



SAVONIA

OPINNÄYTETYÖ - AMMATTIKORKEAKOULUTUTKINTO
SOSIAALI-, TERVEYS- JA LIIKUNTA-ALA

THE EFFECT OF EXERCISE ON CHEMOTHERAPY- RELATED FATIGUE

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Field of Study Social Services, Health and Sports	
Degree Programme Degree Programme in Nursing	
Author(s) Roosa Toropainen, Nea Virtanen	
Title of Thesis The Effect of Exercise on Chemotherapy-Related Fatigue	
Date 6 October 2021	Pages/Appendices 33/4
Client Organisation /Partners Pohjois-Savon Syöpäyhdistys	
<p>Cancer is an excessively common disease that affects millions of people around the world every year. Annual new cases of cancer in Europe are more than 3,7 million, and in Finland more than 30 000 new cases per year. There are several different treatment methods for cancer, including surgery, radiation, cytostatic treatment and hormone treatment, for example. Cancer treatments may cause side effects that may decrease the quality of life of a cancer patient.</p> <p>The most common side effect in cancer patients, and specifically in chemotherapy receiving patients, is fatigue. Nearly every patient receiving cytotoxic treatment suffers from fatigue. However, physical exercise and activity is shown to be an effective way to treat chemotherapy-related fatigue.</p> <p>The purpose of this thesis was to produce a video about the effects of exercise on chemotherapy-related fatigue. The aim of this thesis was to increase awareness on easing chemotherapy-related fatigue with exercising among cancer patients, as well as to encourage and motivate patients to exercise regularly. The thesis was conducted in cooperation with the client organization Pohjois-Savon Syöpäyhdistys.</p> <p>The thesis was carried out as development work, producing an informational video discussing motivating cancer patients to include exercise into their cancer care. The content of the video is based on the literature search, which studied the side effects of chemotherapy, different modes of exercise and how it eases fatigue.</p> <p>Chemotherapy-related fatigue is a rather common side effect that most cancer patients experience. The results of the literature search showed that exercise is an effective intervention in preventing and treating chemotherapy-related fatigue. The product of the development work will be utilized by the client organization.</p> <p>The video could also be used nationwide in any cancer care facilities.</p>	
Keywords Cancer, chemotherapy, exercise, fatigue, video	

1 INTRODUCTION

Cancer is a highly common disease that affects millions of people around the world every year. In 2018 there were 17 million new cases of cancer worldwide, and 9,6 million cancer deaths. (Cancer research UK s.a.) In Europe, there are more than 3,7 million new cases yearly, and more than 1,9 million cancer caused deaths annually. Europe comprises 1/8 of the world's population but has about a quarter of the world's cancer cases. (WHO Europe 2021.) In Finland there were 34 372 new cases of cancer in 2018, the most common cancer in female patients being breast cancer, and in male patients prostate cancer (Suomen syöpärekisteri 2020).

The treatment methods used for cancer are surgery, radiation therapy, cytostatic treatment, hormone therapy and biological treatment. Every cancer patient is assigned their own, individual care plan. Aspects that affect to an individual care plan are for example the patient's age, general condition, the biological traits of the cancer and how far it has spread and other illnesses of the patient. (Terveyskylä, Syöpätalo 2018.) Cancer treatments may cause side effects that decrease the quality of life of the cancer patient, including changes in coping, sleep, sexual health, appetite and bowel movement (THL 2021).

The most common side effect in cancer patients is fatigue and nearly every patient receiving cytotoxic chemotherapy suffers from it. A survey that included 1569 cancer patients receiving chemotherapy, 80% experienced fatigue and a survey that included 753 patients showed that majority of those patients felt that fatigue interfered with their physical performance. In the United States it is recommended to treat cancer-related fatigue by exercise (The American Cancer Society 2014), as a part of the cancer treatment plan (Berger et al. 2021).

In Finland, the effect of exercise on chemotherapy-related fatigue has recently been studied more (Liikunta: Käypä hoito –suositus, 2016). Lempiäinen, Jyrkkiö, Minn and Heinonen (2021) have released an article about the effect of exercise on prevention, treatment and rehabilitation of cancer which includes information on how exercise effects on cancer tumors, efficiency of cancer treatments and side effects. Health village has published general exercise guidelines for cancer patients to use if individualized exercise programs are not available (Terveyskylä 2021). In her master's thesis of cancer-related exercise Himberg (2020) did not find any Finnish studies concerning exercise interventions during cancer treatment or international recommendations of increasing exercise during cancer treatment, which has been used efficiently to ease side effects of cancer treatment or to increase the quality of life of cancer patients. By increasing the knowledge and importance of exercise and its positive effect on health condition and quality of everyday life, it strives to motivate cancer patients to exercise more to improve their health. (Heinonen, Lempiäinen,

Himberg & Rekunen 2020.) In Finland patients have fears towards exercise during cancer treatment and the illness (Himberg 2020), and prolonged fatigue in for example breast cancer patients reduces their quality of life by decreasing the functional ability, negatively affecting their working ability, and it is as well a highly untreated condition (Hsiang-Ping et al. 2019; O'Regan et al. 2017.)

Successful patient guidance increases the quality of life, mobility, well-being and adherence to treatment of the patient, and it should always be part of high-quality treatment (Pohjola-Katajisto 2008). Cancer patient guidance is based on individual needs and guidance should be given vocally and in writing (Parttimaa 2011). All cancer patients should receive information about fatigue, especially those who will receive chemotherapy. It is suggested that cancer patients meet professionals like physiotherapists to assess the need for exercise program and exercise guidance to reduce cancer-related fatigue. (Berger et al. 2021.)

This thesis is a development work, and it studies how exercise can help with the side effects of cytostatic treatment, focusing on fatigue. The authors participated in Cancer and exercise seminar where TYKS professionals spoke about physiological effects of exercise, ongoing studies, group rehabilitation and multiprofessionalism (Heinonen et al. 2020).

The purpose of this development work was to produce a video about the effects of exercise on chemotherapy-related fatigue for cancer patients. The content of the video consisted of the theory, which is based on the literature search. The aims of this video are to increase the patients' knowledge about easing chemotherapy-related fatigue with exercising and to encourage and motivate patients to exercise daily. This video strives also to teach health care professionals to guide patients about the benefits of exercise during chemotherapy treatment.

2 CANCER AS AN ILLNESS

2.1 Cancer care and treatment

Cancer is a generic name for a cluster of different diseases where damaged cells mutate into malignant and start to increase in body. Cancer is a fairly common disease. Every third Finn will be diagnosed with cancer at some point in their life. Risk for cancer increases with age, so when population ages the number of new cancer cases rises. (Kaikki syövästä – Mikä on syöpä? s.a.) With better treatment options the amount of cancer-related deaths only increases a little. A common measure used to evaluate the cancer survival rate is a relative survival rate, which measures the amount of cancer patients who are alive for example 5 years after diagnosis. Currently the relative survival rate for male cancer patients is 67% and for female cancer patients 69%, in Finland. (Seppä 2016.)

