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Effect of moderate running training and mindfulness-based stress reduction on immune system and quality of life in women with breast cancer receiving aromatase inhibitors

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Introduction and summary

Women with breast cancer receiving aromatase inhibitors often cannot resume normal life because their quality of life is affected severely from side effects.

At the moment these physical side effects of aromatase inhibitors cannot be avoided effectively so that a stress reduction by undergoing a mindfulness-based stress (MBSR) reduction training seems to be a chance to enhance the quality of life for affected women.

In this context our randomized control trial examines the hypothesis, whether an MBSR training of 8 weeks improves quality of life for women of the MBSR group (MBSR group n=10). By contrast women of the control group (n=15) take part in Nordic walking once per week.

Surprisingly, results reveal that women of the MBSR group noticed an increase of breast pain located in their breast affected by cancer and also an increase of insomnia. The cortisol level in the afternoon had fallen slightly at the end of 8 weeks in participants of the control group and had risen in participants of the MBSR group.

However, as a long-term effect the cognitive functioning in the MBSR group was improved after 16 weeks.

Methods

Participants of the MBSR group (intervention group, limited to N=10) and control group with Nordic walking training were randomized. All women had breast cancer, were aged 50-79, had hormon-rezeptive tumours, and a tumour stage UICC I-III [1].

The period of training was 8 weeks for both groups. Three measurements were taken in each group:

- t1: before the beginning of 8 weeks training
- t2: 8 weeks after the beginning of training (at the end of training)
- t3: 16 weeks after the beginning of training (8 weeks after training)

Primary endpoint (measuring time points t1 and t2) were the physiological parameters of serum cortisol and serum prolactin. Secondary endpoint was the quality of life at the measuring time points t2 and t3 according to the inventary of EORTC-questionnaire (Figure 1)

- EORTC QLQ-C30 Version 3.0 and
- EORTC QLQ-BR23

Statistical methods

Considering the small sample, we focused the effect size to get valuable information to clinical effects despite not having significance.

We did an analysis of covariance (ANCOVA) with timepoint t1 (= beginning of the intervention) as covariate.

The effect size η^2 was calculated related to the effect of the factor "group". For interpretation of the effect size we used table 1 [1].

Results

Results of the physiological parameters

Analysis of covariance: Timepoints t1 and t2: Participants of the MBSR group had a small increase of postprandial cortisol at 2 p.m., whereas participants of the Nordic walking group had a small decrease of postprandial cortisol at 2 p.m. (η^2 = 0,162, Table 2).

Results of the EORTC-Questionnaires

Analysis of covariance timepoints t1 (beginning of intervention) and t2 = 8 weeks (end of intervention/training). Participants of the MBSR group reported an increase of breast pain, table 3 (p = 0,042; η^2 = 0,175) and an increase of isomnia (η^2 = 0,113, Table 3), which disappeared 8 weeks after the end of MBSR training.

Analysis of covariance timepoints t1 (beginning of intervention) und t3 = 16 weeks (= 8 weeks after finishing intervention). Participants of the MBSR group had an increase of cognitive functioning (η^2 = 0,131, Table 4).

Discussion

The quality of life was not improved for participants of both groups as a short-time effect after 8 weeks of training, thus Nordic walking or MBSR training were both equally ineffective to improve quality of life.

The striking result for MBSR training was the increased sensitization for unpleasant body sensations in breasts. Accordingly,

