

# **CANCER AND EXERCISE**

## **A TRAINING MANUAL FOR HEALTH FITNESS INSTRUCTORS**

**Christopher A. Goad**

ACSM, ACE

Cancer Exercise Specialist

**2004**

# **Cancer and Exercise: An online training manual for health fitness instructors**

Welcome to the Book!

**PLEASE READ THIS BEFORE YOU BEGIN!**

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## INTRODUCTION

This manual is meant to educate personal trainers on how to train a person living with cancer. It assumes that the person using it has an advanced understanding of training principles. It therefore will not describe basic training concepts—only those specific to training a person who has, or has previously had, cancer.

Before getting into the specifics, however, it is important to take a moment to consider the point of view of the personal trainer's prospective clientele. Imagine for a moment that you or someone you know has just received a diagnosis of cancer. What are the concerns that come to mind? When a decision is made to act, how much thought has gone into it? Imagine the number of new specialists you may come in contact with—all holding a piece of your life in their hands. Imagine your available dollars and where you are going to best invest them toward your goal of not just beating the cancer, but to getting through this overwhelming process with the least amount of suffering. Think of how many hours there are in a day, and decide how you are going to divide them up. Your old life didn't just stop—you may have a family and a job and relationships that still require the same time and attention, if not more.

As a personal trainer, now consider your client's relationship with you. After learning the specifics of training a person with cancer you will have a set of tools that have the potential of creating a positive and immediate effect not just in your client's day, but possibly in his or her life. You not only offer your client the physiological and psychological effects of exercise, which will be covered in detail in this manual, but you provide something even greater in importance, and much harder for the person with cancer to find: a sense of empowerment. So much happens *to* the person with cancer. The experience robs them of their power and control in a monumental way. Where will they regain their sense of control? What can *they* contribute that will provide an immediate sense of accomplishment, relief, and above all else, control? One of the most effective things they can do is **exercise**.

You will become an important player in the long list of specialists that the cancer patient comes in contact with. You will also have the unique advantage of spending a great deal of time with the person. Many visits with specialists are hurried and overwhelming to the patient—with so much new technical information being discussed. All the while the patient must struggle continually to understand what it means to him or her individually in the bigger picture.

Now that you have considered some of these factors, imagine the experience of walking into a new gym for the first time—not necessarily an easy thing to do for someone in the best of times. Suppose your only previous experience with exercise was a fruitless attempt to lose those 25 extra pounds that have been haunting you for the past several years. Now, thanks to the side effects of your treatment you have gained another 10 unwanted pounds. Perhaps you have lost some or all of your hair from your

chemotherapy. You might believe that being here will help you—you are not sure exactly how, but you hope it will. You are scared: is this going to be another overwhelming confusing meeting with yet another new specialist? Am I going to be able to do this? Are people looking at me? Do I look sick? Weak? Dying?

The point to consider from this is that as a trainer, you are going to have to have empathy. Put yourself in your client's shoes. Hear the words you speak with their ears. You know the ideal exercise program that would best benefit the person you are working with, but how are you going to get them to believe in and adhere to the exercise program you develop? How can you best meet them where they are at and guide them along the path to wellness?

Do not assume to know where your client is with their cancer diagnosis. You may be surprised. Ask a lot of questions. What does the term *exercise* mean to them? Would *activity* be a better word for now? What goals should you start with? What is reasonable? What is safe? How would the recommendations you make affect the person you are working with *right now*? How are you going to present your plan in a way that will keep the person with cancer motivated? Will they feel confident that they can do what you show them?

The information contained in this text is the culmination of extensive research from multiple sources with a strong foundation based on proven data and standard guidelines where those exist. It also has its roots in the opinion that designing an exercise program for the cancer patient must not only address physiological factors, but must also have a high degree of sensitivity to psychological factors. This integrative "Mind/Body" approach is meant to treat the person as a whole, which is essential if any type of treatment is to be effective.

