Complementary Therapies in Clinical Practice 27 (2017) 19–26

Contents lists available at ScienceDirect

Complementary Therapies in Clinical Practice

journal homepage: www.elsevier.com/locate/ctcp

Psychophysical health status of breast cancer survivors and effects of 12 weeks of aerobic training

Andrea Di Blasio [a, *], Teresa Morano [a], Ettore Cianchetti [b, c], Sabina Gallina [d], Ines Bucci [a], Serena Di Santo [a], Camilla Tinari [a], Francesco Di Donato [e], Pascal Izzicupo [a], Angela Di Baldassarre [a], Alessandra Cimini [c], Giorgio Napolitano [a]

[a] *Department of Medicine and Ageing Sciences, 'G. d'Annunzio' University of Chieti–Pescara, Italy*
[b] *Department of Medical, Oral and Biotechnological Sciences, 'G. d'Annunzio' University of Chieti–Pescara, Italy*
[c] *Department of General Surgery Specialised in Senology of the 'G. Bernabeo' Hospital, Ortona, Italy*
[d] *Department of Neuroscience and Imaging, 'G. d'Annunzio' University of Chieti–Pescara, Italy*
[e] *Dietamovimento Laboratories, Montesilvano, Italy*

A R T I C L E I N F O

Article history:
Received 23 December 2016
Accepted 26 January 2017

Keywords:
Cortisol
DHEA-S
Sedentary time
SF-36 questionnaire

A B S T R A C T

The aim of this study was to analyse the health status of breast cancer survivors and the effects of 12 weeks of aerobic training. Twenty-three breast cancer survivors (51.71 ± 3.17 years) and 23 healthy women (50.73 ± 2.97 years) were investigated for body composition, daily physical activity, quality of life, salivary cortisol, and DHEA-S. Breast cancer survivors were then aerobically trained for 12 weeks. Breast cancer survivors have a worse psychophysical health than healthy women. Aerobic training increased salivary DHEA-S, aerobic fitness, self-reported health, and nocturnal sleeping time and reduced salivary cortisol in breast cancer survivors. Salivary cortisol variation correlated with change of sleeping time and self-reported health. Salivary DHEA-S correlated with change of self-reported physical pain and general health as well. Breast cancer survivors can live in a situation of continuous distress, requiring a multidisciplinary approach. Twelve weeks of aerobic training improve the psychophysical health of breast cancer survivors.

1. Introduction

Both non-pharmacological and pharmacological treatments of breast cancer could have negative side effects in one or multiple domains (i.e. kinesiological, metabolic, cardiovascular, and psychological) according to the interaction of treatment characteristics with both the physio-pathological and psychological conditions of each woman [2,45,52]. In addition, it is important to consider that a breast cancer diagnosis per se has a negative effect on female psychological health. Indeed, self-reported distress significantly decreases only after 6 months post-treatment [32], and depression is a common consequence of this situation [15]. A combination of non-pharmacological and pharmacological side effects of breast cancer treatment, commonly leading to breast cancer treatment-related fatigue [52], and a breast cancer diagnosis per se determine a self-reinforcing negative loop (Fig. 1), leading to sedentarism. Sedentarism has negative consequences for health, as it is considered the starting point, through its characteristic pro-inflammatory pattern, of the most common chronic non-communicable diseases [13], including breast cancer onset and recurrence [31]. An important accelerator and amplifier of this negative loop is sleep disturbance. Sleep disturbance is a consequence of breast cancer-related pharmacological treatment, distress, and depression, and it negatively affects the levels of those hormones fluctuating according to the light and dark cycle (e.g. growth hormone, melatonin, cortisol, leptin, and ghrelin), leading to metabolism disorder [27] and a progressive exacerbation of the situation. Thus, sleep disturbance impairs recovery and increases plasma cortisol levels, which, in turn, reinforce sleep disturbance and the described negative loop [11] (Fig. 1). For this reason, plasma cortisol, responding to physical and psychological stimulus [35], has a central role for health or disease promotion: daily fluctuation and acute elevation, such as after physical stress [7], are

* Corresponding author. Department of Medicine and Ageing Sciences, Endocrinology Unit, 'G. d'Annunzio' University of Chieti–Pescara, Via dei Vestini 31, 66013 Chieti Scalo, Italy.
E-mail address: andiblasio@gmail.com (A. Di Blasio).

http://dx.doi.org/10.1016/j.ctcp.2017.01.004

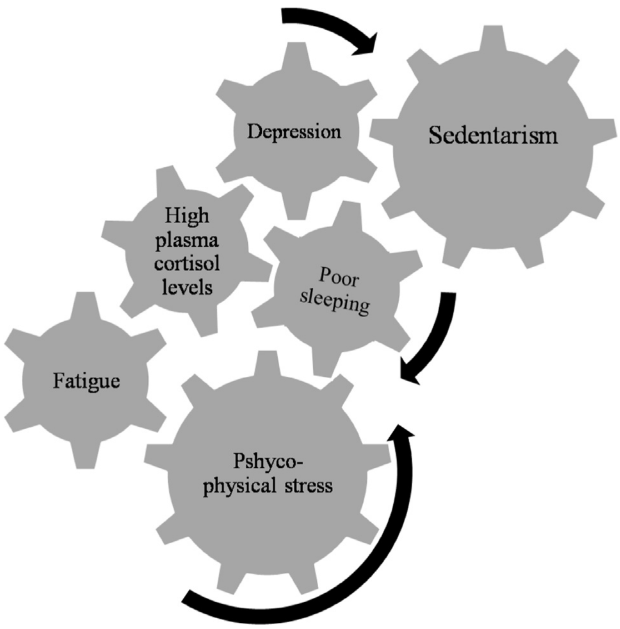

Fig. 1. Psycho-physical self-reinforcing negative loop.