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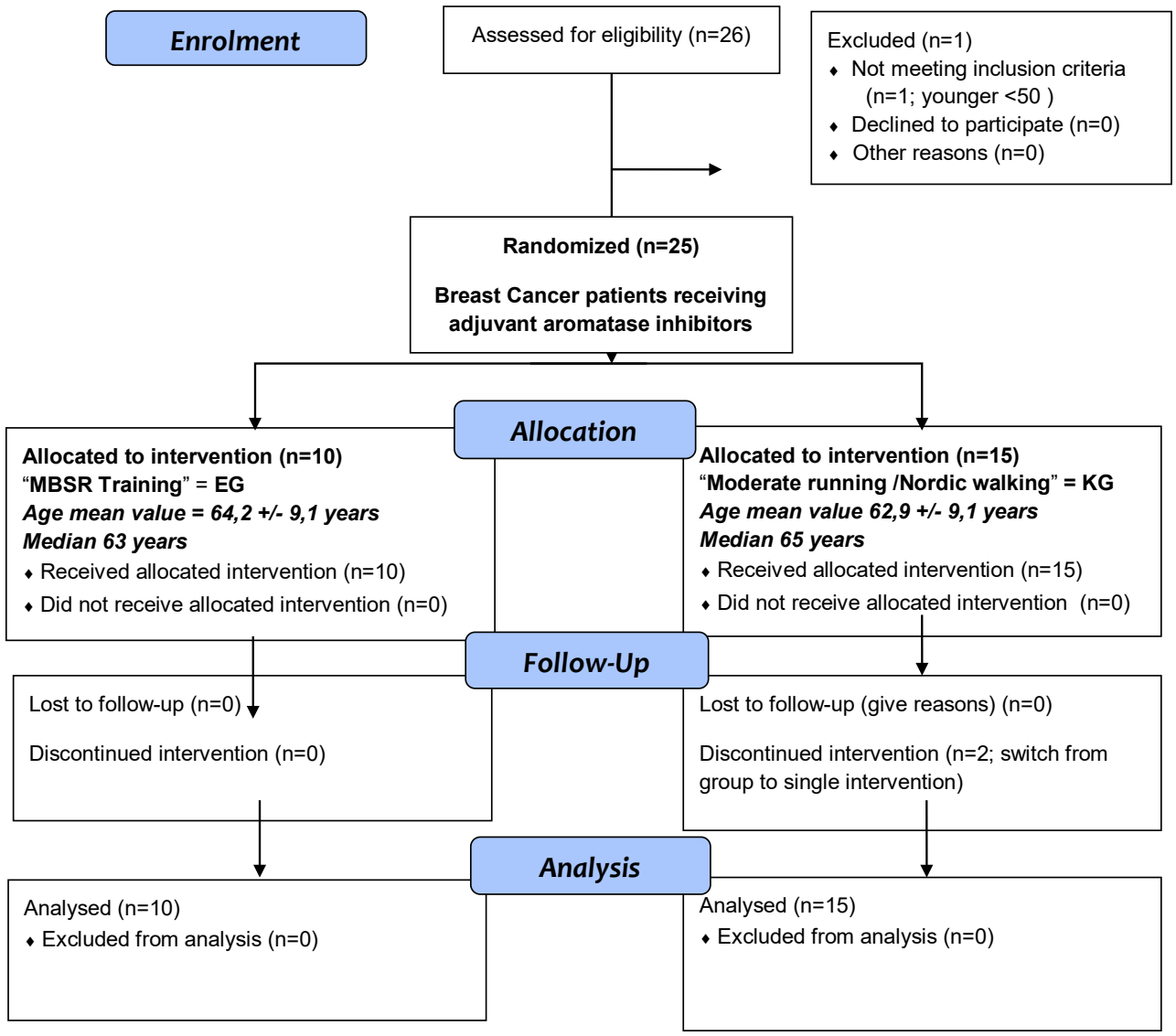

Figure 1. Consort flow chart

Table 1. Interpretation of effect size

	Small	Moderate	Large
r	< 0.3	0.3 – 0.5	> 0.5
d	< 0.5	0.5 – 0.8	< 0-8
η^2	0.06	0.06 – 0.14	> 0.14

Table 2. Physiological parameters

Parameters Mean values (and SD)	t1 MBSR	t2 MBSR	t1 Nordic walking	t2 Nordic walking	ANCOVA (t1 = covariate)	effect size*
Cortisol at 2 pm (SD)	304,2 (109,309)	318 (102,177)	279,867 (151,394)	228,533 (100,904)	F = 4,252 df = 1 p = 0,051 (group)	η^2 = 0,162
Prolaktin at 2 pm (SD)	8,659 (1,773)	9,386 (2,1)	8,549 (2,643)	9,996 (4,078)	F = 0,262 df = 1 p = 0,614 (group)	η^2 = 0,012

*effect size related to the effect of the factor "group"

[cortisol standard value in serum: 138 – 690 nmol/l; prolactin standard value in serum: 4,79 – 23.3 µg/l]

Table 3. Analysis of covariance: timepoints t1 and t2=8 weeks.