One of the most challenging aspects of research on disease management in cancer treatment concerns the integration of psychological factors such as motivation and self-efficacy with the physical elements of exercise behavior and compliance. Motivating clients to adhere to an exercise program is a daunting task, even without all of the complications that the presence of cancer or the effects of the treatment of cancer create. The goal of this manual is to help you fully understand as best you can what happens to the person you are working with whose life has been affected by cancer so that you can design an exercise program that they can adhere to and truly make a difference in that person's life.

## **BENEFITS OF EXERCISE FOR THE CANCER PATIENT**

Several studies have examined the relationship between exercise, rehabilitation and quality of life in cancer patients and reported positive findings.

These studies have found that overall, exercise had a positive effect on physical and psychological functioning of cancer patients while in treatment. These benefits include the following objective and self-reported findings:

- Improved sense of control
- Increased functional capacity
- Decreased nausea and fatigue
- Decreased pain
- Improved natural defense mechanisms
- Increased lean muscle mass
- Decreased body fat
- Improved mood
- Improved self-esteem
- Self-reported improved quality of life

The full list of benefits associated with cancer and exercise is of course extensive and even as of yet not fully understood. As with any health decision, careful consideration must be given to the type of exercise engaged in, as improper exercise can also be detrimental to the cancer patient's health. It is your responsibility to completely understand these guidelines, and when in doubt about crucial decisions, seek the answers from the appropriately trained professionals.

## **WHAT IS CANCER?**

It is important to have a basic understanding of cancer and the procedures used to treat a person with cancer in order to effectively train a person with cancer.

Cancer is defined as a malignant tumor of potentially unlimited growth that expands locally by invasion and systemically by metastasis. (Metastasis generally means the spreading of cancer to other parts of the body beyond the location of the initial tumor or tumors.) Cancer can be divided into three main types: carcinomas, sarcomas, and hematological or blood cancers. A carcinoma is defined as a malignant tumor of epithelial origin. A sarcoma is defined as a malignant neoplasm arising in tissue of mesodermal origin (such as connective tissue, bone, cartilage, or striated muscle) that spreads by extension into neighboring tissue or by way of the bloodstream. The

hematological or blood cancers are cancers of blood cells including leukemias, lymphomas, and myelomas.

In addition to understanding what type of cancer a person has, it is important to understand the terminology used to stage a cancer, or to classify the degree of spread of a person's cancer. The staging of cancers has only recently become more uniform in the medical field. It is basically used to determine the extent of the tumor. It defines the size, the degree of growth and the extent of spread. The most common method of staging a cancer is by the **TNM** standard. **T** constitutes tumor size, **N** implies a spread of the cancer to the lymph nodes, and **M** tells whether or not a cancer has metastasized to other areas of the body (excluding lymph nodes). Cancers are staged differently from one cancer to another; so do not expect to understand this concept completely. The most important pieces to know regarding staging is that it is described on a scale from one to four, with one being the least advanced, and four being the most advanced. For the purpose of training a person with cancer, investigate the specifics of how the patient's current stage affects him or her personally. A person whose cancer has spread to the lymph nodes will often have some or several lymph nodes removed, which changes the type of program you will assign him or her. A person whose cancer has metastasized (spread to one or more additional parts of the body) is generally on more aggressive treatments, and may have additional pain and fatigue issues that a trainer will have to consider as well.

## **CANCER TREATMENTS AND EXERCISE**

The following section will break down the most common methods of treating the cancer so that you may understand how to best design an exercise program.

### **SURGERY**

The first step in many cancers is surgery or multiple surgeries. Common surgical procedures include:

- Tumor biopsies (usually the removal of a piece of a lump to test for cancerous cells)
- Tumor removal (which can often include removal of surrounding tissue as well)
- Surgical reconstruction
- Implantation of a port for administering chemotherapy or other IV medications
- Internal radiation implantation

Regardless of the reason for or the timing of the surgery, the trainer should understand how the surgery has affected the person's body so that the correct exercise recommendations can be made.

