SOMATOSENSORY AMPLIFICATION AND MENOPAUSAL SYMPTOMS IN BREAST CANCER SURVIVORS AND MIDLIFE WOMEN

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Abstract

OBJECTIVES—Somatosensory amplification is the experience of sensing everyday bodily sensations as intense, agitating, and unpleasant. Using data from menopausal breast cancer survivors and midlife women without cancer, the study purposes were to (1) explore the psychometric properties of the Somatosensory Amplification Scale and (2) to describe somatosensory amplification and its relationship to menopausal symptoms of hot flashes, mood and sleep disturbance.

STUDY DESIGN—This was a cross-sectional, descriptive, correlational study using demographic, e-diary, and questionnaire data from 99 breast cancer survivors and 138 midlife women.

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	Securing funding for the work	Data collection	Data management and analysis	Paper conceptualization	Writing	Editing
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MAIN OUTCOME MEASURES—Somatosensory amplification, hot flashes (frequency, severity, bother, interference, perceived control), mood, and sleep.

RESULTS—Cronbach's alphas for the scale were low. When an 8-item version of the scale was evaluated, alphas improved and item-total correlations remained strong or improved. Midlife women and breast cancer survivors did not have significantly different somatosensory amplification total or item scores after adjusting for group differences in demographics. Somatosensory amplification was significantly correlated with hot flash interference, perceived control over hot flashes, and mood and sleep disturbance in both groups but the patterns of correlations differed slightly between groups and depending on whether the 10-item or 8-item scale was used.

CONCLUSION—Somatosensory amplification may be a relevant concept to assess in relation to the menopausal symptom experience of midlife women with and without breast cancer as it may represent a potential intervention target to improve the menopausal symptom experience.

Keywords

INTRODUCTION

Somatosensory amplification refers to the ability to perceive every day or normal bodily sensations at a more intense, agitating, and unpleasant level [1]. Somatosensory amplification is sometimes referred to as "amplification". Greater understanding of somatosensory amplification and menopausal symptoms could provide a better understanding of women's symptom experiences. Other studies have linked somatosensory amplification to symptoms in individuals with upper respiratory infections and migraines [2], as well as overall health worries [3]. Because breast cancer survivors are known to be more symptomatic at menopause than midlife menopausal women [4], understanding differences in somatosensory amplification between these two groups could lead to a new avenue for intervention research.

To the best of our knowledge, there is no published research exploring somatosensory amplification in relation to menopausal symptoms. Using the PubMed search engine, a literature search was conducted to identify articles on somatosensory amplification and menopausal symptoms. The goal was to find English language, human subjects, original research studies. Search phrases were (1) (somatosensory amplification) and (menopause or hot flashes or sleep) and 2) (somatosensory amplification) and (menopause and mood). The first search phrase produced 2 results, neither of which was relevant. The second search phrase produced no articles. These search results indicated that somatosensory amplification had not been previously studied in menopausal women, suggesting the need to explore the psychometric properties of the Somatosensory Amplification Scale (SSAS) in this population and explore relationships between this concept and menopausal symptoms.

Therefore, using data from menopausal breast cancer survivors and midlife women without cancer, the study purposes were to (a) explore the psychometric properties of the

Somatosensory Amplification Scale and (b) to describe somatosensory amplification and its relationship to menopausal symptoms of hot flashes, mood and sleep disturbance. We explored Cronbach's alpha and item-total correlations as measures of internal consistency reliability, group differences in somatosensory amplification, and relationships between somatosensory amplification and menopausal symptoms.

METHODS

This was a cross-sectional, descriptive, correlational study. Data used was from information collected at baseline of a larger hot flash intervention study. All study procedures were approved by an Institutional Review Board and the cancer center's Scientific Review Committee. The study population included 99 breast cancer survivors and 138 midlife women without cancer [5]. Participants were recruited from the breast cancer and high risk clinics at a Midwestern National Cancer Institute-designated cancer center and from the community using mass mailings of brochures and flyers, website and newsletter advertisements, and word of mouth. Eligible and interested women provided written informed consent, written approval to use health information, and completed a packet of questionnaires at baseline before being randomized in the intervention study. Data from all women who completed baseline questionnaires are used here for this analysis.