Development of cancer, also called carcinogenesis is a process where the damaging of cell's genetic material causes the cell to mutate into malignant. The malignant mutation is a multi-staged process. Copying of building materials that happen in cell division are controlled by certain hereditary factors, genes. If this signal system stops working, the cell will mutate into endlessly self-copying cancer cell. Regulatory mechanism of body is not capable of preventing the reproduction of cells anymore and cancerous cells start to conquer living space. (THL 2020; Joensuu et al. 2013.) Cancer treatment has been developing constantly over the past few decades and results of treatment in Finland are good based on international evaluations. Almost two thirds of all cancer patients are alive five years after initial cancer diagnosis. (Suomen Syöpärekisteri 2020.)

Surgery is a primary treatment option for many solid cancer tumours. Cancer tumour and some healthy tissue around the tumour is surgically removed and that prevents local spread. Cancer surgery can be the only treatment, but usually radiation therapy and/or pharmacological treatment such as chemotherapy is used also. Combination treatment is needed to avoid the spread of single cancer cells that cannot be prevented by only using surgical treatment. (Kaikki syövästä - Syövän leikkaus s.a.)

Radiation treatment is commonly used to treat cancer. The treatment uses high energy ionizing radiation, so called radioactive radiation. Radiation treatment is an important localized treatment method for cancer. Radiation treatment can be given externally with a radiation treatment machine or internally by inserting the source of radiation into the body one way or another. (Kaikki syövästä – Sädehoito s.a.) In some cancers cancer cells use body's own hormones to grow, and hormonal cancer treatment is based on preventing this action by eliminating hormones that are vital for those cancer cells. For example, hormone therapy that eliminates oestrogen may cause menopause like symptoms. Those symptoms can be eased. (Kaikki syövästä – Muut syövän hoitomuodot s.a.)

There are many different biological treatment options, meaning biological cancer medications can for example prevent enlargement of blood vessels or prevent the function of a specific gene in cancer cell. Biological cancer medications only impact cancerous cells, which means there are less side effects compared to other cancer treatment options. Biological treatment is usually combined with chemotherapy or hormonal therapy. Biological treatment is not a suitable treatment method for all cancers. (Kaikki syövästä – Muut syövän hoitomuodot s.a.)

Chemotherapy or cytostatic agents are medications that destroy cancer cells. Cytostatic agents prevent the dividing of cells and by doing that, cause cancer cells to die. Cytostatic agents spread all over body via blood stream and effect all dividing cells including healthy tissue. Cancer cells usually divide faster than healthy cells which makes cancerous cells very sensitive to cytostatic agents. Effects of chemotherapy in healthy cells are minor and healthy cells tend to recover more rapidly. Chemotherapy is still a very common treatment option for cancers even though the use of cytostatic treatment has decreased slightly. Usually, patients are given a combination of multiple different cytostatic medications that have different impacts. Efficiency of chemotherapy depends on for example the type, size and growth rate of the tumour. Chemotherapy can be given as PO tablets or IV infusions. Sometimes the medication can be given locally to for example lung sack, urinary bladder or spinal canal. I.v. infusions are usually given in hospital setting, but patients can go back home after treatment sessions. Treatment regimens are normally given every three to four weeks. (Kaikki syövästä – Solunsalpaajat eli sytostaatit s.a.) This way cancerous cells do not have time to recover, but healthy tissue does. Chemotherapy requires precise monitoring of blood values. (Kaikki syövästä – Solunsalpaajat eli sytostaatit s.a.; Mustajoki, Alila, Matilainen, Pellikka & Rasimus 2018.)

Progression of some cancers might be so slow that patient's situation will be monitored for a while before the most suitable treatment method is chosen. New treatment options include antibodies and specific drugs that only affect the malignant cancer tumour. Goal with these treatment options is to reduce treatment-related side effects. Different treatments are commonly combined for best possible results. (Iivanainen, Papinaho, Karlsson, Silvoniemi & Tukiainen 2016.) Selection of treatment depends on for example of the type of cancer, how much the cancer has spread, patient's general well-being and patient's age. Every patient's cancer treatment is individually planned, which means there may be differences in treatment between patients with same type of cancer. (THL 2021.)

There are a lot of alternative cancer treatment options available, but there is no evidence of efficiency or safety of those treatments. Usually, alternative treatments are products or

antioxidants of health food stores, vitamins and trace elements. Per se safe natural products can change the effectiveness of medications used in cancer treatments. It is important that patient discloses to the attending physician what kind of natural products and/or alternative treatments he/she is using or is allowed to use during the cancer treatment. (THL 2021.)

2.2 Chemotherapy-related fatigue

Cancer treatments and cancer itself may cause side effects. These are problems that occur when the disease or the treatment affects healthy tissue or organ. Side effects are always individual, and people experience symptoms differently. Cancer treatment may have several different side effects, such as anaemia, bowel symptoms, hair loss, swelling, mouth and throat problems, pain, sexual and reproductive issues in both male and female, nausea, insomnia and fatigue. (National cancer institute s.a.)

Cancer-related fatigue is the most common and distressing symptom reported in cancer patients. National Comprehensive Cancer Network (Berger et al. 2021) defines cancer-related fatigue as subjective, persistent sense of physical, emotional and/or cognitive tiredness due to cancer or cancer treatments that is not proportional to recent activity and interferes with daily activities. It may worsen the experience of other symptoms, affect to mood negatively, make it difficult to carry out daily activities and lower the quality of life (Bennett et al. 2016). Fatigue is a very underdiagnosed and undertreated symptom (Berger et al. 2021). Patients can experience fatigue during and after chemotherapy, and the symptom may be present long after completing treatment (Zhang, Li, Zhang, Yu & Cong 2016). A usual complaint from example breast cancer patients is that they feel more fatigued as the treatment progresses, which is an issue for a patient, since usually breast cancer patients are in relatively good health otherwise (Herath, Peswani & Chitambar 2016).

2.3 Cancer patient guidance

Successful patient guidance increases the quality of life, mobility, well-being and adherence to treatment of the patient, and it should always be part of high-quality treatment. Patients have a right to get best possible information. Sickness and crisis can weaken the patient's ability to receive information and that might affect the outcome of guidance. Patient's motivation, knowledge and skills play a big part in how successful the guidance will be and the individual significance of the topic of the guidance is also a meaningful part of a successful guidance. When guiding a patient, it is important not to give too much information at once.

That might lead to patient missing the most essential thing. Focusing on the most important issues and iterating will help the patient to remember the things better. (Lipponen 2014.)

Cancer patients need information and guidance about their disease and treatment options to be able to take responsibility of their own care. Cancer patient guidance is based on individual needs and guidance should be given vocally and in writing. When a patient is unable to ask for guidance, health care professionals should give information and guidance spontaneously. (Parttimaa 2011.)

"Cancer patients receive rather little information considering cancer and chemotherapy-related fatigue and how to relieve it" (O'Reagan & Hegarty 2017). Haavisto (2021) said that during her cancer treatment, the oncologist had guided her to cycle with exercise bike at least 15 minutes every day and considering individual resources exercising as much as possible was recommended. Physiotherapists gave guidance on how to keep your body moving while bed rest and emphasized the positive effects of exercise. Registered nurses cheered when they saw a patient up and moving in cancer ward but did not guide or encourage patients to exercise. Haavisto (2021) was not informed about any possibilities of guided exercise.