The trainer needs to be aware of the presence of scar tissue at the surgical site, as it often causes pain or discomfort. Surgeries leave scar tissue. Scar tissue is the result of the inflammation process following a surgery. It creates fibrous and collagenous tissue. Scar tissue is less pliable or flexible than normal tissue and can cause a feeling of tightness. If the surgery is on or close to a joint, it will often change the joint's range of motion. With gentle stretching and manipulation (such as massage), scar tissue can be broken up so that the affected tissue can begin to regain its original natural properties. Scar tissue can and often does reform, so it can be an ongoing process to maintain normal flexibility. Just remember to encourage your client to be gentle and avoid painful movements. Normal range of motion should be achieved before progressing to higher resistance (weights).

The activities you recommend should never cause or worsen pain. Establish a clear understanding and terminology that will allow you and your client to differentiate between pain and discomfort. A number system of 1 – 10 is often helpful, with 10 being pain (your program should never induce a 10!) When the client describes the discomfort as an 8, it is an appropriate time to discontinue whatever activity in which your client is engaging.

If the scar tissue surrounds a nerve, it can initially cause numbness and mild pain. As the scar tissue is broken up, the nerve sensation will return, often causing a new sensation of increased pain or discomfort. It may be helpful to warn your client of this ahead of time.

Depending on its location and severity, some scar tissue may interrupt certain bodily functions including eating, digestion, breathing, and blood flow. The possible surgeries that are performed for the treatment of cancer are extensive and continue to change as advancements in medicine are made. Ask questions regarding the types of surgeries that your client has had or is expecting to have. It is crucial that your client has been cleared for activity following or prior to any surgical procedure.

### **Surgery and exercise overview:**

- A physician's clearance is needed following a surgery
- Surgery can cause pain and discomfort
- Activity should never cause or worsen pain
- Surgery can cause scar tissue
- Scar tissue can be reduced by gentle stretching or massage
- Scar tissue can re-form

- Scar tissue can affect joint range of motion
- As scar tissue reduces around a nerve, the person may feel a new sense of pain or discomfort.

**Follow these basic guidelines when training a person who has had a surgical procedure:**

1. Get a physician's release prior to recommending activity.
2. Scar tissue can be broken up by the use of gentle stretching and light massage (referral to a trained massage therapist is recommended).
3. Establish terminology with your client to differentiate between discomfort and pain.
4. Normal range of motion must be restored before applying progressive resistance to a joint.
5. Research other effects of the surgery on the person and modify the program design appropriately.
6. If surgical procedure interferes with proper nutrition, recommend a nutritionist
7. Be proactive: find out what surgeries your client is scheduled to have.

## **CHEMOTHERAPY**

Chemotherapy is a general term for medications used to fight cancer. There are many classes of drugs used, the two most common being *cytotoxic chemotherapy* and *biological or immunological chemotherapy* (biotherapy or immunotherapy). Other types of drugs are used that will not be discussed here, so it is important to get a complete list of the medications your client is taking as well as their side effects. Also remember that the treatment plan for your client may change, so ***continue to ask*** what medications your client is on and their potential side effects, as they will sometimes affect how you train your client.

**Cytotoxic chemotherapy** kills or arrests the growth of cancer cells by targeting specific aspects of the cell growth cycle. However, normal healthy cells share some of these pathways and thus are also injured or killed by chemotherapy. This is what causes most side effects from chemotherapy.

Cytotoxic chemotherapy usually targets rapidly dividing cells. Some normal cells—including blood cells, hair, and cells lining the gastrointestinal tract—are also rapidly dividing and thus these are the normal cells most likely to be damaged. This type of chemotherapy may cause nausea and vomiting, hair loss, a depressed immune system,

fatigue, loss of appetite, changes in taste and smell, and mouth sores. Symptoms from chemotherapy tend to be cumulative.