Parameters Mean values (and SD)	**t1 MBSR**	**t2 MBSR**	**t1 Nordic walking**	**t2 Nordic walking**	**ANCOVA (t1 = covariate)**		**effect size***
Quality of Life (SD)	53,33 (16,29)	61,67 (18,92)	65,00 (21,41)	64,44 (21,47)	F=1,100 df=1 (group)	p = 0,306	η^2=0,048
Physical Functioning (SD)	71,33 (12,98)	74,00 (13,86)	80,44 (21,30)	81,33 (18,89)	F=0,004 df=1 (group)	p = 0,951	η^2=0,001
Role Functioning (SD)	61,67 (17,66)	61,67 (24,91)	67,78 (34,20)	71,11 (26.33)	F=0,624 df=1 (group)	p = 0,438	η^2=0,028
Emotional Functioning (SD)	55,83 (26,95)	61,67 (24,91)	58,89 (31,88)	70,56 (26,14)	F=1,383 df=1 (group)	p = 0,252	η^2=0,059
Cognitive Functioning (SD)	70,00 (30,23)	71,67 (26,12)	71,11 (31,16)	70,00 (32,85)	F=0,179 df=1 (group)	p = 0,677	η^2=0,008
Social Functioning (SD)	60,00 (43,18)	71,67 (27,27)	64,44 (36,11)	70,00 (34,62)	F=0,216 df=1 (group)	p = 0,646	η^2=0,010
Fatigue	48,89 (29,26)	46,67 (27,12)	38,52 (28,75)	36,30 (29,83)	F=0,058 df=1 (group)	p = 0,811	η^2=0,003
Nausea and Vomiting (SD)			5,56 (17,44)	3,33 (12,91)	F=0,381 df=1 (group)	p = 0,544	η^2=0,017
Pain (SD)	38,33 (24,91)	45,00 (30,48)	36,67 (32,24)	38,89 (27,94)	F=0,308 df=1 (group)	p = 0,585	η^2=0,014
Dyspnoea (SD)	23,33 (22,50)	20,00 (28,11)	33,33 (37,80)	28,89 (27,79)	F=0,090 df=1 (group)	p = 0,768	η^2=0,004
Insomnia (SD)	**56,67 (38,65)**	**60,00 (37,84)**	**57,78 (36,66)**	**44,44 (39,17)**	**F=2,792 df=1 (group)**	**p = 0,109**	**η^2=0,113**
Appetite loss (SD)	20,00 (35,83)	16,67 (36,00)	11,11 (24,12)	6,67 (18,69)	F=0,262 df=1 (group)	p = 0,614	η^2=0,012
Constipation (SD)	13,33 (32,20)	20,00 (35,83)	22,22 (27,22)	17,78 (24,77)	F=1,113 df=1 (group)	p = 0,303	η^2=0,048
Diarrhoea (SD)	3,33 (10,54)	3,33 (10,54)	6,67 (18,69)	0,00 (0,00)	F=2,391 df=1 (group)	p = 0,136	η^2=0,098
Financial Diffuculties (SD)	30,00 (42,89)	20,00 (32,20)	26,67 (38,21)	(24,44 (38,76)	F=1,502 df=1 (group)	p = 0,233	η^2=0,064
Body Image (SD)	52,50 (35,15)	59,17 (35,67)	62,78 (36,31)	66,11 (37,86)	F=0,078 df=1 (group)	p = 0,782	η^2=0,004
Sexual Functioning (SD)	77,08 (30,78)	78,57 (31,50)	72,22 (33,73)	76,19 (25,08)	F=0,285 df=1 (group)	p = 0,600	η^2=0,016
Sexual Enjoyment (SD)	66,67 (47,14)	66,67 (47,14)	50,00 (43,03)	66,67 (27,22)	not possible to evaluate		
Future Perspective (SD)	50,00 (28,33)	53,33 (32,20)	46,67 (41,40)	35,56 (36,66)	F=2,427 df=1 (group)	p = 0,134	η^2=0,099
Systemic Therapy Side Effects (SD)	34,76 (19,83)	29,96 (22,07)	27,94 (14,94)	26,03 (17,90)	F=1,043 df=1 (group)	p = 0,318	η^2=0,045
Breast Symptoms (SD)	15,83 (19,02)	25,00 (19,25)	25,00 (21,13)	22,22 (21,52)	F=4,663 df=1 (group)	**p = 0,042**	**η^2=0,175**
Arm Symptoms (SD)	33,33 (29,63)	35,56 (30,45)	37,04 (27,11)	31,48 (21,99)	F=1,610 df=1 (group)	p = 0,218	η^2=0,068
Upset by Hair loss (SD)	67,67	22,22 (38,49)	61,11 (38,97)	41,67 (42,72)	F=1,812 df=1 (group)	p = 0,236	η^2=0,266

*effect size related to the effect of the factor "group"

Table 4. Analysis of covariance: timepoints t1 and t3 = 16 weeks.

