completers and non-completers did not differ on demographic variables (i.e., age, education level, employment, household income, religious belief, and marital status) ($Ps > 0.33$), cancer-related parameters (i.e., time since the first diagnosis, stage, surgery, treated with chemotherapy and radiotherapy) ($Ps > 0.31$), and variables of interest (i.e., quality of life dimensions) at baseline ($Ps > 0.29$). Participants in the four groups were compared to determine the success of randomization using ANOVA and Chi square tests. There were no significant group differences in demographic variables, cancer-related parameters, or baseline QoL between the four groups (all $P > 0.05$). However, post hoc analyses revealed that the EMO group had a higher baseline level of social wellbeing ($d = 2.97$, $P = 0.02$) and emotional wellbeing ($d = 2.74$, $P = 0.035$) than the SR group. Emotional wellbeing in the EMO group was also higher than that of the CTL group ($d = 3.31$, $P = 0.012$).

Essay ratings

The independent rater correctly judged the writing assignment for 85.3% of the 76 sets of essays (80% SR, 86.4% EMO, and 90.4% CTL), indicating good adherence to the writing instructions.

Linguistic analysis

To determine group differences in words used in the written essays, SCLIWC was used to examine word counts in two emotion categories: positive emotions (e.g., confident, satisfied, blessed) and negative emotions (e.g., worried, suspicious, sad). It was also used for two categories that reflect cognitive processes: insight (e.g., think, know, consider) and causation (e.g., because, effect, hence). As expected, the EMO and SR groups used more negative emotion words compared to the CTL group (all $P < 0.05$), and there was no difference between the EMO and the SR groups. No differences were found in the use of positive emotion and cognitive words among the three writing groups.

Analyses on FACT-B quality-of-life

Repeated measures ANOVA showed significant effects of time and the time × group interaction on overall QoL (F = 13.9, $P < 0.001$, $\eta^2 = 0.20$; F = 3.5, $P < 0.01$, $\eta^2 = 0.08$), physical well-being (F = 13.08, $P < 0.001$, $\eta^2 = 0.19$; F = 5.35, $P < 0.001$, $\eta^2 = 0.12$), emotional well-being (F = 3.84, $P < 0.05$, $\eta^2 = 0.06$; F = 2.20, $P < 0.05$, $\eta^2 = 0.06$), and additional concerns for breast cancer (F = 11.42, $P < 0.001$, $\eta^2 = 0.17$; F = 2.72, $P < 0.01$, $\eta^2 = 0.07$) (Table 2).

As there was a significant time × group interaction, a series of regression models were conducted to detect the group differences in QoL and its subdimensions over time. Because four conditions were included in the present study, three regression models were conducted for QoL and each dimension as outcomes, with the first regression model testing the effects of CTL, SR, and EMO in comparison to the CON condition, and the second model testing the effects of EMO, SR, and CON in comparison to the CTL condition, and the third model testing the effects of SR, CTL, and CON in comparison to the EMO condition.

Results from these residualized change regression analyses are presented in Table 3. Results show that the CTL, EMO, and SR groups reported higher levels of overall quality of life (b = 23.20, $P < 0.001$; b = 24.66, $P < 0.001$; b = 17.80, $P < 0.001$) than the control group (see Fig. 2). The three writing group also had higher physical well-being (b = 8.40, $P < 0.001$; b = 7.47, $P < 0.001$; b = 6.06, $P < 0.001$), emotional well-being (b = 5.45, $P < 0.001$; b = 4.85, $P < 0.001$; b = 3.93, $P < 0.001$), and additional concerns for breast cancer (b = 5.73, $P < 0.001$; b = 6.99, $P < 0.001$; b = 5.17, $P < 0.001$) than the control group. The CTL group had higher physical well-being (b = 2.35, $P < 0.05$) and the EMO group had higher social well-being (b = 1.97, $P < 0.05$) than the SR group.