All cancer patients should receive information about fatigue, especially those who will receive chemotherapy. It is suggested that cancer patients meet professionals like physiotherapists to assess the need for exercise program and exercise guidance. In United States there is a program that provides certification for professionals working with cancer patients and it also has exercise guidelines for cancer patients. Research that consists of 113 studies with 11525 cancer patients found that from nonpharmacological treatment exercise reduces fatigue better than pharmacological treatment. (Berger et al. 2021.)

"Educational interventions may help people to manage this fatigue or to cope with this symptom and reduce its overall burden. Despite the importance of education for managing cancer-related fatigue there are currently no systematic reviews examining this approach." Stating that there is an effect in overall fatigue with informational intervention in comparison to conventional care. Exercise should be recommended with caution in case the patient has any of the following conditions: bone metastases, fever, active infection, anaemia, thrombocytopaenia, limitations secondary to metastasis or other comorbidities, post-surgery or safety issues, such as fall risk et cetera. (Berger et al. 2021.)

3 EXERCISE WITH CANCER-RELATED FATIGUE

3.1 Description of the literature search

The literature search for this development work was conducted in January 2021 to produce data for the development work product (video). First the research question for the literature search was determined (Pursell & McCrae 2020). The material was retrieved from two international databases; Cinahl and Cochrane, with one article discovered from a seminar the authors took part in the beginning of the development work project. The database keywords consisted of words related to cancer, chemotherapy, exercise and fatigue. The keywords considering cancer were cancer OR neoplasms, keywords used considering chemotherapy were chemotherapy OR chemo, keyword used considering exercise was exercise, and keywords used considering fatigue were fatigue OR tiredness OR exhaustion OR lethargy. The keywords were approved by Savonia UAS information specialist. The search was limited to scientific, peer-reviewed articles published between the years 2010-2021, written in English or Finnish (Table 1.).

Question guiding the research:

How does exercise reduce chemotherapy-related fatigue?

Search terms: ("cancer" OR "neoplasms") AND ("exercise") AND ("fatigue" OR "exhaustion" OR "tiredness" OR "lethargy") AND ("chemotherapy" OR "chemo")

Table 1. Description of information retrieval

Data-base	Search terms	Restrictions	Articles found	Chosen articles
Cinahl	("cancer" OR "neoplasms") AND ("exercise") AND ("fatigue" OR "exhaustion" OR "tiredness" OR "lethargy") AND ("chemotherapy" OR "chemo")	Language: English Period of publication 2010-2021 Peer Reviewed Apply equivalent subjects	214	10
Cochrane	("cancer" OR "neoplasms") AND ("exercise") AND ("fatigue" OR "exhaustion" OR "tiredness" OR "lethargy") AND ("chemotherapy" OR "chemo")	Language: English Period of publication 2010-2021 Database of systematic reviews	10	1
Manual search	Source from Syöpä ja Liikunta -seminar presentation		1	1
Com-bined				12

The searches from two databases and one other source generated 225 sources. The inclusion criteria for chosen articles were peer-review, apply equivalent subjects (Cinahl) and an answer to the research question. The exclusion criteria were articles concerning paediatric patients, patients not receiving chemotherapy, full text not available, and articles that did not answer the research question. The article selection was carried out gradually based on title, abstract and full text. 56 articles were selected based on title, and 28 articles based on abstract. From these articles, we selected 12 by full text (Figure 1.).

A table of these articles was made, including information on authors, year of publication, country of origin, purposes and aims of the study, study method, data acquired and studied, main conclusions and database (Appendix 1). Before tabulation the selected articles were read several times. The descriptive literature search described above was also conducted by the supervisor of this thesis, and the conclusion of the chosen articles was done in co-operation.

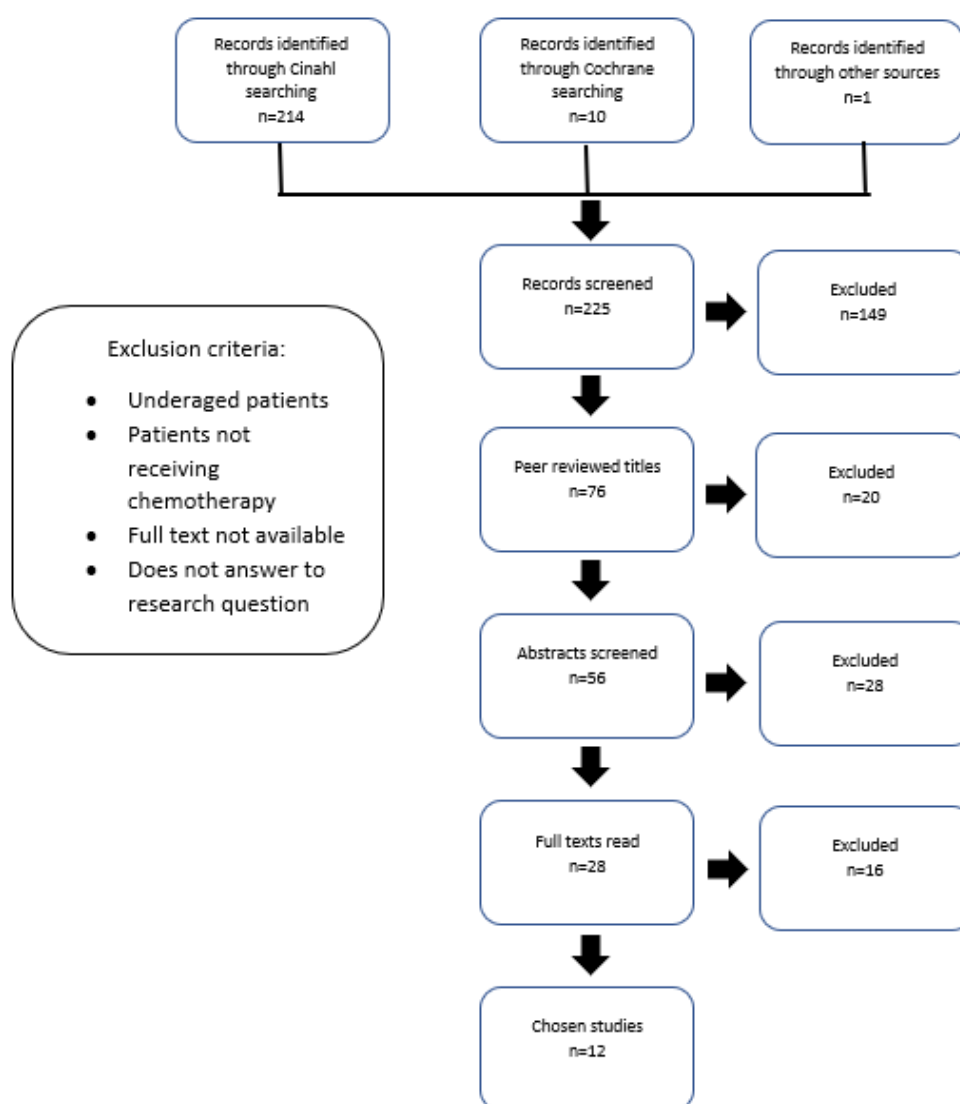


Figure 1. Literature search process

The analysis of the literature search was used for data analysis. The findings from the literature search were classified to 4 categories (Figure 2.): category number 1, guided exercise; category number 2, guided exercise combined with home-based exercise; category number 3, only home-based exercise; and finally category number 4, exercise as a part of several self-care strategies. There was a clear difference in results if the exercise was guided or home-based. However, fatigue is an extremely subjective sensation, and measuring fatigue and its different aspects may be challenging. Studies used in this thesis have followed precise protocols to assess the fatigue of the patients studied.