Parameters Mean values (and SD)	t1 MBSR	t3 MBSR	t1 Nordic walking	t3 Nordic walking	ANCOVA (t1 = covariate)		effect size*
Quality of Life (SD)	53,3 (16,3)	56,7 (26,6)	65,0 (21,4)	65,6 (20,9)	F=0,010 df=1	p = 0,919 (group)	η^2=0,001
Physical Functioning (SD)	71,3 (13,0)	77,3 (15,8)	80,4 (21,3)	80,9 (18,7)	F=0,276 df=1	p = 0,610 (group)	η^2=0,012
Role Functioning (SD)	61,7 (17,7)	60,0 (29,6)	67,8 (34,2)	73,3 (24,2)	F=1,324 df=1	p = 0,262 (group)	η^2=0,057
Emotional Functioning (SD)	55,8 (26,9)	54,2 (26,7)	58,9 (31,9)	63,9 (32,5)	F=0,864 df=1	p = 0,363 (group)	η^2=0,038
Cognitive Functioning (SD)	**70,0 (30,2)**	**78,3 (23,6)**	**71,1 (31,2)**	**65,6 (34,2)**	**F=3,322 df=1**	**p = 0,082 (group)**	**η^2=0,131**
Social Functioning (SD)	60,0 (43,2)	65,0 (32,8)	64,4 (36,1)	70,0 (36,3)	F=0,043 df=1	p = 0,838 (group)	η^2=0,002
Fatigue (SD)	48,9 (29,3)	47,8 (28,2)	38,5 (28,8)	34,8 (27,8)	F=0,552 df=1	p = 0,465 (group)	η^2=0,024
Nausea and Vomiting (SD)	,0 (,0)	3,3 (10,5)	5,6 (17,4)	3,3 (9,3)	F=0,073 df=1	p = 0,790 (group)	η^2=0,003
Pain (SD)	38,3 (24,9)	41,7 (28,6)	36,7 (32,2)	40,0 (31,4)	F=0,003 df=1	p = 0,954 (group)	η^2=0,001
Dyspnoea (SD)	23,3 (22,5)	23,3 (27,4)	33,3 (37,8)	26,7 (33,8)	F=0,206 df=1	p = 0,654 (group)	η^2=0,009
Insomnia (SD)	56,7 (38,7)	56,7 (41,7)	57,8 (36,7)	48,9 (39,6)	F=0,861 df=1	p = 0,363 (group)	η^2=0,038
Appetite loss (SD)	20,0 (35,8)	23,3 (41,7)	11,1 (24,1)	4,4 (11,7)	F=2,323 df=1	p = 0,142 (group)	η^2=0,096
Constipation (SD)	13,3 (32,2)	23,3 (31,6)	22,2 (27,2)	15,6 (21,3)	F=1,733 df=1	p = 0,202 (group)	η^2=0,073
Diarrhoea (SD)	3,3 (10,5)	10 (22,5)	6,7 (18,7)	2,2 (8,6)	F=1,939 df=1	p = 0,178 (group)	η^2=0,081
Financial Diffuculties (SD)	30,0 (42,9)	30,0 (36,7)	26,7 (38,2)	28,6 (38,9)	F=0,702 df=1	p = 0,412 (group)	η^2=0,032
Body Image (SD)	52,5 (35,1)	53,9 (32,3)	62,8 (36,3)	66,7 (36,2)	F=0,301 df=1	p = 0,589 (group)	η^2=0,013
Sexual Functioning (SD)	77,1 (30,8)	77,1 (19,8)	72,2 (33,7)	81,0 (24,3)	F=1,341 df=1	p = 0,262 (group)	η^2=0,069
Sexual Enjoyment (SD)	66,7 (47,1)	44,4 (19,2)	50,0 (43,0)	50,0 (43,0)	F=2,400 df=1	p = 0,261 (group)	(η^2=0,545)
Future Perspective (SD)	50,0 (28,3)	56,7 (31,6)	46,7 (41,4)	48,9 (39,6)	F=0,373 df=1	p = 0,548 (group)	η^2=0,017
Systemic Therapy Side Effects (SD)	34,8 (19,8)	33,3 (19,0)	27,9 (14,9)	27,0 (19,3)	F=0,015 df=1	p = 0,904 (group)	η^2=0,001
Breast Symptoms (SD)	15,8 (19,0)	21,7 (22,3)	25,0 (21,1)	28,9 (24,6)	F=0,005 df=1	p = 0,942 (group)	η^2=0,001
Arm Symptoms (SD)	33,3 (29,6)	30,0 (29,7)	37,0 (27,1)	41,5 (25,7)	F=1,494 df=1	p = 0,234 (group)	η^2=0,064
Upset by Hair loss (SD)	66,7 (,0)	33,3 (,0)	61,1 (39,0)	53,3 (47,7)	F=1,143 df=1	p = 0,397 (group)	(η^2=0,364)

* effect size related to the effect of the factor "group"

most participants of the MBSR group did not answer the EORTC-questionnaire as to questions concerning sexual enjoyment and only one participant could report to have still pleasant sexual experiences.

This result of a disturbed acceptance of parts of the body could be an effect of the attention and self-reflection which is induced by MBSR training. Women might have located unconsciously their fear of breast cancer in their body experience. Therefore, we propose individual psychotherapy to develop confidence in their own body sensations after cancer treatment.

Further studies are necessary because of the small sample in this study.

References

1. Mattes J (2017) Awareness Culture and Health: A Prospective, Randomized and Controlled Study of Spiritual Practice in Breast Cancer Patients. Marburg, Tectum Verlag, ISBN 978-3-8288-3907-6.