Discussion

The present study aimed to examine the health benefits of expressive writing among mainland Chinese breast cancer patients. Findings suggest the potential benefits of expressive writing and the importance of further testing the expressive writing paradigm among patients in mainland China. Participants in the SR, EMO, and CTL conditions reported higher quality of life than those in the control condition at the 6-month follow-up, which indicates that all three active writing conditions were beneficial for mainland Chinese breast cancer patients.

Table 2 Repeated measure analysis of variance on quality of life

Outcomes (score range)	Self-regulation (n = 31)	Emotional disclosure (n = 30)	Cancer-Facts (n = 27)	Control group (n = 30)	Time	Time*Group
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	$F(\eta^2)$	$F(\eta^2)$
Quality of life (0–148)					13.9*** (0.20)	3.5** (0.08)
Pre-writing	86.7 (18.1)	95.6 (19.6)	94.0 (24.0)	89.9 (19.2)		
3-month FU	93.2 (13.1)	103.3 (14.9)	103.3 (21.6)	83.8 (16.9)		
6-month FU	101.0 (14.9)	110.2 (11.2)	108.3 (16.495)	84.0 (17.0)		
Physical well-being (0–28)					13.08*** (0.19)	5.35*** (0.12)
Pre-writing	16.2 (5.2)	16.3 (5.9)	16.9 (7.4)	18.0 (5.6)		
3-month FU	18.3 (5.1)	19.6 (4.2)	21.3 (5.5)	16.1 (5.3)		
6-month FU	20.7 (5.2)	22.1 (3.9)	23.1 (2.8)	14.8 (5.2)		
Social well-being (0–28)					1.43 (0.03)	0.93 (0.02)
Pre-writing	18.1 (5.8)	21.1 (3.3)	19.7 (6.4)	20.1 (4.2)		
3-month FU	19.0 (4.9)	21.8 (2.8)	20.8 (5.5)	19.2 (3.9)		
6-month FU	19.1 (5.0)	22.6 (2.6)	20.6 (5.9)	19.5 (4.4)		
Emotional well-being (0–24)					3.84* (0.06)	2.20* (0.06)
Pre-writing	15.0 (4.6)	17.7 (4.3)	15.7 (5.6)	14.4 (5.5)		
3-month FU	16.5 (3.7)	17.9 (3.8)	17.6 (4.9)	14.8 (4.7)		
6-month FU	17.2 (3.6)	18.8 (2.9)	18.9 (3.9)	13.2 (4.9)		
Functional well-being (0–28)					5.11** (0.08)	0.88 (0.02)
Pre-writing	14.8 (6.2)	16.8 (6.4)	16.8 (7.2)	15.3 (7.1)		
3-month FU	15.7 (5.7)	18.0 (5.9)	18.1 (6.5)	14.6 (4.9)		
6-month FU	18.0 (6.0)	18.6 (4.9)	18.6 (6.4)	15.9 (6.3)		
Additional concerns for breast cancer (0–40)					11.42*** (0.17)	2.72** (0.07)
Pre-writing	22.65 (6.4)	23.7 (5.6)	25.0 (5.7)	22.0 (5.2)		
3-month FU	23.65 (3.4)	26.0 (4.2)	25.4 (5.9)	19.2 (6.4)		
6-month FU	26.0 (3.5)	28.1 (3.8)	27.1 (4.7)	20.7 (4.8)		

Note, for scores, higher were better

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$

The mechanisms through which expressive writing is beneficial to one's health could be explained by several theories. According to inhibition theory, the inhibition of thoughts or feelings regarding a stressful event is detrimental, and, therefore, disclosure of those inhibited thoughts or feelings may alleviate stress and improve physical and psychological health (Freud, 1954). Repeated expression may decrease the attendant negative emotions and physiological arousal, which, in turn, may diminish negative emotions. Thus, the situation is not experienced as dire as originally conceived, and benefit can be extracted from adversity (Stanton et al., 2000). According to cognitive-processing theory, expressive writing may allow for the cognitive reorganization of a stressful event, ultimately reducing physiological activation associated with inhibition and obsessive thinking (Pennebaker, 1993). According to self-regulation theory, expressive writing may allow people to observe themselves expressing and controlling their emotions. This may lead to a stronger sense of emotional regulation self-efficacy and help people feel that their traumas or stressors are more controllable, which could reduce negative affect and produce health benefits (Lepore et al., 2002). Furthermore, Creswell et al. (2007) found that self-disclosure through expressive writing facilitates self-affirmation, which could buffer the stress of traumatic life events and positively affect functional health status. Future studies should further test these mechanisms.