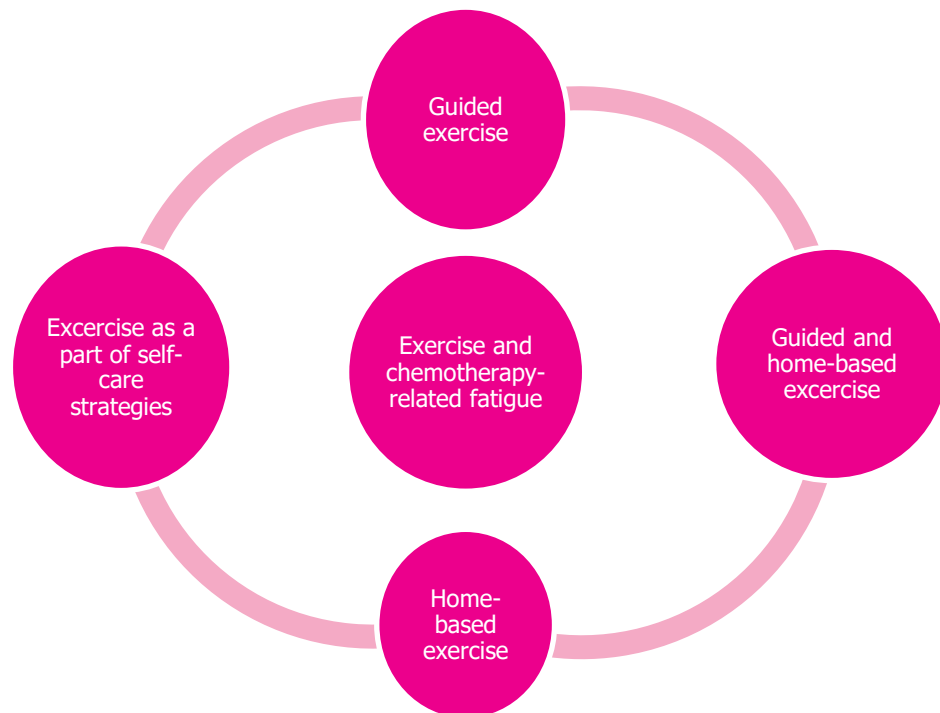


Figure 2. Categories of the literature search

3.2 Guided exercise

Guided aerobic and resistance training, such as cycling or walking either outdoors or on a treadmill, decreased cancer-related fatigue in women with ovarian cancer and breast cancer (Zhang et al. 2016; Kirkham et al. 2020). Guided exercise is effective in reducing chemotherapy-related fatigue (Zhang et al. 2016; Wengström et al. 2017; Kirkham et al. 2020). Patients who do not exercise regularly during chemotherapy may experience a greater worsening of symptoms, such as fatigue (Kirkham et al. 2020). To this day, this is the first trial to compare a guided home-based exercise regimen with cognitive behavioural therapy, striving to help women with ovarian cancer to decrease cancer-related fatigue, depressive symptoms and improve the quality of sleep (Zhang et al 2016). However, recent controlled trials have studied high-intensity training and showed that high-intensity exercise is superior to low or moderate intensity exercise, as well as concluded that exercise is a safe and

well-tolerated intervention to patients undergoing chemotherapy and to cancer survivors (Wengström et al. 2017).

3.3 Guided and home-based exercise

Aerobic and muscle resistance training as a combination of home-based and guided exercise reduced fatigue significantly in colon cancer patients and breast cancer patients, especially during chemotherapy (Van Waart et al. 2015; Van Vulpen et al. 2016; Gebruers et al. 2018). Resistance training was effective in improving fatigue in both home-based and guided exercise settings (Gebruers et al. 2018). High-intensity exercise during chemotherapy has a beneficial effect on fatigue. Exercise intervention sustained the positive effect on fatigue and other aspects studied during chemotherapy, but after completing the treatment, patients experienced similar levels in fatigue than they did pre-chemotherapy. Moderate to high-intensity exercise was more effective in reducing the fatigue levels than low-intensity exercise. (Van Waart et al. 2015.) Patients who exercised experienced less fatigue than patients who did not exercise, and the difference was maintained after the treatment as well. Mental fatigue was greater in patients who did not participate in the exercise programme, compared to the exercising patients. Additionally, the exercise group reported significantly higher levels of physical functioning than the usual care group. (Van Vulpen et al. 2016.) There is evidence present showing that training programmes improve the quality of life of cancer patients. This is significant, since quality of life is a common measure used in oncological studies. (Gebruers et al. 2018.)

3.4 Home-based exercise

Patients with breast cancer or colon cancer had reduced fatigue levels with home-based aerobic exercise programs with low and moderate intensity (Herath et al. 2016; Hsiang-Ping et al. 2019). Fatigue levels during chemotherapy reduce with exercise as well in overweight patients, and remain stable, even if patient stops exercising during chemotherapy (Herath et al. 2016). In one study home-based low intensity exercise had no impact on chemotherapy-related fatigue levels in patients with breast cancer, whereas guided, moderate level exercise had a positive effect on CRF (Van Waart et al. 2015). Patients who had been exercising before the diagnosis experienced less fatigue than patients who did not initiate in physical activity (Hsiang-Ping et al. 2019). Patients who exercised during chemotherapy experienced a worsening of the fatigue, but the level of worsening was greater in patients who did not exercise than in those who did, and lesser of those who exercised experienced this worsening compared to the patients without exercise (Herath et al. 2016). Exercise relieves fatigue even when the patient exercises less than the designed programme prescribe. The increased muscle strength resulting from regular physical activity can possibly reduce cancer treatment induced fatigue. Low activity levels and stationary

habits cause muscle catabolism, which makes cancer-related fatigue a self-retaining condition. However, the studied patients' fatigue levels fluctuated in different stages of treatment, and this association has been noted in previous studies. This aspect may help in developing more tailored programmes for cancer patients in the future. (Hsiang-Ping et al. 2019.)

3.5 Exercise as a part of self-care strategies

Level of fatigue in patients with breast cancer, Hodgking's lymphoma, non-Hodgking's lymphoma and other primary cancers was reduced in the combination of self-care strategies including exercise (Furmaniak, Menig & Markes 2016; Mustanian et al. 2017; O'Reagan et al. 2017; Junga & Man-Gyoon 2020). The most beneficial health effect on breast cancer patients was moderate to high intensity aerobic, resistance or combined training interventions (Junga & Man-Gyoon 2020). Different self-care methods are more effective in managing chemotherapy-related fatigue than pharmaceutical options (Furmaniak et al. 2016; Mustian et al. 2017). Exercise and psychological interventions are useful and effective in managing chemotherapy-related fatigue, and physicians should prescribe more physical activity during chemotherapy (Mustian et al. 2017). Exercise should be perceived as one self-care strategy that probably results in decreased chemotherapy-related fatigue (Furmaniak et al. 2016). Exercise is an effective, low-cost intervention to relieve fatigue in chemotherapy patients (Mustian et al. 2017). The more frequent the exercise is, the more it seems to relieve fatigue, there was also a connection between exercise and the relief of cognitive mood fatigue (O'Reagan et al. 2017). Breast cancer patients wish to know specific physical activity instructions and guidelines, both to improve their health and to help the on-going medical treatment, so it is important to provide evidence-based instructions and guidelines to cancer patients (Junga et al. 2020).