Demographics were assessed using a questionnaire. Questions were both personal characteristics (e.g., age, race, marital status) and medical information (e.g., comorbidities, use of hot flash treatments).

The 10-item Somatosensory Amplification Scale includes a 5-item Likert-type response scale for participants to indicate the degree they are bothered by different somatic and visceral sensations [6]. A higher total score suggests greater symptom amplification with the scores ranging between 10 and 50.

An electronic hot flash diary was used to collect real-time, prospective ratings of hot flash frequency, severity and bother. Women carried a small monitor in a waist pack and pressed buttons on the monitor each time they had a hot flash. Severity and bother of each hot flash was rated by pressing the buttons and using a 0 (not at all) to 10 (extremely) scale. Women wore the monitor for a minimum of 24-hours and a maximum of 7-days based on their personal preference. Twenty-four hour average hot flash frequency, severity, and bother were calculated.

The 10-item Hot Flash Related Daily Interference Scale [7] was used to assess hot flash interference or disruption. Participants rated each of the items using a 0 to 10 numeric rating scale. Scores range from 0 to 100 with higher scores indicating greater interference.

The Perceived Control over Hot Flashes Index (PCI) is a 15-item questionnaire (e.g., If I do all the right things, I can successfully manage hot flush symptoms) that uses a 4-point Likert scale (ranging from 'strongly disagree' to 'strongly agree') [8]. Higher total scores convey more perceived control over hot flashes.

The 37-item Profile of Mood States (POMS) questionnaire is a psychological self-report assessment using a 5-point Likert scale that measures affective mood states [9]. It yields a total mood disturbance score as well as 6 sub-scores with higher scores signifying greater mood disturbance on all except vigor/activity. The subscales are tension/anxiety, anger/hostility, fatigue/inertia, depression/dejection, vigor/activity and confusion/bewilderment.

The Pittsburgh Sleep Quality Index (PSQI) is a self-rated questionnaire that evaluates sleep quality and patterns over the past month [10]. Nineteen items generate seven subscale scores: sleep quality, sleep latency, sleep duration, sleep disturbance, sleep medication, daytime sleep and sleep efficiency. These seven scores are used to distinguish good sleep from poor sleep and the total of these subscales produces one global score. A global sum of 5 or greater signifies a poor sleeper.

Descriptive statistics (means, standard deviations, frequencies, percentages) were used to describe demographic characteristics in each group. Cronbach's alpha coefficients item-total Pearson correlations for the SSAS were calculated in each group. Cronbach's alpha is a measure of internal consistency reliability, or a measure of how similar the scale items are to one another. Alpha ranges from 0 to 1.00 with >.70 generally seen as an acceptable cutoff for a new scale and >.80 acceptable for an existing scale. Between group comparisons on demographics and baseline measures were done using t-tests and chi-squared analyses. Pearson correlations were used to evaluate relationships between item and total scores in both groups. An analysis of covariance was done to compare somatosensory amplification between groups controlling for baseline demographic differences. Spearman correlations were used to evaluate relationships between total scores and menopausal symptom variables because of the skewed distribution of the latter. Because this was a correlative study from a larger clinical trial [5] and because no formal hypotheses were stipulated for this descriptive analysis, no corresponding sample size justification was made related to these outcomes in the original clinical trial protocol. Given the descriptive/exploratory nature of our analyses, our moderately large sample size seemed appropriate to address our purpose.

RESULTS

Sample Characteristics

As shown in Table 1, there were no group differences in ethnicity, employment status, menopausal status, age, body mass index, or years of education. However, compared to midlife women, breast cancer survivors were more likely to be White, married, have less difficulty paying for basics, less likely to be smokers, more likely to be using a hot flash treatment, more likely to be taking Tamoxifen/aromatase inhibitor (both of which cause hot flashes) and using more medications in general. Breast cancer survivors were a mean of 7.57 years post diagnosis (SD = 7.61).

There were no differences between groups in hot flash frequency, severity, bother, interference, perceived control over hot flashes or sleep (p > .05). Total mood disturbance was significantly higher in the midlife women than in the breast cancer survivors (p < 0.05).