The study also showed that the cancer-facts condition reported a significantly higher level of physical well-being

Table 3 Residual change models at 6-month follow-up

Outcome	Model 1			Model 2			Model 3		
	Predictor	*B*	*SE*	Predictor	*B*	*SE*	Predictor	*B*	*SE*
Quality of life (Qol)a	Baseline Qol	0.27***	0.07	Baseline Qol	0.27***	0.07	Baseline Qol	0.27***	0.07
	CTL (vs. CON)	23.20***	3.76	EMO (vs. CTL)	1.46	3.75	CTL (vs. EMO)	− 1.46	3.75
	EMO (vs. CON)	24.66***	3.67	SR (vs. CTL)	− 5.40	3.75	SR (vs. EMO)	− 6.86	3.66
	SR (vs. CON)	17.80***	3.62	CON (vs. CTL)	− 23.20***	3.76	CON (vs. EMO)	− 24.66***	3.67
Physical well-being (PWB)	Baseline PWB	0.09	0.07	Baseline PWB	0.09	0.07	Baseline PWB	0.09	0.07
	CTL (vs. CON)	8.40***	1.18	EMO (vs. CTL)	-0.93	1.17	CTL (vs. EMO)	0.93	1.17
	EMO (vs. CON)	7.47***	1.15	SR (vs. CTL)	− 2.35*	1.17	SR (vs. EMO)	− 1.42	1.13
	SR (vs. CON)	6.06***	1.14	CON (vs. CTL)	− 8.40***	1.18	CON (vs. EMO)	− 7.47***	1.15
Social well-being (SWB)	Baseline SWB	0.51***	0.07	Baseline SWB	0.51***	0.07	Baseline SWB	0.51***	0.07
	CTL (vs. CON)	1.35	1.01	EMO (vs. CTL)	1.27	1.01	CTL (vs. EMO)	− 1.27	1.01
	EMO (vs. CON)	2.61**	0.98	SR (vs. CTL)	-0.70	1.01	SR (vs. EMO)	− 1.97*	0.99
	SR (vs. CON)	0.65	0.98	CON (vs. CTL)	− 1.35	1.01	CON (vs. EMO)	− 2.61**	0.98
Emotional well-being (EWB)	Baseline EWB	0.24**	0.07	Baseline EWB	0.24**	0.07	Baseline EWB	0.24**	0.07
	CTL (vs. CON)	5.45***	0.99	EMO (vs. CTL)	-0.59	1.00	CTL (vs. EMO)	0.59	1.00
	EMO (vs. CON)	4.85***	0.99	SR (vs. CTL)	− 1.52	0.99	SR (vs. EMO)	-0.93	0.98
	SR (vs. CON)	3.93***	0.96	CON (vs. CTL)	− 5.45***	0.99	CON (vs. EMO)	− 4.85***	0.99
Functional well-being (FWB)	Baseline FWB	0.35***	0.08	Baseline FWB	0.35***	0.08	Baseline FWB	0.35***	0.08
	CTL (vs. CON)	2.18	1.45	EMO (vs. CTL)	0.01	1.45	CTL (vs. EMO)	-0.01	1.45
	EMO (vs. CON)	2.19	1.41	SR (vs. CTL)	0.08	1.44	SR (vs. EMO)	0.08	1.40
	SR (vs. CON)	2.18	1.40	CON (vs. CTL)	− 2.18	1.45	CON (vs. EMO)	− 2.19	1.41
Additional concerns for breast cancer (BCS)	Baseline BCS	0.24***	0.07	Baseline BCS	0.24***	0.07	Baseline BCS	0.24***	0.07
	CTL (vs. CON)	5.73***	1.08	EMO (vs. CTL)	1.26	1.07	CTL (vs. EMO)	− 1.26	1.07
	EMO (vs. CON)	6.99***	1.04	SR (vs. CTL)	-0.57	1.07	SR (vs. EMO)	− 1.83	1.03
	SR (vs. CON)	5.17***	1.03	CON (vs. CTL)	− 5.73***	1.08	CON (vs. EMO)	− 6.99***	1.04

