



The effects of yoga and self-esteem on menopausal symptoms and quality of life in breast cancer survivors—A secondary analysis of a randomized controlled trial

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ABSTRACT

Objectives: Previous research has found that yoga can enhance quality of life and ease menopausal symptoms of breast cancer survivors. The study examined whether self-esteem mediated the effects of yoga on quality of life, fatigue and menopausal symptoms, utilizing validated outcome measures.

Study design: This is a secondary analysis of a randomized controlled trial comparing the effects of yoga with those of usual care in 40 breast cancer survivors who suffered from menopausal symptoms. All participants completed all 3 assessments (week 0, week 12, and week 24) and provided full data.

Main outcome measures: Outcomes were measured using self-rating instruments. Mediation analyses were performed using SPSS.

Results: Self-esteem mediated the effect of yoga on total menopausal symptoms ($B = -2.11$, 95% BCI $[-5.40$ to $-0.37]$), psychological menopausal symptoms ($B = -0.94$, 95% BCI $[-2.30$ to $-0.01]$), and urogenital menopausal symptoms ($B = -0.66$, 95% BCI $[-1.65$ to $-0.15]$), quality of life ($B = 8.04$, 95% BCI $[3.15-17.03]$), social well-being ($B = 1.80$, 95% BCI $[0.54-4.21]$), emotional well-being ($B = 1.62$, 95% BCI $[0.70-3.34]$), functional well-being ($B = 1.84$, 95% BCI $[0.59-4.13]$), and fatigue ($B = 4.34$, 95% BCI $[1.28-9.55]$). Self-esteem had no effect on somatovegetative menopausal symptoms ($B = -0.50$, 95% BCI n.s.) or on physical well-being ($B = 0.79$, 95% BCI n.s.).

Conclusions: Findings support the assumption that self-esteem plays a vital role in the beneficial effect of yoga and that yoga can have long-term benefits for women diagnosed with breast cancer and undergoing menopausal transition.

1. Introduction

Breast cancer is the most frequently diagnosed cancer in women worldwide. Treatment advances have led to improved survival rates and more women reaching menopause [1]. Climacteric symptoms tend to be more intense in breast cancer survivors, especially in those taking aromatase inhibitors [2,3]. As estrogen-based treatments are usually contraindicated, there is a need for alternative strategies.

Yoga can serve as one such alternative or complementary intervention for menopausal complaints. It has a positive effect on breast cancer patients in general and also on breast cancer survivors undergoing

menopausal transition in particular [4,5]. It can influence somatovegetative, psychological, and urogenital menopausal symptoms as well as fatigue, quality of life, and menopausal symptoms in general [6]. Therefore, treatment of menopausal symptoms with yoga is evidence based. However, the mechanisms of action remain unclear.

One explanation for those mechanisms involves the psychological aspects of menopause management. Self-esteem for example refers to the way we evaluate ourselves. Women with higher self-esteem are more resilient to stress and possess more resources to cope with demands [7,8]. Reduced self-esteem might put survivors at a higher risk of negative outcomes like depression or negative health in general

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and reduced quality of life [9,10]. At the menopausal transition women often report loss of self-esteem and there seems to be a linear association between high self-esteem and fewer menopausal symptoms [9]. Therefore it is valuable to strengthen women's self-esteem in order to diminish any negative consequences of the menopausal transition. Research has demonstrated that physical activity, including yoga, positively influences self-esteem in menopausal women, even in the long run [11,12]. This process may account for the mechanisms through which yoga alleviates menopausal symptoms: yoga enhances self-esteem and self-esteem, in turn, decreases menopausal symptoms and fatigue, and increases quality of life.

Therefore, we hypothesized that the beneficial effect of yoga on menopausal symptoms in general, and more specifically somatovegetative, psychological, and urogenital menopausal symptoms as well as fatigue and quality of life, is mediated by self-esteem. To test this assumption, we performed a secondary analysis of data from a randomized controlled trial that compared the effects of yoga with those of usual care in 40 breast cancer survivors who suffered from menopausal symptoms.

2. Methods

2.1. Design

This is a secondary mediator analysis based on an open-label, randomized controlled clinical trial that has been published previously [6]. It was conducted at the Department of Gynecology Certified Breast Center at Malteser Hospital St. Anna (Duisburg, Germany) and approved by the Ethics Committee of the University of Duisburg-Essen (approval number 13-5421-BO).

