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CASE STUDY ON THE THERAPEUTIC EFFECT OF EXERCISE PROGRAM ON BREAST
CANCER SURVIVORS DURING AND AFTER CHEMOTHERAPY TREATMENT.

by

John Kolade

B.Ed., University of Ibadan, 2016

A Research Paper

Submitted in Partial Fulfillment of the Requirements for the
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In the Graduate School
Southern Illinois University Carbondale
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RESEARCH PAPER APPROVAL

CASE STUDY ON THE THERAPEUTIC EFFECT OF EXERCISE PROGRAM ON BREAST
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A Research Paper Submitted in Partial
Fulfillment of the Requirements
for the Degree of
Master of Science in Education
in the field of Kinesiology

Approved by:

Dr. Phil Anton, Chair

Graduate School
Southern Illinois University Carbondale
June 25, 2021

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DEDICATION

This work is dedicated to my parents; Olumide & Omolade Kolade.

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CHAPTER 1

INTRODUCTION

The American Cancer Society estimated 330,840 new cases of breast cancer will be diagnosed in 2021 (American Cancer Society, 2021). Of the 330,840 new breast cancer cases, 281,550 are projected to be invasive breast cancer, while the remaining 49,290 new cases are predicted to be non-invasive (American Cancer Society, 2021). It was established that the 5-year survival rate for invasive breast cancer that has not metastasized to other healthy tissue is 90% (American Cancer Society, 2021).

With a very high rate of survival after breast cancer diagnosis, the need for rehabilitation cannot be overemphasized. Following a breast cancer diagnosis and during and following chemotherapy treatment, cancer rehabilitation is strongly recommended due to many issues, one of them being weight gain. In women treated for breast cancer, weight gain originates due to numerous possible causes: premature menopause caused by cancer treatment, hormonal therapy during breast cancer treatment, hypofunction of the endocrine gland after chemotherapy treatment, and reduction in women's physical ability and activity during/following chemotherapy (Bernadine et al., 1999).

Considering this, Winningham and associates scrutinized the contribution of exercise in body weight control and management (Winningham et al., 1989). According to their research, for patients who were obese and non-obese, and that exercised 20-30 minutes three times a week, exercise was effective on body weight in Stage II breast cancer survivors. In addition, their research compared exercising and non-exercising group, and no effect on body weight was recorded among the non-exercising group (Winningham et al., 1989).

After breast cancer diagnosis, during breast cancer treatment, and after breast cancer treatment, survivors experience a variety of side effects ranging from fatigue, hair loss, sore mouth, bruising and bleeding, memory, and concentration problems. The current study aimed at examining how exercise can be used to alleviate physical and psychological effects of chemotherapy treatment in breast cancer survivors.

CHAPTER 2

LITERATURE REVIEW

This recent study focuses on the consequences of chemotherapy treatment on breast cancer survivors and how exercise protocols can be used to mitigate these consequences. Structured exercise program may provide possible preservative advantage against cancer (Frish et al., 1985; Vena et al., 1987; Bernstein et al., 1994; Pinto and Marcus 1994; Thune et al., 1997), also when exercise is used as an adjuvant treatment during and after chemotherapy, it can be responsible for mitigating physical and psychological symptoms. Several studies have investigated the effects of several exercise intensities in recuperating cancer survivors after they have undergone medical care such as chemotherapy (Kampshoff et al., 2015, Burnham et al., 2002). One of the studies delineated that high intensity exercise resulted in better cardiorespiratory fitness improvement when compared to low intensity exercise and usual medical care (Burnham et al., 2002). On the other hand, another study concluded that in cases where either low intensity or moderate intensity aerobic exercise is adopted in cancer rehabilitation, there is a recorded improvement in cardiorespiratory fitness, compared to how much improvement that is recorded from usual medical care (Burnham et al., 2002). Furthermore, it can be deduced that low, high, and moderate intensity can be functional when ameliorating muscle strength and muscle endurance, lessening fatigue, as well as improving emotions after chemotherapy treatment (Kampshoff et al 2015).