**Biological therapy** is used to stimulate the body's own immune system to kill cancer cells. Biotherapy is a relatively new treatment based on the knowledge that the human body does have a defense against at least some types of cancer. When introduced into a patient's body, the person's immune system recognizes the drug and mounts a much greater response than it could on its own. Because these drug are proteins (or synthetic proteins) that are normally found in the human body, the effects are relatively less toxic than cytotoxic therapy. That is a very generalized statement, but these drugs can present a whole different group of side effects. The side effects of this type of treatment are generally the same, as one would expect to experience any time the immune system is called to action, such as with the flu. These flu-like symptoms may include fever, nausea and vomiting, loss of appetite, and fatigue. Other common side effect of biotherapy is chemically-induced cognitive impairment and emotional changes. With biotherapy, many side effects actually diminish over time even though the patient continues to receive the treatment.

The same chemotherapy can cause different effects on different people, and can change for the same person over time. It is therefore important to find out from your client how their chemotherapy affects them on an ongoing basis and make modifications in the exercise program when necessary.

### **Chemotherapy overview:**

- Chemotherapy is any medication used to fight cancer.
- Two most common classes include cytotoxic chemotherapy and immunotherapy.
- Chemotherapy has many potential side effects.
- Chemotherapy affects people differently; encourage your client to keep a journal of side effects.
- Exercise is believed to reduce many of the side effects of chemotherapy, including fatigue and nausea

### **Follow these basic guidelines when training a person receiving chemotherapy:**

1. Avoid exercising the day of and generally the day after receiving chemotherapy.
2. Be aware of germs when working with someone whose immune system is depressed.
3. Do not exercise on an unstable surface if fatigue is extreme.
4. Wear loose fitting clothing to allow good ventilation.
5. Drink plenty of fluids.
6. Maintain a healthy diet.

7. Stay ahead of nausea (with recommended medications, carbonated beverages, ice chips).
8. Avoid exercising in extreme temperatures.
9. Use a journal to make notes after each dose of chemotherapy to better plan ahead for lighter days.

## **RADIATION THERAPY**

Radiation therapy is often used to treat cancer. Radiation destroys the integrity of cancer cell's DNA, making them unable to replicate and die. Radiation can also affect normal cells, particularly those that multiply rapidly. Normal cells will often repair themselves usually within a few hours of treatment. Radiation is administered either internally or externally to treat cancer, externally being the most common. In general, the main side effects of radiation therapy are fatigue and local skin irritations (burns). The fatigue associated with radiation treatment is generally cumulative, progressive and sometimes debilitating.

If administered externally, the radiation may cause skin irritations including dryness, sensitivity, and mild burns. The burns to the skin feel much like sunburn and will in time fade, and often disappear. The affected area should be treated gently and washed with warm water and mild soap.

Depending upon where the radiation is being directed or how it is being administered, the person receiving it may also experience hair loss, nausea, and gastro-intestinal tract discomfort.

If directed at lymph nodes, the patient will have a higher risk of developing **lymphedema**—a potentially serious condition, which will be discussed later in this manual.

Radiation is sometimes administered internally to deliver a higher dose of the radioactive material in a shorter amount of time. Patients who receive internally-administered radiation are sometimes isolated to prevent exposing others to the radiation.

If your client is receiving radiation, check with them regarding their own limitations specific to the side effects they are experiencing as a result of their radiation treatment.

### **Radiation Therapy overview:**

- Radiation destroys cancer cells as well as healthy cells.

- Radiation may be administered internally or externally.
- Radiation has many side effects; most common are fatigue and local skin irritation.
- Side effects vary depending upon location and method of administration.
- Radiation of lymph nodes may increase potential of lymphedema.

**Follow these basic guidelines when training a person receiving radiation:**

1. Have your client conserve energy by sitting between sets.
2. Encourage proper hydration.
3. Wear loose fitting clothing.
4. Avoid exercises that put pressure on affected areas.
5. Avoid exercising in extreme temperatures.
6. Appropriate moisturizer should be applied to affected areas.
7. Avoid infectious agents coming in contact with the burned areas, especially for clients with suppressed immune systems or with the potential for lymphedema.
8. Monitor client for lymphedema when applicable.