2.2. Participants

Participants were recruited from the Department of Gynecology Certified Breast Center at Malteser Hospital St. Anna by the study physician. To be included, women had to be aged 30–65 years, to have been treated for nonmetastatic breast cancer (International Union Against Cancer stages I–III) and to have completed surgical (breast-conserving surgery, mastectomy, simultaneous breast reconstruction), radiotherapeutic, and/or chemotherapeutic treatment. Women had to suffer from at least mild menopausal symptoms, indicated by a score of at least 5 on the Menopause Rating Scale (MRS). Physical inability to do yoga, regular yoga practice within the last year, psychosis, participation or planned participation in other clinical trials, (planned) surgical interventions during the previous three months, and (planned) hormone-replacement therapy were exclusion criteria. If women were on a stable dose of antiestrogen medication, nonhormonal treatment, or antidepressant medication, they were not excluded from the trial.

2.3. Randomization

Women were randomly allocated either to yoga and meditation or to usual care. They were stratified by the intake of antiestrogen medication during the study period (two strata: no intake and intake) by block randomization with randomly varying block lengths. A biometrician who was not involved in patient recruitment or assessment was in charge used Random Allocation Software [13] for randomization and secured the randomization list with a password. Sealed, sequentially numbered envelopes containing the treatment assignments were prepared by the biometrician and opened after written informed consent – in the form of a prepared consent form that had to be signed by the patient – had been obtained and baseline assessment had been done, beginning with the lowest number.

2.4. Interventions

2.4.1. Yoga and meditation

The yoga group received weekly traditional Hatha yoga sessions that included meditation. Those yoga sessions were 90 min long and based on the teachings of Sivananda Saraswati [14]. Yoga took place over a period of 3 months. The meditation was derived from the Karma Kagyu school of Tibetan Buddhism according to Lama Ole Nydahl. A certified Hatha yoga instructor led the classes. She also was a direct student of Lama Ole Nydahl. Each class started with the corpse pose and was followed by breathing techniques and a series of sun salutations (a flowing sequence of yoga postures). Afterwards a couple of yoga postures and/or meditation practices were performed. Not all practices were included in each class. Practices were adapted to the women's possibilities and needs. Classes ended with guided relaxation in the corpse pose. 5–10 min of lectures on yoga (yogic theories on the physiological and psychological effects of the postures, breathing techniques, and meditation and on the nature of the mind) and/or Buddhist philosophy (Buddhist theories on cause and effect and on negative emotions) complemented the classes. Participants were encouraged to practice daily at home, although no minimum practice time was required. Women were introduced to all exercises before home practice, in class.

2.4.2. Usual care

Participants in the usual care group did not participate in any study intervention for the first 24 weeks of the trial. After 24 weeks they were offered the same yoga classes as the intervention group.

2.5. Measures

All measures in their German versions were captured at three time points: week 0, 12, and 24.

2.5.1. Self-esteem

Self-esteem was measured using the SES scale from Rosenberg [15]. It includes ten items that can be answered on a four-point scale, ranging from *strongly agree* to *strongly disagree*; an example item is "On the whole, I am satisfied with myself". For mediation analyses, self-esteem at week 12 was used.

2.5.2. Menopausal symptoms

Menopausal symptoms were assessed as *total symptoms*, *somatovegetative symptoms*, *psychological symptoms*, and *urogenital symptoms* using the Menopause Rating Scale score (MRS) [16,17]. Higher scores indicate more severe symptoms. For mediation analyses, menopausal symptoms at week 24 were used. Total menopausal symptoms was the primary outcome.

2.5.3. Breast cancer specific quality of life

We evaluated breast cancer specific quality of life using the Functional Assessment of Cancer Therapy-Breast (FACT-B) [18], which evaluates overall quality of life, physical well-being, social well-being, emotional well-being, and functional well-being. Higher scores indicate better quality of life. For mediation analyses, breast cancer specific quality of life at week 24 was used.

2.5.4. Fatigue

Fatigue was assessed using the Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F) [19]. Higher scores indicate less fatigue. For mediation analyses, fatigue at week 24 was used.

All adverse events that occurred during the study period were recorded.