SR Self-regulation group, *EMO* emotional disclosure group, *CTL* cancer-facts writing group, and CON control group. Model 1: CON was the reference group; model 2: CTL was the reference group; model 3: EMO was the reference group

*P < 0.05, **P < 0.01, ***P < 0.001

Fig. 2 Overall quality of life across time within the four conditions

Quality of Life at Baseline, 3- and 6-Month Follow-up
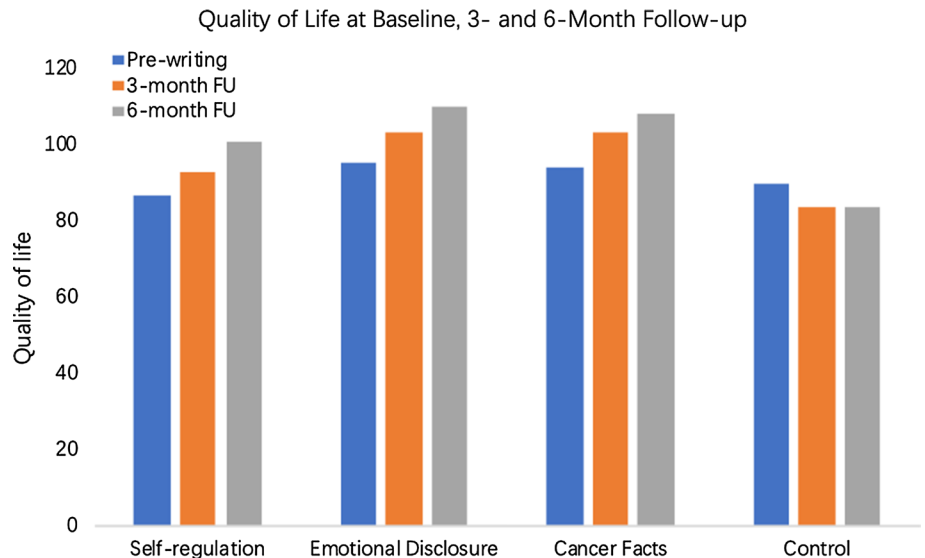
than the self-regulation group at the 6-month follow-up. This is consistent with a previous study showing that mainland Chinese patients undergoing treatment benefited more from cancer-facts writing than self-regulation writing (Lu et al., 2019). This finding is also similar to the Lu et al. (2017) study that showed that the CTL was the most beneficial among Chinese immigrant cancer survivors in the U.S., and also that the CTL facilitated cognitive processes and gaining insight. Asian cultural norms that prioritize emotional restraint to maintain group harmony may have restricted Asians from talking openly about their cancer diagnosis and experience (Papadopoulos et al., 2010), and, therefore, their cancer-related thoughts may have been suppressed. As discussed above, the inhibition of thoughts regarding a stressful event is harmful (Pennebaker, 1993). Consequently, the opportunity to describe the cancer diagnosis and experience in detail in the cancer-facts writing task could be therapeutic as it presents the opportunity to deal with inhibited thoughts in a non-threatening way (Lu et al., 2017).