Educational interventions in treatment of cancer-related fatigue seem to have a small effect on reducing the fatigue itself, as well as its intensity and interference with daily life. The interventions used may also reduce anxiety felt about the disease and its symptoms and improve the overall quality of life, but it is unclear what kind of effect they have on depressive symptoms or activities in daily life. In conclusion, it seems beneficial to use educational interventions in the treatment of symptoms related to cancer treatment. However, educational interventions on their own are unlikely to improve the level of fatigue or help patients to manage its impact and should be considered to be delivered together with other interventions, (Bennett et al. 2016) like physical activity guidance from the Pohjois-Savon Syöpäyhdistys. (Pohjois-Savon Syöpäyhdistys s.a.)

4 THE PURPOSE AND THE AIMS OF THE DEVELOPMENT WORK

The purpose of this development work was to produce a video about the effects of exercise on chemotherapy-related fatigue for cancer patients. The content of the video consisted of the theory which is based on the literature search. The aims of this video are to increase the patients' knowledge about easing chemotherapy-related fatigue with exercising and to encourage and motivate patients to exercise daily. This video strives also to teach health care professionals to guide patients about the benefits of exercise during chemotherapy treatment.

5 IMPLEMENTATION OF THE DEVELOPMENT WORK

5.1 Theoretical description of the development method

The development work produced a video targeted to cancer patients receiving chemotherapy. The video presents ways to alleviate chemotherapy-related fatigue using exercise as an intervention in a motivational way. The content of the video was based on the literature search of cancer care, chemotherapy and side effects of chemotherapy, chemotherapy-related fatigue and exercise as an intervention. The literature search is described in the theory part and conducted by authors and by the supervisor. The results of the literature search were categorized by using the inductive content analysis, in four different categories, based on each research article's results (Elo & Kyngäs 2008).

As the video is targeted at cancer patients, it is integral that the video is easy to understand and that it maintains the audience's attention (Miettinen & Utriainen 2016). Making a holistic and aesthetic video requires a well-written and planned script (Kuokkanen 2019). The information of the video is presented in both written and spoken form, including subtitles. The visual implementation of the video follows partly one patient's journey in cancer care, and partly several clips of various actors. Creating a story visually draws the audience's attention and awakes feelings. The more a story awakes feelings in a viewer, the more likely they are to tell the story they saw forward. (Tolin 2018.)

The phases of creating the development work video (Table 2) commenced from creating a draft script and planning the voice lines. The next phases included creating were an exact plan of the video clips, making informational frames and voice-overs. The layout and the consistency of the video was tested with a demo video, and after that was accepted by the thesis supervisor, the video clips were filmed and the voice-overs recorded.

Table 2. The phases of creating a development work video

<i>Phase</i>	<i>Content of the phase</i>
Phase 1	Draft the script and plan the lines of the actors and voice-over
Phase 2	Plan the video clips and the length of the clips
Phase 3	Create the informational frames of the video (powerpoint, word)
Phase 4	Create demovideo
Phase 5	Film the planned clips
Phase 6	Record the voice-over
Phase 7	Edit, subtitle

5.2 Development work implementation

The process of creating the video took place in April and May 2021. The crucial part of beginning the video-making process was to gather the theoretical information and format it to a comprehensive form. The video is sectioned similarly to the literature search results (Figure 2). It describes the aims of the development work, the definition of fatigue in cancer care and chemotherapy, the different forms of exercise based on the descriptive literature review, and finally a conclusion and the contact information to the collaboration partner Pohjois-Savon Syöpäyhdistys. After the literature search was completed, actors and actresses were recruited from friends and family. The authors took part in acting and voice-overs as well. The script and the lines of the video were drawn. The exact lines for voice-over were planned and written before proceeding to filming. After the script was in order, the informational frames were created using Microsoft PowerPoint. The visual video clips were filmed on several different occasions. After creating the content and gathering the materials, the video was edited to its final form. As the last step the subtitles were added. The length of the video set to be 6 minutes and 42 seconds. Photos in the video were collected from the authors' photo libraries and are all taken by the authors. Teosto and Gramex licences have been bought for the background music of the video.

5.3 Development work piloting

The piloting of the video was conducted in several different occasions during webinars and online trainings that authors participated in. The thesis video was piloted with working life partner, Pohjois-Savon Syöpäyhdistys. Written feedback was received orally and via emails. The video was described to be motivational and inspirational to cancer patients and the layout of the video was clear and was stated to be a concrete tool for patients.

In March 2021, there was "Hyvinvointia syöpää sairastavan arkeen" -webinar, where multidisciplinary professionals, the authors and a cancer survivor gave short presentations about the subject. The audience (n=195) consisted of professionals, the public, students and everyone interested. The webinar was organized by Savonia UAS and Pohjois-Savon Syöpäyhdistys. In the meeting the authors spoke about chemotherapy-related fatigue and exercise as an intervention in treating chemotherapy-related fatigue.

In April 2021, there was a meeting with Kuopio University Hospital personnel where the authors gave a presentation further explaining the thesis process, literature search and its results, how videos can help with patient guidance and the ideas for the thesis video.

In June 2021, the video was presented for the first time in a webinar of personnel from Pohjois-Savon Syöpäyhdistys, Suomen Syöpäyhdistys, personnel from different university hospitals in Finland, as well as lecturers from different universities of applied sciences in

Finland. The collected oral feedback from the audience of the webinar stated that the video was well constructed, with clear presentation, a good layout and expressed positive attitude. The third piloting was completed with nurses of university hospital in an event where the authors presented the video. The purpose of this event was also to increase nurses' knowledge about easing chemotherapy-related fatigue with exercising and encourage nurses to motivate patients to exercise during treatment. Nurses were able to ask questions and give feedback, which was similar to the previous statements. After completing piloting, the product was evaluated by the authors and the supervisor, and the subtitles were added to the video. The authors wanted the video to reach as many cancer patients as possible, and adding the subtitles was one way to broaden the audience, not only relying on an oral presentation, but to add the written part as well.

These meetings and webinars were crucial, as they gave a comprehensive and holistic introduction and basis to the subject. They formed a meaningful and interesting ground to start working on the development work process. It also gave a tangible touch to working life context during the development work process. The authors got to meet the field's professionals, the ones who carry out daily care to our target audience, as well as personnel, who conduct research and utilize the results of the studies to everyday care work.