2.6. Sample size calculation and statistical analysis

A sample size calculation was made a priori. As a cutoff value to evaluate the efficacy of a treatment for menopausal symptoms compared with no specific treatment, a group difference of 7 points on the MRS total score is suggested. Assuming a standard deviation of 7.1, a 2-sided, level 5% *t*-test requires 36 participants to detect a 7-point difference between groups with a statistical power of 80% [20]. Accounting for a maximum of 10% dropouts, we planned to include 40 patients.

The analyses were conducted on all patients who participated in the study ($N = 40$). To estimate baseline differences in self-esteem, paired *t*-tests were conducted. Mediation analyses were performed following the procedure recommended by Hayes [21], using the “Process” macro for SPSS. Bootstrapping drawing 1000 samples and 95% confidence intervals (CI) were applied. All analyses were performed using the Statistical Package for Social Sciences software (IBM SPSS Statistics for Windows, release 22.0; IBM Corporation, Armonk, NY).

3. Results

40 women were enrolled in the study after they provided informed consent (see Fig. 1 for participant flow diagram and Table 1 for a brief overview of the participants’ demographic characteristics; for a detailed sample description see the previous report [6]). Every woman completed all 3 assessments and provided full data. Hence there was no missing data. Mean age (standard deviation) was 49.2 ± 5.9 years, and the mean time since surgery was 28.1 ± 18.3 months. Most women currently received antiestrogen medication (90%). No woman used antidepressant medication or made use of any nonhormonal treatment for her menopausal symptoms. There were no baseline differences between the two groups.

Women in the yoga group attended a mean of 9.7 ± 2.3 (80.8%) yoga classes and practiced at home for 35.3 ± 27.9 min per week. Correlations between study variables are shown in Table 2.

Mediation analyses showed that self-esteem mediated the effect between yoga and eight out of ten relevant outcomes (see Table 3): total menopausal symptoms, psychological menopausal symptoms, and urogenital menopausal symptoms, quality of life, social well-being, emotional well-being, functional well-being, and fatigue. The effects on physical well-being, and somatovegetative menopausal symptoms were not mediated by self-esteem. The direct effects of yoga on the different outcomes were not significant (all CI include zero).

There were no serious adverse events.

4. Discussion

The present study examined the mediational effects of self-esteem

for yoga on different menopause-related symptoms in a sample of breast cancer survivors enrolled in a randomized controlled yoga trial. Research has demonstrated that yoga has a positive effect on menopausal symptoms [22,23]. However, the underlying mechanisms remained unclear. This analysis indicates that self-esteem plays a vital role in the effects of yoga on menopause-related outcomes. The effect of yoga on total menopausal symptoms, psychological menopausal symptoms, and urogenital menopausal symptoms, quality of life, social well-being, emotional well-being, functional well-being, and fatigue was mediated by self-esteem. No mediation was found for physical well-being or somatovegetative menopausal symptoms.

Interestingly, when testing for mediations none of the direct effects of yoga on the different outcomes was significant. This indicates a complete mediation of the effects of yoga on the different outcomes by self-esteem, i.e. self-esteem seems to be the main mechanism of action of yoga in alleviating menopausal symptoms in breast cancer survivors. A strong relationship between positive attitude towards oneself and the severity of menopausal symptoms has been found before. Women who are satisfied with their appearance and perceive themselves as attractive have less severe menopausal symptoms than those who do not [24]. Likewise, low self-confidence and low self-esteem are associated with more severe menopausal symptoms [9,25]. It has been previously shown that yoga can increase self-esteem in female students [26], sedentary adults [27], women with abdominal obesity [28], and breast cancer survivors [29]. Moreover, there are hints that yoga also improves self-esteem in menopausal women without a history of breast cancer [30]. Increases in self-worth during a yoga intervention are associated with decreases in menopausal symptoms [10]. Yoga’s influence on psychological constructs related to self-esteem such as body satisfaction and self-objectification have been discussed as potential mechanisms of yoga’s effects on well-being, especially in women [31]. Given the strong association of self-esteem with menopausal symptoms [9] on the one hand and the effect of yoga on self-esteem [29,30], the pathway shown in this study is appears to be valid.