On the other hand, unexpectedly, we found that the EMO group had higher levels of social well-being than the SR group. This finding was in contrast with the Lu et al. (2017) study that found the EMO group had lower emotional well-being than the SR group. There are at least two plausible explanations. First, the baseline social wellbeing and emotional wellbeing score was higher in the EMO condition; although we examined the group effect after controlling for the baseline data, it is still possible that those who have a higher quality of life to begin with may benefit more from expressive writing. Second, these divergent findings might be explained by sample differences, such as time since diagnosis. In the Lu et al. (2017) study, the average time since diagnosis was 19 months. In contrast, in the present study, the average time since diagnosis was 3.6 months and most participants were newly diagnosed and were receiving radiotherapy or chemotherapy. One study in mainland China found that women newly diagnosed with breast cancer used more catastrophizing and less positive reappraisal compared to healthy women (Li et al., 2015). It is possible that newly diagnosed patients have a lot of emotional trauma and can benefit from emotional disclosure; however, they may not be ready to switch topics from a traumatic experience to a positive one as the SR condition asked of them. This explanation is in line with a previous study showing that the writing condition switching from disclosing trauma to benefit finding did not yield as much benefit as the conditions that focused on either trauma disclosure or benefit finding alone (King & Miner, 2000). Stanton et al. (2002) also discusses that whether benefit finding writing is helpful or not depends on the trajectory of the breast cancer experience. Writing instructions to promote finding benefits shortly after diagnosis or in the midst of treatment might have been much more difficult for women to perform effectively (Stanton et al.,

2002). However, finding benefits in another expressive writing study with mainland Chinese breast cancer survivors undergoing treatment did deliver benefits (Lu et al., 2019). Together, these findings suggest that benefit finding could be beneficial; however, future studies need to examine how and when to switch writing topics from emotional disclosure to benefit finding during treatment in order to exceed the benefits of emotional disclosure alone. In summary, the inconsistent results regarding differences between EMO and SR between the current study and the Lu et al. (2017) study might be explained by baseline differences in QOL in the current study or sample differences in the time since diagnosis between the two samples. This study highlights the importance of further investigating the expressive writing paradigm among cancer patients in different survivorship stages.

Study limitations

Limitations of the present study deserve mention. First, one limitation was a primary reliance on participant self-report; however, questionnaire measures were psychometrically sound and empirically validated. Second, the participants in the present study were newly diagnosed mainland Chinese breast cancer patients receiving cancer treatment. Generalizability of our findings to long-term survivors, other cultural groups, and individuals with other types of medical illnesses may not be warranted. Third, due to the small sample sizes for each condition, the study was more hypothesis generating than testing. Future studies are warranted with larger sample sizes to replicate the findings. Finally, previous expressive writing studies with cancer survivors suggest that studies with a no-writing control condition are more likely to find benefits of writing (Gellaitry et al., 2010; Henry et al., 2010). It is possible that the benefits of this study might have been smaller if the control condition was a writing condition as people may expect benefits from writing.

Clinical implications and conclusions

The current study was one of the first expressive writing studies with a neutral control condition conducted among mainland Chinese breast cancer patients. We found that mainland Chinese breast cancer patients in SR, EMO, and CTL conditions reported higher levels of quality of life than those in the neutral control condition at the 6-month follow-up, suggesting potential health benefits of expressive writing. Furthermore, our findings suggest that mainland Chinese breast cancer patients shortly after diagnosis tend to benefit more from cancer-facts writing and emotional disclosure rather than self-regulation. This result contrasts with previous studies conducted in Western countries and suggest that the benefits of expressive writing vary as a function of

sample characteristics, such as cancer survivorship stage and culture. Thus, cultural adaptation and evaluation is critical for applying validated psychosocial interventions to new populations.

Compliance with ethical standards

Conflict of interest Li-li Ji, Qian Lu, Li-juan Wang, Xiang-lian Sun, Hui-dong Wang, Bing-xue Han, Yu-feng Ma and Guo-hua Lu declare that they have no conflict of interest.

Human and animal rights and Informed Consent All procedures followed were in accordance with ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

References

Burton, C. M., & King, L. A. (2008). Effects of (very) brief writing on health: the two-minute miracle. *British Journal of Health Psychology, 13,* 9–14. https://doi.org/10.1348/135910707x250910

Chang, J. (2014). The interplay between collectivism and social support processes among Asian and Latino American College students. *Asian American Journal of Psychology, 6,* 4–14.

Creswell, J. D., Lam, S., Stanton, A. L., Taylor, S. E., Bower, J. E., & Sherman, D. K. (2007). Does self-affirmation, cognitive processing, or discovery of meaning explain cancer-related health benefits of expressive writing? *Personality and Social Psychology Bulletin, 33,* 238–250. https://doi.org/10.1177/0146167206294412

Fan, L., Strasserweippl, K., Li, J. J., St, L. J., Finkelstein, D. M., Yu, K. D., et al. (2014). Breast cancer in China. *Lancet Oncology, 15,* e279–e289.