6 DISCUSSION

6.1 Ethicalness and reliability

This development work was completed following the ethical principles of research work. The integrity, meticulousness and accuracy were taken into consideration in each step of the process. All selected materials have gone through a careful and exact screening to ensure that the sources are trustworthy, valid and ethically sustainable. (Finnish Advisory Board on Research Integrity TENK 2012.) The material has been collected from sources from the health care databases, cited and referenced according to Savonia University of Applied Sciences criteria (Savonian opinnäytetyöryhmä 2021).

The authors have strictly followed the guidelines of ethics by the Rectors' Conference of Finnish University of Applied Sciences Arene (2020). The guidelines for thesis also state an ethical checklist for a student completing thesis work. This checklist has been taken into action by following the instructed guidelines throughout the thesis process. The checklist was studied in the beginning of the thesis process, and the authors have received guidance during the research process, ensuring that the ethical aspects of the research process have surely been taken into account. The authors acquainted themselves with ethical aspects prior and during the research process. There was no conflict of interest, and plagiarism, practical and ethical aspects of the thesis process were discussed with the supervisor in the beginning of the thesis process. (Arene 2020.)

Before starting the thesis process the authors also met client representative to ensure everyone had the same purpose, aims and timetable for the project. This cooperation was carried out throughout the process. The authors do not have personal experience on the subject and have not made any conclusions beforehand. Therefore, the research has been done objectively. Research group, meaning the two authors, get along well, everything has been done in good spirit and the authors have been considerate towards personal information. (TENK 2012.) Research permits and ethical evaluation were not needed, since personal information was not used (Arene 2019). In the video making process, proper licences for the music used in the video have been bought according to the law (Musiikkiluvat s.a.).

As the development work is not a research method on its own, the reliability of this development work is evaluated by the used methods (Kananen 2012). The production of the video is based on the literature search (chapter 3.1), and the development of the video is described in the previous chapters above. The literature search was carried out following the guidelines of Elo & Kyngäs (2008). The aspects that affected the quality of the study were the challenge of the formation of the content analysis categories. The results of the

chosen articles on physical exercise were based on the physical activity. This formation was used when creating the main categories. (Figure 2.)

In the beginning of 2021, we were informed by the supervisor about the possibility to apply for a scholarship offered by Pohjois-Savon Syöpäyhdistys. On 15th of April, we got a response from Pohjois-Savon Syöpäyhdistys stating that we have been granted a scholarship of 4000 euros for our thesis and we could not be more grateful and honoured.

6.2 Evaluation of the video

The aim of this thesis was to produce an informational video targeted to patients with cancer. We researched the subject widely to provide an adequate and motivational video presentation to patients, which would be easy to understand and approach. The content of the video was based on the literature search to produce relevant and reliable information, as it is a fairly new subject to be studied in Finland and in Nursing Science (Liikunta: Käypä Hoito-suositus, 2016). In our opinion the final video is well produced, and it has all the elements we originally wanted. The video is motivating and fun. An important factor for us was to make a video that is not boring and holds the viewer's interest. We believe we succeeded in that. Getting the video's point across without using complicated language or repeating the same thing over and over again was quite challenging.

Developing and compiling the video included some strengths and a few challenges. The theoretical knowledge behind the subject was important during the video process. The teamwork was productive during the video making process, every member had their own field of expertise that could be utilized in the video process, for example good acting and vocal skills, creating a plot, good editorial and IT skills, and an eye for aesthetics. This ensured that all the aspects in the video making process could be taken into account, thus creating a high-quality informational video with a meaningful cause. The thing that felt challenging during the video was how to turn the academic knowledge and literature research results to a comprehensible form to the audience. It had to be taken into consideration what the target audience already knows about the subject and carry on to our subject from that point. (Kuokkanen 2019.) With teamwork and assistance from our supervisor we got over that challenge as well. The video will be used in the activities and events organized by Pohjois-Savon Syöpäyhdistys to promote exercise interventions during chemotherapy. The aim of the thesis was reached.

6.3 Learning experiences of the development work

The topic was chosen as it offers a great opportunity to work together with a community to increase the wellbeing and awareness of patients, clients, personnel and students. Thesis

was done in cooperation with Pohjois-Savon Syöpäyhdistys personnel. Partner organizations were Savonia UAS and Pohjois-Savon Syöpäyhdistys, with close cooperation of FICAN East and KUH.

Writing the thesis from the nursing point of view deepened our skills and knowledge in several subjects of the competence requirements in nursing. To reflect on the thesis process according to the curriculum goals of thesis work by Savonia UAS, we succeeded in producing a thesis and choosing a suitable subject that shall support the professional growth towards graduating as registered nurses. We paired with a working life partner and produced a work that was wished and suitable for the working life partner, Pohjois-Savon Syöpäyhdistys. The cooperation felt fluent and adequate. (Savonia UAS 2018.)

The thesis process also gave valuable experience and knowledge on evidence-based practice. We studied and worked with studies and articles that concerned testing hypotheses in practice, making their results and findings evidence-based. Evidence-based practice is rather integral in the nursing field. We also strengthened our ability to guide and teach patients. Making an informational video required us to study in detail on how to get your message across, and what are the most effective ways on guiding and teaching. Creating an informational video requires a thorough and accurate research of the subject, as well as properly understanding the subject the authors are making content of. This way the final product is also accurate and informative, and the target audience is able to utilize the final product in a correct manner. Participating in the previously mentioned webinars also gave valuable insight on teaching and guidance. Evidence-based information was used in the form of several different types of studies and materials and form a logical and holistic report on the thesis. The evaluation of the thesis process was done according to goals and instructions, but perhaps could have been more comprehensive. The authors have taken the maturity test, as according to Savonia University of Applied Sciences states. (Savonia UAS 2018.)

As for the professional development this thesis process taught us client-centeredness, how to include the patient/client into their own care, to utilize the experience of the patient in their own care, and to support the participation of the family of the patient into the care. The process also strengthened our knowledge in ethical knowledge in nursing field, by conducting thesis research with good ethical protocol. Writing the thesis also developed our skills in making research and taking the ethical aspects into consideration. The process also taught us academic writing and information retrieval. The sources had to be retrieved from several different databases, which developed our informational skills. Theoretical part of the thesis required us to summarize the most important message of each study and article,

which was beneficial in learning academic writing and finding the key points in academic text.

Neither of us had conducted a literature search prior to the development work. Categorizing the results of the literature search was challenging. We looked at the subject from a patient-centered point of view, which gave a challenging aspect to go through rather academic articles. Finding a way to categorize the results and take both of these aspects into consideration was challenging, but successful with teamwork. The support of the thesis supervisor has been indescribably integral and valued at all stages of the writing and development process. Defining wide but specific enough search terms ensured that the most exact and relevant materials were found to be used in the development work (Editage 2017). Filtering through the reviewed materials was also challenging, but it gave a thorough understanding of the subject and what is being researched at the moment in the field.

Since cancer is a national health issue, we gained a lot of valuable information on preventing and treating cancer with the use of promotion of health and functional ability. Exercise being one of the corner stones of high-quality health promotion, this thesis discusses the subject widely, thus teaching us on promoting people's health. This process also ensured our skills in providing high quality and safe health care services by handling different aspects of data security with assuming a responsible role in securing patient data. The thesis process deepened our clinical skills by familiarizing ourselves deeply with cancer care and different treatments, as well as non-pharmacological aspects of cancer care.