However, there are additional underlying processes imaginable that need to be evaluated. Besides psychological modes of action like the path involving self-esteem, yoga might also have an impact on biological processes which influence menopause-related outcomes. For example, it has been shown that yoga lowers blood pressure and influences other biological and behavioral cardiovascular risk factors [32–34]. This in turn might affect the degree of vasomotor menopausal symptoms. Furthermore, it might be that yoga positively influences cortisol levels, which in turn increase well-being and quality of life [35], or that yoga inhibits the production of proinflammatory cytokines interleukin-6, which in turn leads to decreased fatigue [36]. Those biological processes were not within the scope of the present study. Further research needs to evaluate other possible mechanisms, taking biological as well as psychological processes into account.

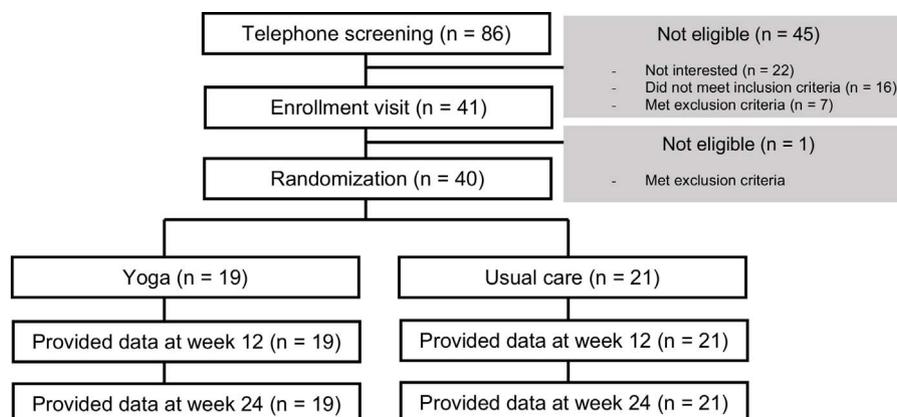


Fig. 1. Participant flow diagram.

Table 1
Demographic characteristics.

	Yoga (n = 19)	Usual Care (n = 21)	Total (n = 40)
Age: mean \pm SD	48.3 \pm 4.8	50.0 \pm 6.7	49.2 \pm 5.9
Height: mean \pm SD, cm	169.9 \pm 7.3	170.2 \pm 5.4	170.1 \pm 6.3
Weight: mean \pm SD, kg	69.8 \pm 11.9	74.3 \pm 17.0	72.2 \pm 17.8
Marital status			
Married	13	17	30
Living together	2	4	6
Single	1	0	1
Divorced	3	0	3
No. of children: mean \pm SD	1.6 \pm 0.9	1.1 \pm 1.2	1.4 \pm 1.1
Education (%)			
No qualification	1 (5.3)	0 (0)	1 (2.5)
Secondary modern school: "Hauptschule" qualification	1 (5.3)	3 (14.3)	4 (10)
High school: "Realschule" qualification	3 (15.8)	8 (38.1)	11 (27.5)
A level: "Abitur"	8 (42.1)	3 (14.3)	11 (27.5)
University degree	5 (26.3)	6 (28.6)	11 (27.5)
Other	1 (5.3)	1 (4.8)	2 (5)
Employment			
Full time	6 (31.6)	6 (28.6)	12 (30)
Part time	10 (52.6)	5 (23.8)	15 (37.5)
Home keeper	1 (5.3)	4 (19)	5 (12.5)
Retired	0 (0)	1 (4.8)	1 (5.3)
Disabled	2 (10.5)	2 (9.5)	4 (10)
Unemployed	0 (0)	3 (14.3)	3 (7.5)
Cancer stage: n (%)			
I	11 (57.9)	12 (57.1)	23 (57.5)
II	7 (36.8)	7 (33.3)	14 (35)
III	1 (5.3)	2 (9.5)	3 (7.5)
Time since diagnosis: mean \pm SD, mo	26.7 14.0	33.6 19.4	30.3 17.2
Time since surgery: Mean \pm SD, mo	24.6 15.1	31.2 20.7	28.1 18.3
Current antihormonal therapy: n (%)			
Yes	17 (89.5)	19 (90.5)	36 (90)
No	2 (10.5)	2 (9.5)	4 (10)
Prior chemotherapy: n (%)			
Yes	13 (68.4)	16 (76.2)	29 (72.5)
No	6 (31.6)	5 (23.8)	11 (27.5)
Prior radiotherapy: n (%)			
Yes	17 (89.5)	19 (90.5)	36 (90)
No	2 (10.5)	2 (9.5)	4 (10)

Note. SD = standard deviation.