SSAS Psychometrics

When using the full 10-item scale, Cronbach's alpha coefficient was sub-optimal in both groups (0.66 breast cancer group, 0.68 midlife women group) and item-total correlations ranged from 0.270 to 0.610 in the breast cancer group and 0.365 to 0.615 in the midlife women (Table 2). Based on these results, we removed the items most poorly correlated with total scores in both groups: item #1 "I can't stand smoke, smog, or pollutants in the air" and item #3 "When I bruise myself, it stays noticeable for a long time". Removal of these two items resulted in slightly improved alphas (0.70 both groups). For the 8-item scale, most item-total correlations improved ranging from 0.441 to 0.660 in the breast cancer group and 0.447 to 0.644 in the menopausal women (Table 2). For consistency with other studies and accounting for the psychometric instability, we present findings for both the full 10-item original SSAS and the modified 8-item SSAS.

Group Differences in Somatosensory Amplification

Group differences in SSAS total scores and SSAS items are shown in Table 3. Although there was a tendency for total and items scores to be higher in midlife women, group differences were not statistically significant after adjusting for covariates. Findings held for both the 10-item and 8-item versions of the scale. Thus, both groups appeared to have the same level of somatosensory amplification.

Correlations Between Somatosensory Amplification and Menopausal Symptoms

The 10-item SSAS total scores were significantly related to hot flash interference and perceived control (Table 4). In both groups, greater somatosensory amplification was associated with greater hot flash interference and less perceived control over hot flashes. Somatosensory amplification was also related to mood in both groups, though the pattern of correlations differed slightly (Table 4). In breast cancer survivors and midlife women, higher somatosensory amplification was related to increased tension/anxiety, fatigue/inertia/depression/dejection, and confusion/bewilderment. However, higher somatosensory amplification was related to greater anger/hostility only among the menopausal women. In addition, greater somatosensory amplification was related to poorer sleep (Table 4). In both breast cancer survivors and menopausal women, low sleep quality, higher sleep disturbances and increased daytime sleepiness were significantly related to a higher somatosensory awareness. In breast cancer survivors only, greater amplification was significantly related to longer sleep duration. Results for the 8-item SSAS total scores followed a similar pattern with only a few exceptions. In the breast cancer group, the 8-item SSAS showed no relationship to perceived hot flash control and a negative relationship with vigor/activity.

CONCLUSIONS

The findings in this study offer a new understanding concerning the concept of somatosensory amplification and the role it plays in the hot flash, mood and sleep experience of healthy menopausal women and menopausal women with a history of breast cancer. No difference was found in the SSAS total and individual item total between the two groups. This indicates that somatosensory amplification affects menopausal women at a similarly steady level regardless of exposure to breast cancer diagnosis and treatment. The

effect of somatosensory amplification on hot flash experience appears to be one that can be generalized across women. Both groups reported comparable levels of hot flash severity, frequency, and bother as well as mood and sleep disturbance in contrast to prior studies showing a more severe symptom experience in cancer survivors. [4, 11] This similarity may have (a) been due to the fact that all were seeking treatment in this intervention study and (b) contributed to the lack of group differences in somatosensory amplification.

Somatosensory amplification was related to hot flash interference and perceived control but not with other hot flash variables. It is important to note that the hot flash variables that had no correlation with somatosensory amplification were variables that were measured in real-time using the electronic diary while the other variables were assessed over the past week or two weeks using standardized questionnaires. This may indicate the necessity to look further into women's personal interpretation of their hot flash experience and to seek out methods may positively alter that interpretation. This finding also seems to point to the need for interventions that focus more on the perception of hot flashes instead of on trying to diminish the symptom itself.

Higher sleep and mood disturbance scores were both found to be significantly related to a higher somatosensory amplification for breast cancer survivors and midlife women. These outcomes are consistent with the results found in the literature review that link poor sleep with mood disturbance in the overall menopausal experience [12]. An individual who has a heightened somatosensory awareness could possibly perceive poor sleep and mood disturbance as more distressing than the average individual, though this was not directly studied here.

Limitations of this study included the following. The Cronbach's alpha calculated for the SSAS was low (alpha= 0.66). Improved alphas were seen with a shorter version of the scale but they were still considered low for an established scale (alpha = 0.70). It is possible that the SSAS is not a reliable tool to use to measure the tendency to amplify somatic symptoms. Data used in this analysis were cross-sectional and therefore do not provide information about whether or how these relationships might change over time. The sample had a relatively high percentage of Caucasian women. There were more women without cancer available for the analysis than women with breast cancer.