This thesis will be included in Savonia UAS Bachelor's Degree Programme in Nursing studies, specifically in medical nursing courses. The curriculum of medical nursing courses contains studies about cancer care (Savonia UAS 2018). Increasing nursing students' knowledge in exercise during cancer treatments contributes getting the information to workplaces and through that to cancer patients as well.

6.4 Applicability and future development ideas

Including exercise in cancer patient's care plan is rather new and rare in Finland (Heimonen et al. 2020). As the awareness and knowledge about exercise's benefit in cancer care increases, it may be beneficial to study further on how patients experience exercising during cancer treatment, and how the care personnel have accepted their new role in guiding physical exercise to patients (Richards 2015).

Applicability and future ideas of this development work is to show the video to patients who can give feedback as well. Questionnaire will be on a paper form. Questionnaire will contain questions about the visuals of the video, content and comprehensibility. After the

completion of the thesis, there will be a separate article written based on it for Savonia UAS and Pohjois-Savon Syöpäyhdistys. The video could also be used nationwide in any cancer care facilities.

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APPENDIXES

Article name	Author(s), year, country	Purpose and aim	Method	Data	MAIN results	Database
Effects of nurse-led home-based exercise & cognitive behavioral therapy on reducing cancer-related fatigue in patients with ovarian cancer during and after chemotherapy: A randomized controlled trial	China 2016 Zhang, Qi; Li, Feng; Zhang, Han; Yu, Xiuli; Cong, Yunfeng	"To investigate the feasibility of a nurse-led home-based exercise and cognitive behavioral therapy(E & CBT) for ovarian cancer adults with cancer-related fatigue on outcomes of fatigue, plus other secondary outcomes (sleep disturbance and depression), either during or after completion of primary cancer treatment"	Randomized, single-blind control trial.	72 eligible women who recently had surgery and completed their first cycle of adjuvant che-motherapy (were randomly assigned to two groups.)	"Nurse-delivered home-based E & CBT have measurable benefits in helping women with ovarian cancer to decrease cancer-related fatigue"	Cinahl
Optitrain: a randomised controlled exercise trial for women with breast cancer undergoing chemotherapy	Sweden 2017 Wengström, Y.; Bolam, K. A.; Mijwel, S.; Sundberg, C. J.; Backman, M.; Browall, M.; Norrbom, J.; Rundqvist, H.	"The primary aim of the study is to investigate and compare the effects of two different exercise regimens on the primary outcome cancer-related fatigue"	Randomized controlled trial/ STUDY PROTOCOL	"240 women with breast cancer receiving chemotherapy in Stockholm, Sweden"	Not completed at the time of thesis writing	Cinahl

Chemotherapy-periodized" Exercise to Accommodate for Cyclical Variation in Fatigue	Canada 2020 Kirkham, Amy; Bland, Kelcey; Zucker, David; Boward, Joshua; Shenkier, Tamara; Mckenzie, Donald; Davis, Margot; Gelmon, Karen; Campbell, Kristin	"The purpose of this study was to provide a rationale for "chemotherapy-periodized" exercise by characterizing cyclical variations in fatigue and exercise response across a chemotherapy cycle and comparing exercise adherence during chemotherapy between a prescription that is periodized according to chemotherapy cycle length and a standard linearly progressed prescription"	Randomized controlled trial	"Women with breast cancer who were prescribed taxane-based chemotherapy were randomly assigned to a supervised aerobic and resistance exercise program after a chemotherapy-periodized exercise prescription (n = 12) or to usual care during chemotherapy (n = 15). Fatigue and steady state exercise responses were assessed in both groups before the first taxane treatment and across the third treatment (i.e., 0–3 d prior and 3–5 d after the third treatment, and 0–3 d before the fourth treatment) to assess cyclical variations. Adherence to the chemotherapy-periodized exercise prescription was compared with adherence to a standard linear prescription from a prior study in a similar population (n = 51)."	"": Fatigue and exercise V' O2 vary across a chemotherapy cycle. A chemotherapy-periodized exercise prescription that accommodates cyclical variations in fatigue may increase adherence to supervised exercise."	Cinahl
Effect of Low-Intensity Physical Activity and Moderate- to High-Intensity Physical Exercise During Adjuvant Chemotherapy on Physical Fitness, Fatigue, and Chemotherapy Completion Rates: Results of the PACES Randomized Clinical Trial	The Netherlands 2015 Hanna van Waart , Martijn M. Stuiver , Wim H. van Harten , Edwin Geleijn , Jacobien M. Kieffer ,	"We evaluated the effectiveness of a low-intensity, home-based physical activity program (OncoMove) and a moderate- to high-intensity, combined supervised resistance and aerobic exercise program (OnTrack) versus usual care (UC) in maintaining or	"Randomized Clinical Trial"	"We randomly assigned patients who were scheduled to undergo adjuvant chemotherapy (N 230) to Onco-Move, OnTrack, or UC. Performance-based and self-reported outcomes were assessed before random assignment, at the end of chemotherapy, and at the 6-month follow-up. We used generalized estimating equations to compare the groups over time."	"OnTrack also resulted in better outcomes for muscle strength (P .002) and physical fatigue (P .001)." "A supervised, moderate- to high-intensity, combined resistance and aerobic exercise program is most effective for patients with breast cancer undergoing adjuvant chemotherapy. A home-based, low-intensity physical activity program represents a viable alternative for women who are	Cinahl

	Jeannette A.J.H. Hellendoorn-van Vreeswijk , Gabe S. Sonke , Neil K. Aaronson	completion rates in patients undergoing adjuvant chemotherapy for breast cancer.”		compare the groups over time.”	represents a viable alternative for women who are unable or unwilling to follow the higher intensity program.”	
Effects of an Exercise Program in Colon Cancer Patients undergoing Chemotherapy	The Netherlands 2016 van vulpen, jonna k.; velthuis, miranda j.; steins bisschop, charlotte n.; travier, noémie; van den buijs, bram j. w.; backx, frank j. g.; los, maartje; erdkamp, frans l. g.; bloemendal, haiko j.; koopman, miriam; de roos, marnix a. j.; verhaar, marlies j.; ten bokkel-huinink, daan; van der wall, elskan; peeters, petra h. m.; may, anne m	“Fatigue is a common problem among colon cancer patients and typically increases during chemotherapy. Exercise during chemotherapy might have beneficial effects on fatigue. To investigate the short- and long-term effects of an exercise program in colon cancer patients during adjuvant treatment, the Physical Activity During Cancer Treatment study was conducted.”	“randomized controlled trial”	“33 colon cancer patients undergoing chemotherapy (21 men and 12 women) were randomly assigned to either a group receiving an 18-wk supervised exercise program (n = 17) or to usual care (n = 16). The primary outcome was fatigue as measured by the Multidimensional Fatigue Inventory and the Fatigue Quality List. Secondary outcomes were quality of life, physical fitness, anxiety, depression, body weight, and	“Intention-to-treat mixed linear model analyses showed that patients in the intervention group experienced significantly less physical fatigue at 18 wk and general fatigue at 36 wk (mean between group differences, j3.2; 95% confidence interval [CI], j6.2 to j0.2; effect size [ES], j0.9 and j2.7; 95% CI, j5.2 to j0.1; ES, j0.8, respectively), and reported higher physical functioning (12.3; 95% CI, 3.3–21.4; ES, 1.0) compared with patients in the usual care group. The Physical	Cinahl