During and after chemotherapy treatment, among the most habitual and discomforting symptoms which acutely affects quality of life (QoL) in breast cancer survivors is cancer-related fatigue (Berger et al., 2012; Goedendorp et al., 2011; Schmidt et al., 2012). Fatigue is a familiar side effects of all chemotherapy drugs (Kerry et al., 2002). Especially women that are at the

premenopausal stage may experience ovarian ablation which in turn will reduce the production of estrogens. Also, women in the postmenopausal stage may be recommended to use aromatase enzyme inhibitors which can reduce the conversion of androgen to estrogen. This results in fatigue and weight gain in breast cancer survivors (Kerry et al., 2002). Succeeding conclusions from research studies in this area, numerous exercise interventions have depicted advantageous effects on cancer-related fatigue and QoL for disparate cancer types and treatment settings (Brown et al., 2011; Velthuis et al., 2010; Schmitz et al., 2010; Cramp et al., 2012). However, Martina and colleagues believed that recommendation for exercise intervention may need to be more specific to the abilities and strength of patients during the different intervals of cancer and chemotherapy treatment (Schmidt et al., 2014).

Skeletal muscle atrophy is another common result of breast cancer treatment in women diagnosed with breast cancer. To date, not many studies have investigated the relationship between breast cancer treatment and skeletal muscle atrophy. However, cachexia is a condition that has been studied. Cachexia is a syndrome where fat and skeletal muscle tissue decreases in patients with late-stage disease (Fearon et al., 2012). Guigini and colleagues addressed how chemotherapy treatment affects skeletal muscle, and they found that breast cancer treatment caused depletion in single muscle fiber cross-sectional area and reduction in the functional content of subsarcolemmal and intermyofibrillar mitochondria (Guigini et al., 2018). In the same vein, chemotherapy drugs like doxorubicin and paclitaxel have been found to result in limiting muscle mass production by reducing myosin expression, loss of mitochondria due to reduction in the number of muscle cells, and a consequent increase in the production of reactive oxygen species (Guigini et al., 2018). Exercise has been found to be helpful in promoting muscle strength and muscle endurance in healthy adults. In an older study, resistance exercise

routines have demonstrated increase in muscle cross-sectional area (Narici et al., 1996). In the same vein, Guigini and fellow researchers validated the significance of exercise in their conclusion; they concluded that resistance exercise is a functional intervention for treating the unpleasant outcomes of breast cancer treatment (Guigini et al., 2018). Furthermore, it was recommended that the focus for exercise should be to improve physical performance (Guigini et al., 2018). This article suggested that deficient physical performance can be ameliorated by increasing muscle strength, muscle power, enhance lean body mass, as well as reducing self-reported fatigue (Guigini et al., 2018).

Exercise can be an effective tool for treating mood problems that originate after breast cancer diagnosis and breast cancer treatment. Research has found regular exercise to show significant improvement in anxiety, management of depression, and in increasing self-esteem in a sample of sedentary individuals (Doyle et al., 1987; Ossip-Klein et al., 1989; Pappas et al., 1990; King et al., 1991). In Pinto and colleagues' research, they established that exercise could enhance mood and lessen depression and anxiety among breast cancer survivors which is a similar response delineated by exercisers in other populations (Pinto et al., 1999).

CHAPTER 3

METHODOLOGY

SAMPLE AND RECRUITMENT

Two breast cancer survivors who had chemotherapy as a neoadjuvant treatment following breast cancer diagnosis were engaged for this qualitative research study. Subjects were recruited from the Strong Survivors Nutrition and Exercise Program for Cancer Survivors and Caregivers. The Julie A. Honerkamp Strong Survivors Cancer Rehabilitation Laboratory at Southern Illinois University Carbondale houses the Strong Survivors program, and this program is a free exercise intervention program. The Strong Survivors program is set up with the intention to enlighten cancer survivors and caregivers on the significance and benefit of exercise and nutrition in the treatment and management of the physical and psychological consequences of cancer diagnosis and treatment.

Five participants were sampled for this study. Two participants provided usable interviews for the study. This study was cross-sectional, and participation was completely voluntary; no form of incentive was offered for participation. During the sampling process, only breast cancer survivors that have completed the Strong Survivors program within the previous 6 months were included. Consequently, participants that dropped out of the Strong Survivors program were excluded from this study. To successfully complete this research study, approval was obtained from the Institutional Review Board at Southern Illinois University, Carbondale.