The results of this study suggest that future menopausal symptom management interventions for midlife women could focus on altering somatosensory amplification. Assisting women to change how they sense and interpret their menopausal symptoms may help women decrease hot flash interference and mood and sleep disruption and may also help increase a woman's perceived control over hot flashes. Focusing interventions on decreasing somatosensory awareness may have a successful effect on increasing the perception of sleep quality.

Acknowledgments

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Julie L. Otte, PhD, RN				X	X	X
Debra S. Burns, PhD, MT-BC	X	X	X	X	X	X
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Jingwei Wu, MS	X	X	X	X	X	x

Table 1

Group Differences in Demographics and Menopausal Symptoms

	BCS % (n)	MW % (n)	P
Ethnicity			0.642
Latina	1 (1)	2 (3)	
Non-Latina	99 (98)	98 (135)	
Race			<.001
White/Caucasian	86 (85)	57 (78)	
Other	14 (14)	43 (60)	
Marital			<.001
Married / living with partner	75 (74)	53 (73)	
Single, widowed	20 (20)	4 (5)	
Other	5 (5)	43 (60)	
Employment			0.841
Full time	63 (62)	65 (90)	
Part time	13 (13)	14 (19)	
Not employed	24 (24)	21 (29)	
Difficulty paying for basics			0.024
None	82 (81)	66 (91)	
Some	15 (15)	27 (37)	
A lot 3 (3)		7 (10)	
Smoker			0.393
Never	72 (71)	59 (81)	
Former or current	28 (28)	41 (57)	
Menopausal status			0.088
Early peri / late peri	1 (1)	5 (6)	
Early post	9 (9)	16 (21)	
Late post	90 (85)	79 (102)	
Current use of hot flash treatments			0.031
No	41 (40)	55 (76)	
yes	59 (58)	45 (62)	
Use of SERM			<.001
No, not currently	64 (63)	99 (136)	
Yes, currently	36 (36)	1 (2)	
Use of AI			<.001
No, not currently	75 (74)	100 (138)	
Yes, currently	25 (25)	0 (0)	
	(M, SD)	(M, SD)	p
Age	53.10 (8.10)	52.36 (5.17)	0.388
Body mass index	28.80 (6.02)	30.17 (8.01)	0.136

	BCS % (n)	MW % (n)	P
Years of education	15.22 (2.48)	14.78 (2.13)	0.146
Concurrent medications	2.74 (2.00)	1.96 (1.93)	0.003
Comorbid conditions	2.11 (1.05)	1.46 (1.35)	<.001
Years since last menses	7.57 (7.61)	6.32 (7.00)	0.211
Electronic hot flash diary days	3.82 (3.30)	4.00 (2.65)	0.600
24-hour hot flash frequency	6.94 (4.30)	6.34 (4.39)	0.303
24-hour hot flash severity	2.07 (1.59)	2.08 (1.65)	0.940
24-hour hot flash bother	1.83 (1.49)	1.88 (1.63)	0.818
Total hot flash related daily interference	39.98 (24.61)	45.49 (24.08)	0.091
Perceived control over hot flashes	37.59 (5.05)	37.61 (4.72)	0.9741
POMS total mood disturbance	39.04 (22.48)	45.62 (24.86)	0.0418
PSQI Global sleep	7.84 (3.19)	8.07 (3.68)	0.620

SERM = selective estrogen receptor modulator, AI = aromatase inhibitor

Table 2

SSAS Item-Total Correlations by Group

SSAS Item		10-item SSAS Total		8-item SSAS Total	
		BCS	MW	BCS	MW
1.	I can't stand smoke, smog, or pollutants in the air.	0.452***	0.434***	NA	NA
2.	I am often aware of various things happening within my body.	0.565***	0.500***	0.520***	0.462***
3.	When I bruise myself, it stays noticeable for a long time.	0.270**	0.365***	NA	NA
4.	I sometimes can feel the blood flowing in my body.	0.596***	0.417***	0.591***	0.447***
5.	Sudden loud noises really bother me.	0.425***	0.615***	0.441***	0.581***
6.	I can sometimes hear my pulse or my heartbeat throbbing in my ear.	0.598***	0.518***	0.660***	0.558***
7.	I hate to be too hot or too cold.	0.610***	0.571***	0.601***	0.599***
8.	I am quick to sense the hunger contractions in my stomach.	0.494***	0.559***	0.563***	0.628***
9.	Even something minor, like an insect bite or a splinter really bothers me.	0.519***	0.602***	0.593***	0.644***
10.	I can't stand pain.	0.514***	0.559***	0.601***	0.605***