The results of this study have to be interpreted in light of some limitations. Due to the nature of the study, no blinding of participants and therapists was possible. Furthermore, there was no long-term follow-up beyond 24 weeks and a selection bias is possible. The small sample size is another limitation.

To conclude, self-esteem may play a vital role within the process of yoga influencing quality of life and menopausal symptoms, but further research is necessary to fully understand the underlying mechanisms.

Table 2
Correlations between study variables.

	1	2	3	4	5	6	7	8	9	10	11	12
1 Group ^a												
2 Self-Esteem ^b	0.01											
3 Self-Esteem ^c	0.43**	0.62***										
4 Total quality of life ^d	0.32*	0.29	0.55***									
5 Physical well-being ^d	0.38*	0.14	0.32*	0.82***								
6 Social well-being ^d	0.25	0.18	.50**	0.65***	0.35*							
7 Emotional well-being ^d	0.25	0.38*	0.55***	0.75***	0.46**	0.36*						
8 Functional well-being ^d	0.19	0.25	0.45**	0.90***	0.76***	0.56***	0.66***					
9 Fatigue ^d	0.31	0.19	0.49**	0.84***	0.86***	0.45**	0.62***	0.81***				
10 Total menopausal symptoms ^d	-0.37*	-0.07	-0.40*	-0.76***	-0.77***	-0.26	-0.60***	-0.74***	-0.80***			
11 Somatovegetative menopausal symptoms ^d	-0.26	-0.01	-0.26	-0.68***	-0.68***	-0.19	-0.51**	-0.65***	-0.72***	0.88***		
12 Psychological menopausal symptoms ^d	-0.34*	-0.06	-0.39*	-0.80***	-0.76***	-0.38*	-0.66***	-0.73***	-0.82***	0.90***	0.75***	
13 Urogenital menopausal symptoms ^d	-0.33*	-0.12	-0.37*	-0.40*	-0.47**	-0.06	-0.33*	-0.46**	-0.46**	0.74***	0.48**	0.48**

Note. N = 40; ^a Yoga = 1, usual care = 0; ^b = time point one; ^c = time point two; ^d = time point three.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3

Results of the mediation analyses: effects of group mediated by self-esteem on the different outcomes.

	<i>B</i>	<i>SD B</i>	95% BCI		
			lower 2,5%	upper 2,5%	
total quality of life	8.04	3.24	3.15	17.03	*
physical well-being	0.79	0.71	-0.15	2.89	n.s.
social well-being	1.80	0.85	0.54	4.21	*
emotional well-being	1.62	0.63	0.70	3.34	*
functional well-being	1.84	0.85	0.59	4.13	*
fatigue	4.34	2.05	1.28	9.55	*
total menopausal symptoms	-2.11	1.25	-5.40	-0.37	*
somatovegetative menopausal symptoms	-0.50	0.56	-2.06	0.37	n.s.
psychological menopausal symptoms	-0.94	0.61	-2.30	-0.01	*
urogenital menopausal symptoms	-0.66	0.38	-1.65	-0.15	*

Note. *N* = 40; BCI = bootstrapping confidence interval; if the confidence interval does not include zero, the effect is significant; *B* = mean of unstandardized estimators of 1000 bootstrapping samples; *SD B* = standard deviation of *B*; Yoga was coded as “1” and usual care as “0”, therefore a positive, significant *B*-value indicates a mediation effect between yoga and outcomes.

Contributors

AKK, lead author, analyzed and interpreted the data.

SR, co-author, conceived, designed, and performed the experiments.

RL, co-author, conceived, designed, and performed the experiments.

SK, co-author, conceived, designed, and performed the experiments.

GD, co-author, conceived and designed the experiments.

JL, co-author, conceived and designed the experiments.

HC, co-author, conceived, designed, and performed the experiments.

Conflict of interest

The authors declare that they have no conflict of interest.

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Ethical approval

This is a secondary analysis of results from a clinical trial conducted at the Department of Gynecology Certified Breast Center at Malteser Hospital St. Anna (Duisburg, Germany) and approved by the Ethics Committee of the University of Duisburg-Essen (approval number 13–5421-BO).

Provenance and peer review

This article has undergone peer review.

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