Ferlay, J., Soerjomataram, I., Dikshit, R., Eser, S., Mathers, C., Rebelo, M., et al. (2015). Cancer incidence and mortality worldwide: Sources, methods and major patterns in GLOBOCAN 2012. *International Journal of Cancer, 136,* E359–386. https://doi.org/10.1002/ijc.29210

Freud, S. (1954). *The origins of psychoanalysis*. New York: Basic Books.

Gao, R., Hao, B., Li, H., Gao, Y., & Zhu, T. (2013). Developing simplified chinese psychological linguistic analysis dictionary for microblog. In *Brain and health informatics* (pp 359–368).

Gellaitry, G., Peters, K., Bloomfield, D., & Horne, R. (2010). Narrowing the gap: the effects of an expressive writing intervention on perceptions of actual and ideal emotional support in women who have completed treatment for early stage breast cancer. *Psycho-oncology, 19,* 77–84.

Henry, E. A., Schlegel, R. J., Talley, A., & Molix, L. A. (2010). The feasibility and effectiveness of expressive writing for rural and urban breast cancer survivors. *Oncology Nursing Forum, 37,* 749–757.

Ji, L., Tsai, W., Sun, X., Lu, Q., Wang, H., Wang, L., et al. (2019). The detrimental effects of ambivalence over emotional expression on well-being among Mainland Chinese breast cancer patients: Mediating role of perceived social support. *Psycho-oncology, 28,* 1142–1148.

King, L. A., & Miner, K. (2000). Writing about the perceived benefits of traumatic events: Implications for physical health. *Personality and Social Psychology Bulletin, 26,* 220–230.

Knowles, E. D., Wearing, J. R., & Campos, B. (2011). Culture and the health benefits of expressive writing. *Social Psychological and Personality Science, 2,* 408–415.

Lepore, S. J., Greenberg, M. A., Bruno, M., & Smyth, J. M. (2002). Expressive writing and health: Self-regulation of emotion-related experience, physiology, and behavior. In S. J. Lepore & J. M. Smyth (Eds.), *The writing cure: How expressive writing promotes health and emotional well-being* (pp. 99–117). Washington, DC: American Psychological Association.

Li, B. (2016). Ethical review of biomedical research involving human beings. Retrieved from http://www.gov.cn/gongbao/content/2017/content_5227817.htm

Li, L., Zhu, X., Yang, Y., He, J., Yi, J., Wang, Y., et al. (2015). Cognitive emotion regulation: Characteristics and effect on quality of life in women with breast cancer. *Health and Quality of Life Outcomes, 13,* 51.

Lu, Q., Dong, L., Wu, I. H. C., You, J., Huang, J., & Hu, Y. (2019). The impact of an expressive writing intervention on quality of life among Chinese breast cancer patients undergoing chemotherapy. *Supportive Care in Cancer, 27,* 165–173.

Lu, Q., Gallagher, M. W., Loh, A., & Young, L. (2018). Expressive writing intervention improves quality of life among Chinese-American breast cancer survivors: A randomized controlled trial. *Annals of Behavioral Medicine, 52,* 952–962.

Lu, Q., & Stanton, A. L. (2010). How benefits of expressive writing vary as a function of writing instructions, ethnicity and ambivalence over emotional expression. *Psychol Health, 25,* 669–684.

Lu, Q., Wong, C. C., Gallagher, M. W., Tou, R. Y., Young, L., & Loh, A. (2017). Expressive writing among Chinese American breast cancer survivors: A randomized controlled trial. *Health Psychology, 36,* 370–379. https://doi.org/10.1037/hea0000449

Lu, Q., You, J., Kavanagh, A., Warmoth, K., Meng, Z., Chen, Z., et al. (2016). Differences in quality of life between American and Chinese breast cancer survivors. *Supportive Care in Cancer, 24,* 1–8.