physiological and advantageous for recovery, while chronic elevation has negative effects [14]. As the literature is increasingly stating that properly prescribed and practiced physical exercise has positive effects on each of the described negative consequences and on several other negative sequelae of breast cancer treatments [9], the prescription of physical exercise is increasing. In the roundtable document on exercise guidelines for cancer survivors, the American College of Sport Medicine (ACSM) reported information about safety, aerobic fitness, muscular strength, body composition, quality-of-life fatigue, anxiety, and other outcomes, such as shoulder range of motion, sleep, immune functions, and body image, of physical exercise both during and after chemotherapy or radiation therapy [1]. Although there are specific risks associated with cancer treatments that need to be considered when survivors exercise [28], the ACSM's document states that exercise is safe and very useful during and after cancer treatment [1]. Physical exercise enhances dehydroepiandrosterone (DHEA) and its sulfate conjugate (i.e. DHEA-S) [8,25,48], thus eliciting a wide variety of positive effects on health, from immunomodulation to cardiovascular health and well-being [33,42], and counteracting the negative effects of prolonged plasma cortisol elevation [34]. Indeed, in cohort studies, both cortisol and DHEA-S levels have been shown to be linked to mortality. Higher plasma cortisol has been associated with increased mortality in non-clinical populations [30], and lower DHEA-S has been shown to be negatively associated with total and cardiovascular disease mortality, with ischemic heart disease in women [21], and with both all-cause and cardiovascular disease mortality in both sexes [20], even if, according to DHEA level, it is possible to elicit anti-cancer or cancer-promoting effects [38].

We hypothesise that physical exercise is an important modulator of health in breast cancer survivors who should have a worse health status than non-pathological peers in its absence, while its practice should improve their health. Therefore, the aim of our study was to evaluate cortisol and DHEA-S levels, together with body composition, daily physical activity, self-reported health, and aerobic fitness in breast cancer survivors 8–12 months after surgical treatment. We also compared these parameters with those observed in healthy women in order to show eventual differences and to verify whether 12 weeks of aerobic physical exercise practice are able to close the gap.

2. Materials and methods

2.1. Subjects

Twenty-three breast cancer survivors (56.71 ± 3.17 years) and 23 healthy women (55.73 ± 2.97 years) were recruited by the Department of General Surgery Specialised in Senology of the 'G. Bernabeo' Hospital (Ortona, Italy) and by general physicians of the Pescara area (Italy), respectively. The inclusion criteria for breast cancer survivors were: 50 < age <65 years; 8–12 months from surgery; no past or actual chemotherapy; no actual radiotherapy; actual aromatase inhibitor therapy; cardiovascular and orthopaedic eligibility for walking and Nordic walking practice; no endocrine diseases; lymphedema lower than class 2 of CEAP-L classification [18]; no dieting or use of nutritional supplements; no participation in any exercise programme during the 6 months prior to the study; and non-employed status. The inclusion criteria for healthy women were: 50 < age ≤65 years; no acute or diagnosed diseases; no dieting or use of nutritional supplements; no participation in any exercise programme during the 6 months prior to the study; and non-employed status. The Ethics Committee of the 'G. d'Annunzio' University of Chieti–Pescara approved this study, and all of the participants gave their written informed consent.

2.2. Study design

Breast cancer survivors were firstly selected by the Department of General Surgery Specialised in Senology of the 'G. Bernabeo' Hospital (Ortona, Italy) and then visited by both a cardiologist and sports medicine specialist to verify their cardiovascular and orthopaedic eligibility for walking and Nordic walking practice through a medical examination, echocardiography, and maximal stress test. After reaching medical eligibility, as showed in Fig. 2, participants underwent an interview about their dietary habits, a quality-of-life assessment, and a five-day physical activity recording in a free-living context. After that, the breast cancer survivors were randomly assigned to one of two aerobic disciplines, i.e. walking or Nordic walking, followed by blood sample collection, anthropometry, a battery of field fitness tests, and multiple daily salivary samplings.

After recruitment, the healthy women underwent the same tests as the breast cancer survivors in the same order and manner. Since the healthy women were used only as a basal control group, only breast cancer survivors were trained for 12 weeks. The same tests were repeated at the end of the training period. Due to the complexity of the research design, with its different aims, we will describe only the steps and the tests useful for the aims of this manuscript.

2.3. Anthropometry and body composition

A second-level anthropometrist of the International Society for the Advancement of Kinanthropometry (ISAK) carried out body measurements of the participants in their fasting condition. Body weight and stretched stature were measured to the nearest 0.1 kg and 0.1 cm, respectively, with the participants dressed in light clothing and without shoes, using a stadiometer with a balance-beam scale (Seca 220, Seca, Hamburg, Germany). Anthropometric tape (Cescorf, Porto Alegre, Brasil) was used to measure waist and hip circumferences to the nearest 0.1 cm according to ISAK guideline [47]. The body mass index was calculated according to the formula of body weight/stature^2 (kg/m^2), and body fat distribution