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Effects of Exercise Interventions on Breast Cancer Patients During Adjuvant Therapy: A Systematic Review and Meta-analysis of Randomized Controlled Trials	Korea 2020 Lee, Junga PhD; Lee, Man-Gyoon PhD	“We investigated the effects of exercise interventions on each measurement, physical fitness, quality of life (QL), fatigue, depression, anxiety, and body compositions and found effective exercise interventions during adjuvant therapy for BC.”	“A Systematic Review and Meta-analysis”	“Twenty-nine studies were found by searching the databases of MEDLINE and EMBASE from January 2000 to February 2018. Randomized controlled trials that investigated the effects of exercise on physical and psychological outcomes in BC patients during adjuvant therapy were selected in this meta-analysis. The size of the effect for each variable from the selected studies considered the method of measurement and was calculated using the standardized mean difference statistic. A total of 2989 BC patients were included.”	“Exercise interventions had positive outcomes in physical fitness, handgrip strength, QL, fatigue, depression, anxiety, self-esteem, % body fat, and body mass index. Exercise interventions were an average of 150 minutes, 3 times per week, for 17 weeks and consisted of moderate to vigorous (~60% of VO2peak), aerobic, resistance, or combined exercises. Interventions that involve moderate to vigorous exercise 150 minutes for 3 times per week and in any modality may provide a better outcome for BC patients during adjuvant therapy.”	Cinahl
Impact of obesity and exercise on chemotherapy-related fatigue	USA 2016 Kanchana Herath 1 , Namrata Peswani 2 , Christopher R Chitambar		-	“Female age 35–75 years with stage I-III breast cancer receiving adjuvant chemotherapy were enrolled in an IRB approved study. Patient fatigue was self-reported using a 14- question fatigue symptom inventory. Patients were queried about fatigue and their level of exercise before, during, and after completion of chemotherapy. BMI was measured prior to their first cycle of chemotherapy.”	“Of the 47 evaluable patients, 37 patients performed regular aerobic exercise. The average FS before chemotherapy in those who exercised and in those who did not exercise was 17 and 23, respectively. The average FS after completion of chemotherapy in the exercise group was 32 and in the nonexercise group was 52. A worsening of the FS from baseline was seen in 53 % of the aerobic exercise group versus 80 % of the non-exercise group. Of the patients	Cinahl

					with a worsening FS, the degree of worsening was greater in those who did not exercise compared to those who exercised (80 versus 35 %)."	
The effect of training interventions on physical performance, quality of life, and fatigue in patients receiving breast cancer treatment: a systematic review	Belgium 2018 Nick Gebruers , Melissa Camberlin, Fleur Theunissen, Wiebren Tjalma, Hanne Verbelen, Timia Van Soom , Eric van Breda	"The primary purpose of this systematic review is to structure the available evidence concerning physical exercise programs and their effects on (1) physical performance outcomes, (2) experienced fatigue, and (3) quality of life (QoL) in patients during the initial treatment for breast cancer."	"Systematic review"	"Finally, after the second screening, 28 RCTs were included in the current review. The selected studies represented a total of 2525 breast cancer patients."	"Overall, we can conclude that incorporating resistance exercises in both the supervised as well as home-based programs was able to reduce the perceived fatigue."	Cinahl
The importance of self-care for fatigue amongst patients undergoing chemotherapy for primary cancer	Ireland 2017 Patricia O' Regan, Josephine Hegarty	"To measure Cancer Related Fatigue (CRF), and explore fatigue self-care strategies used to ameliorate CRF amongst patients undergoing chemotherapy for primary cancer."	"This mixed methods study incorporated a quantitative, descriptive, comparative and correlation survey with an additional qualitative	"A consecutive sample of patients (n=362) undergoing chemotherapy with a primary diagnosis of breast, colorectal, Hodgkin's and non-Hodgkin's lymphoma cancers were recruited."	"CRF is a debilitating, complex phenomenon, therefore multiple CRF strategies should be used for the optimum management of CRF including exercise and socializing."	Cinahl

			descriptive component."			
The effect of a 12-week home-based walking program on reducing fatigue in women with breast cancer undergoing chemotherapy: A randomized controlled study	Taiwan 2019 Huang, Hsiang-Ping; Wen, Fur-Hsing; Yang, Tsui-Yun; Lin, Yung-Chang; Tsai, Jen-Chen; Shun, Shiow-Ching; Jane, Sui-Whi; Chen, Mei-Ling	"The purposes of this study were to examine short-term and long-term effects of an individually tailored, home-based brisk walking program on reducing fatigue in breast cancer patients under chemotherapy."	Randomized controlled trial	"women were recruited from a medical center in northern Taiwan if they were diagnosed with stages I-III breast cancer and experienced insomnia, fatigue, pain, or depressive symptoms after their first cycle of chemotherapy. Consenting participants (N = 159)"	"At the end of the 12-week exercise program, the exercise group had less fatigue than the attention-control group, and this group difference was maintained for the whole study period."	Cinahl
Exercise for women receiving adjuvant therapy for breast cancer	Germany 2016 Anna C Furmaniak, Matthias Menig, Martina H Markes	"To assess the effect of aerobic or resistance exercise interventions during adjuvant treatment for breast cancer on treatment-related sideeffects such as physical deterioration, fatigue, diminished quality of life, depression, and cognitive dysfunction."	Cochrane review (updated review from 2006 original review)	" a total of 32 studies with 2626 randomised women, 8 studies from the original search and 24 studies from the updated search"	"Exercise during adjuvant treatment for breast cancer can be regarded as a supportive self care intervention that probably results in lessfatigue, improved physical fitness, and little or no difference in cancer-specific quality of life and depression"	Cochrane
Comparison of Pharmaceutical, Psychological, and Exercise Treatments for	USA 2017 Karen M. Mustian, PhD, MPH, Catherine M.	"To perform a meta-analysis to establish and compare the mean weighted effect sizes (WESs) of the 4 most	meta-analysis	"From 17 033 references, 113 unique studies articles (11525 unique participants; 78% female; mean age, 54 [range, 35–72] years"	"Exercise and psychological interventions are effective for reducing CRF during and after cancer treatment, and they are significantly better than the	Other

Cancer-Related Fatigue A Meta-analysis	Alfano, PhD, Charles Heckler, PhD, MS, Amber S. Kleckner, PhD, Ian R. Kleckner, PhD, Corinne R. Leach, PhD, David Mohr, PhD, Oxana G. Palesh, PhD, MPH, Luke J. Peppone, PhD, MPH, Barbara F. Piper, PhD, John Scarpato, MA, Tenbroeck Smith, MA, Lisa K. Sprod, PhD, MPH, and Suzanne M. Miller, PhD	commonly recommended treatments for CRF— exercise, psychological, combined exercise and psychological, and pharmaceutical—and to identify independent variables associated with treatment effectiveness”			available pharmaceutical options. Clinicians should prescribe exercise or psychological interventions as first-line treatments for CRF.”	
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