Lu, Q., Zheng, D., Young, L., Kagawa-Singer, M., & Loh, A. (2012). A pilot study of expressive writing intervention among Chinese-speaking breast cancer survivors. *Health Psychology, 31,* 548–551. https://doi.org/10.1037/a0026834

Papadopoulos, I., Guo, F., Lees, S., & Ridge, M. (2010). An exploration of the meanings and experiences of cancer of Chinese people living and working in London. *European Journal of Cancer Care, 16,* 424–432.

Pennebaker, J. W. (1993). Putting stress into words: Health, linguistic, and therapeutic implications. *Behaviour Research and Therapy, 31,* 539–548.

Pennebaker, J. W., & Beall, S. K. (1986). Confronting a traumatic event: Toward an understanding of inhibition and disease. *Journal of Abnormal Psychology, 95,* 274–281.

Petrie, K. J., Booth, R. J., Pennebaker, J. W., Davison, K. P., & Thomas, M. G. (1995). Disclosure of trauma and immune response to a hepatitis B vaccination program. *Journal of Consulting and Clinical Psychology, 63,* 787–792.

Richards, J. M., Beal, W. E., Seagal, J. D., & Pennebaker, J. W. (2000). Effects of disclosure of traumatic events on illness behavior among psychiatric prison inmates. *Journal of Abnormal Psychology, 109,* 156.

Sloan, D. M., & Marx, B. P. (2004). A closer examination of the structured written disclosure procedure. *Journal of

Consulting and Clinical Psychology, 72, 165–175. https://doi.org/10.1037/0022-006x.72.2.165

So, W. K., Marsh, G., Ling, W. M., Leung, F. Y., Lo, J. C., Yeung, M., et al. (2010). Anxiety, depression and quality of life among Chinese breast cancer patients during adjuvant therapy. *European Journal of Oncology Nursing, 14,* 17–22. https://doi.org/10.1016/j.ejon.2009.07.005

Stanton, A. L., Danoff-Burg, S., Cameron, C. L., Bishop, M., Collins, C. A., Kirk, S. B., et al. (2000). Emotionally expressive coping predicts psychological and physical adjustment to breast cancer. *Journal of Consulting and Clinical Psychology, 68,* 875–882.

Stanton, A. L., Danoff-Burg, S., Sworowski, L. A., Collins, C. A., Branstetter, A. D., Rodriguez-Hanley, A., et al. (2002). Randomized, controlled trial of written emotional expression and benefit finding in breast cancer patients. *Journal of Clinical Oncology, 20,* 4160–4168. https://doi.org/10.1200/jco.2002.08.521

Wan, C., Zhang, D., Yang, Z., Tu, X., Tang, W., Feng, C., et al. (2007). Validation of the simplified Chinese version of the FACT-B for measuring quality of life for patients with breast cancer. *Breast Cancer Research and Treatment, 106,* 413.

Wu, D. Y. H., & Tseng, W. S. (1985). *Introduction: the characteristics of chinese culture*. Amsterdam: Elsevier Inc.

Zachariae, R., & O'Toole, M. S. (2015). The effect of expressive writing intervention on psychological and physical health outcomes in cancer patients–a systematic review and meta-analysis. *Psychooncology, 24,* 1349–1359.

Zakowski, S. G., Ramati, A., Morton, C., Johnson, P., & Flanigan, R. (2004). Written emotional disclosure buffers the effects of social constraints on distress among cancer patients. *Health Psychology, 23,* 555–563. https://doi.org/10.1037/0278-6133.23.6.555

Zhao, N., Jiao, D., Bai, S., & Zhu, T. (2016). Evaluating the validity of simplified chinese version of LIWC in detecting psychological expressions in short texts on social network services. *PLoS ONE, 11,* e0157947.

Zhou, C., Wu, Y., An, S., & Li, X. (2015). Effect of expressive writing intervention on health outcomes in breast cancer patients: A systematic review and meta-analysis of randomized controlled trials. *PLoS ONE, 10,* e0131802. https://doi.org/10.1371/journal.pone.0131802