Table 1 Characteristics of the sample

| Participant s | Sex | Age | Diagnosis | Cancer treatment |
|--------------------------|------------|------------|------------------|--|
| Survivor | Female | 61 | Breast cancer | Neoadjuvant chemotherapy and Surgery |
| Survivor | Female | 63 | Breast cancer | Neoadjuvant chemotherapy and Surgery |

MATERIAL AND PROCEDURE

Data was collected for this descriptive qualitative study using a self-structured interview guide concerning breast cancer survivor literature, and conversation with specialists in the field of cancer support (see table 2). Interviews for this study were conducted independently. The researcher worked with each participant to schedule the interview at their convenience, and the interviews were conducted using Zoom video meeting, which allowed the participants to join the interview from the comfort of their home. All the questions that were asked during each interview were straight-forward questions which were not difficult for the participants to comprehend. Interviews were recorded using the Zoom video recording option. In similar vein, Notes were taken during the interviews to guarantee validity of the data. Following each interview, the researcher immediately worked on the notes to strengthen the accuracy of the data. Each interview lasted between 30-60 minutes.

Table 2 Interview questions with specifics

1. How would you rate your overall physical fitness level on a scale of 1-10 before you were diagnosed with breast cancer?
2. How would you rate your physical fitness level before you were diagnosed with breast cancer?
 - a. Aerobic capacity?
 - b. Muscle strength?
 - c. Muscle endurance?
 - d. Body composition?
 - e. Flexibility?
 - f. Balance and agility?
3. How would you rate your overall physical fitness level on a scale of 1-10 after you finished chemotherapy?
4. How would you rate your overall physical fitness level after you finished chemo?
 - a. Aerobic capacity?
 - b. Muscle strength?
 - c. Muscle endurance?
 - d. Body composition?
 - e. Flexibility?
 - f. Balance and agility?
5. What side effects did you experience during and after chemotherapy treatment?

6. What instigated your participation in a structured exercise program like strong survivor?
7. Did your participation start before or after your chemotherapy treatment ended?
8. What is your participation about exercise program as a form of rehabilitation? Was it beneficial to you? Did it help mitigate the side effects that came with the chemotherapy treatment?

DATA ANALYSIS

After the interviews, a verbatim transcription of the interviews was conducted. Analysis was carried out on the obtained data using inductive content analysis, and the principles designed by qualitative methodologists was emulated (Patton., 2002; Gibson et al., 2009). The researcher read the transcriptions several times to understand the content and tone of the interview data. Alongside reading the interview data, the interview data themes was identified and coded, which delineate the essential units of investigation for this research study such as: paragraphs, phrases or quotations. A grouping process was employed where interview raw data that have corresponding meaning into the lower-order themes were merged, and this portrayed a higher level of abstraction. The inductive analysis was finalized by conducting a consensus validation of the raw data themes. The researcher established three themes that are higher order: physical consequences, psychological outcome, and perceived exercise benefit. These higher-order themes illustrated the main level of abstraction. For this data analysis, member check was not completed due to the inability to physically meet with the participants for this study.

CHAPTER 4

RESULTS

PHYSICAL CONSEQUENCES

Physical outcome in breast cancer survivor after chemotherapy treatment was the first higher-order theme that was prominent in the data analysis. Chemotherapy drugs are administered to combat cancer cells, which are fast growing cells. While the chemotherapy drugs focus on obliterating cancer cells, these drugs can kill normal and healthy cells that grow quickly such as cells in the hair follicles, cells in the digestive tracts, cells in the mouth, cells in the bone marrow and immune system that are responsible for blood cell formation.

Also, there has been a record of muscle loss in breast cancer survivors that have undergone chemotherapy treatment. Chemotherapy drugs can affect normal muscle health by reducing the rate of myosin expression and can cause the loss of mitochondria in the muscle cells, which in turn will result in a loss of muscle mass. All of these contributes to the physical effect such as skeletal muscle loss that breast cancer survivor experience during and after chemotherapy treatment. The evident side effects that have been widely reported by chemotherapy treated breast cancer survivors in relation to skeletal muscle mass loss is depletion in muscle endurance and muscle strength which, in turn, results in fatigue.

PSYCHOLOGICAL OUTCOME

In addition to the physical consequences, breast cancer survivors also reported psychological outcomes during and after chemotherapy treatment, such as chemo brain, brain fog, which contributes to lack of concentration and the inability to make decisions of breast cancer survivors that are treated with chemotherapy. Strong Survivors designs exercise protocols with respect to changing survivors' negative behavior towards treatment and exercise in general.