Breast cancer survivors (BCS) n=99; Midlife women (MW) n=138;

*
p<.05,

**
p<.01,

***
p<.001

NA – item not included in the 8-item total score

Table 3

Differences in SSAS Total Scores and SSAS Items Between Groups

		BCS M (SD)	MW M (SD)	p[a]
10-item total score		26.55 (5.75)	28.41 (6.13)	0.3666
8-item total score[b]		20.20 (5.09)	22.01 (5.29)	0.5056
1.	I can't stand smoke, smog, or pollutants in the air.	3.72 (1.33)	6.62 (1.38)	0.5927
2.	I am often aware of various things happening within my body.	3.64 (1.05)	3.87 (0.97)	0.4005
3.	When I bruise myself, it stays noticeable for a long time.	2.63 (1.30)	2.78 (1.27)	0.0499
4.	I sometimes can feel the blood flowing in my body.	1.58 (0.96)	1.74 (1.12)	0.6795
5.	Sudden loud noises really bother me.	2.24 (1.18)	2.49 (1.20)	0.0572
6.	I can sometimes hear my pulse or my heartbeat throbbing in my ear.	2.26 (1.28)	2.22 (1.35)	0.8373
7.	I hate to be too hot or too cold.	3.84 (1.12)	4.06 (0.99)	0.8178
8.	I am quick to sense the hunger contractions in my stomach.	2.86 (1.23)	3.15 (1.24)	0.6037
9.	Even something minor, like an insect bite or a splinter really bothers me.	1.69 (0.97)	1.95 (1.16)	0.8471
10.	I can't stand pain.	2.10 (1.11)	2.54 (1.28)	0.9044

Breast cancer survivors (BCS) n=98; Midlife women (MW) n=138;

[*]
p<.05,

[**]
p<.01,

[***]
p<.001

[a]
p value of differences controlling for demographic differences in race, marital status, ability to pay for basics, smoking, current use of hot flash treatment (yes, no), current use of SERM/AI (yes, no), and number of concurrent medications.

[b]
8-item total omits items #1 and #3.

Table 4

Spearman Correlations Between Somatosensory Amplification (SSAS) and Menopausal Symptoms

	10-item SSAS		8-item SSAS	
	BCS	**MW**	**BCS**	**MW**
HF frequency	0.03	−0.01	−0.05	−0.02
HF severity	0.07	0.03	0.08	0.03
HF bother	0.09	0.11	0.10	0.10
HF interference	0.39***	0.30***	0.34***	0.30***
HF perceived control	−0.24*	−0.19*	−0.19	−0.17*
Total mood disturbance	0.36***	0.25**	0.38***	0.29***
Tension / Anxiety	0.36***	0.26**	0.37**	0.31***
Anger/ Hostility	0.15	0.24**	0.17	0.29***
Fatigue/ Inertia	0.37***	0.18*	0.39***	0.18*
Depression/ Dejection	0.28**	0.21*	0.30**	0.24**
Vigor/ Activity	−0.19	−0.15	−0.23*	−0.13
Confusion/ Bewilderment	0.33***	0.23**	0.36***	0.27**
Global sleep disturbance	0.26**	0.14	0.27**	0.14
Sleep Quality	0.24*	0.17*	0.26*	0.14
Sleep Latency	0.03	0.06	0.03	0.09
Sleep Duration	0.21*	−0.04	0.25*	−0.05
Sleep Disturbance	0.24*	0.20*	0.23*	0.22**
Sleep Medication	0.02	0.15	0.01	0.16
Daytime Sleep	0.40***	0.33***	0.41***	0.34***
Sleep Efficiency	0.01	0.01	0.02	0.01

Breast cancer survivors (BCS) n=99; Midlife women (MW) n=138;

*
p<.05,

**
p<.01,

***
p<.001