PERCEIVED EXERCISE BENEFIT

Breast cancer survivor that participates in structured exercise program such as Strong Survivors have recorded improvements in aerobic capacity, muscle strength and endurance, body composition, flexibility, balance and agility, and improved quality of life (QoL). Breast cancer survivor 2 mentioned that “my aerobic capacity is good now following my participation in Strong Survivors, and I walk around campus 3 miles on my lunch break ... Strong Survivors have made me gain weight and the weight I have put on is muscle-oriented weight.” Breast cancer survivor 1 also mentioned that “I think exercise is the best medicine. At first, I was afraid of hurting myself through engaging in exercise, but I appreciate the fact that I was a part of the Strong Survivors program and had a personal trainer to help design the exercise activity.”

CHAPTER 5

DISCUSSION

In a recent study, researchers found aerobic exercise training to have psychological effects such as improving self-esteem. Aerobic exercise also helped maintain aerobic fitness and conserved the level of body fat (Roanne et al., 2007). In the same vein, Roanne and colleagues established that resistance exercise training affected psychological factors by improving self-esteem. Resistance exercise also increased muscular strength, and improved lean body mass (Roanne et al., 2007). Generally speaking, the present study was able to establish from data collected from active breast cancer survivors that engaged in a structured exercise program like Strong Survivors that they recorded improvements in aerobic capacity, muscle strength and increased self-esteem.

Subjects in this present study reported fatigue after chemotherapy treatment by stating the following: Breast cancer survivor 1 mentioned that “after all chemotherapy I can rate my physical fitness level as 2, it was awful, I felt like I couldn’t shut the car door.” Breast cancer survivor 2 verified this by claiming that “My physical fitness level was bad, weight loss, muscle atrophy, I couldn’t carry my purse and lunch car... I had low hemoglobin. I usually had someone park my car for me, and I got out of breath quickly”. Breast cancer survivor 1 also stated that “my muscle strength was horrible...when I fold laundry, I would have to sit down. I could not mop the kitchen floor at once, I couldn’t push the vacuum”. Breast cancer survivor 2 expressed that “I couldn’t lift anything heavier than 3lbs, I had no strength in my arms and legs... my muscle fatigued in less than 20 minutes.” Consequently, the participants identified that their participation in a structured exercise program like Strong Survivors helped in the restoration and improvement of their physical fitness level.

A recent randomized trial study that investigated the effects of chemotherapy treatment in breast cancer survivors did not find any significant between resistance and aerobic exercise activities with respect to fatigue (Courneya KS et al., 2013). In contrary, this current study established using the themes obtained from the data analysis that participating in exercise helped mitigate fatigue during and after chemotherapy, and exercise rendered the ability to go about their activities of daily living (ADL) without fatigue setting in. Also, the Courneya study had more subjects unlike this present study which had just two.

The exercising groups in previous studies showed significant changes in depression, anxiety and fatigue (McNeely et al., 2006). Consequently, participants stated the following: Breast cancer survivor 2 said “I had chemo brain; brain fog which made it difficult for me to concentrate...I lost my hair, and I lost all my eye lashes which never grew back, and this had me concerned about my self-image.” Breast cancer survivor 1 supported this by claiming that “I was foggy in the brain, which made me lack the ability to make decisions, but Strong Survivors has helped me clear up my brain and lighten up my reasoning ability, this I regard to be a psychological benefit to me.”

This helps support the claim of the participants of this study. Breast cancer survivor 1 indicated engaging in exercise activity promoted their physical and psychological health, and it enabled them to recover some level of their QoL which was affected after breast cancer diagnosis and treatment. These findings support the claim that structured exercise is capable of mitigating the side effects of chemotherapy treatment and helping breast cancer survivors regain their physical and mental abilities, and it can increase the level of activities of daily living.

CHAPTER 6

CONCLUSION

Generally speaking, exercise is believed to be very beneficial to the health of every individual. However, it is questionable by health practitioners if exercise is ideal for breast cancer survivors who had been subjected to the strain of chemotherapy drugs. This study established the physical and psychological health benefit of exercise training on maintaining quality of life (QoL) levels during and after chemotherapy treatment. However, future studies should focus on investigating the effect of exercise programs on breast cancer survivors during and after chemotherapy treatment but should focus on using a larger sample size.

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Case study on the therapeutic effects of exercise program on breast cancer survivors during and after chemotherapy treatment

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