## **HORMONE THERAPY**

Hormone therapy is used to help treat certain cancers. Some tumors are actually stimulated to grow due to the presence of estrogen or testosterone, such as breast uterine, and prostate cancers. These tumors are referred to as being either estrogen or testosterone sensitive. The use of synthetic estrogen such as Tamoxifen is used to fill the estrogen receptor sites on the tumor, thus preventing the estrogen to enter the cancer cell. Without the estrogen, the tumor cannot grow. To prevent the growth of testosterone sensitive tumors, the production of testosterone is shut down by the use of surgery or more commonly by drugs. Side effects depend on many factors, but often the person will experience side effects similar to menopause, including hot flashes and increased sweating, so light loose fitting clothes are a good idea, as is proper hydration. Hormone therapy often causes weight gain due to water retention. Men receiving hormone replacement may also experience nausea and vomiting.

### **Hormone Therapy Overview:**

- Breast, uterine, and prostate cancers may be estrogen or testosterone sensitive.
- Synthetic hormones may be used to block tumor growth.

- Side effects include: hot flashes, increased sweating, indigestion, weight gain (water retention), nausea and vomiting.

**Follow these basic guidelines when training a person receiving hormone therapy:**

- Find out what side effects your client may be experiencing.
- Recommend loose fitting clothes.
- Encourage proper hydration.
- Exercise in cooler environments.
- Monitor client's weight carefully and counsel
- Refer to *Nausea and Exercise* below.

## **ADDITIONAL METHODS OF TREATING CANCER**

New treatments are constantly being developed to treat cancer. If a client comes to you and is receiving a treatment unfamiliar to you, find out from your client and their doctor how the drug or procedure will affect them. If you cannot interpret the information to come up with a sound training program, then ask for help. Contact the person's physician, a physical therapist, a pharmacologist or any other trained professional who can help you make the best decision possible. The answer is out there, and until it becomes absolutely clear to you, be conservative.

## COMMON CANCER-RELATED SYMPTOMS/SIDE EFFECTS AND EXERCISE

### CANCER RELATED FATIGUE

The most common symptom experienced by persons with cancer is fatigue. Cancer treatments, including chemotherapy, radiation, and surgery, can leave cancer patients with debilitating fatigue. That fatigue may accompany not only the treatment, but may also last long after the treatment has been completed. Cancer-related fatigue is unlike normal fatigue, as it is often severe and may come without much, if any, advanced warning. Rest does not always provide relief from this particular manifestation of fatigue.

The source of this fatigue is varied. Fatigue is often caused by low red blood counts (anemia) as described before. Many cancer patients become more sedentary as a result of pain, surgical recovery, depression, and fatigue that can cause muscle atrophy. The atrophied muscles are expected to carry the burden of the missing muscle mass, and therefore begin to fatigue much earlier. The exact reasons contributing to the fatigue are likely complex and as of yet are not completely understood.

Engaging in new exercise activity requires even greater caloric intake to fuel the activity, so proper nutrition is essential. Perhaps a person is not eating enough to maintain their muscle mass and energy levels due to changes in taste, smell, or tissues lining the digestive tract. Insulin resistance and glucose intolerance will affect a person's ability to use the nutrients they are ingesting. Cachexia is a term, which describes the wasting of lean muscle in spite of proper nutrition, and can be a major contributor to fatigue. Your partnership with a trained nutritionist is highly recommended to ensure that these nutritional challenges are adequately addressed.

Stress can also directly add to the level of fatigue. As a person becomes stressed or anxious their body **excretes** several hormones. This response can quicken a person's pulse, raise their blood pressure, and interrupt digestion. If a person stays stressed for a long enough period of time, their levels of cortisol increase causing many major health concerns including chronic fatigue, hypertension, eating disorders, insomnia, and migraines. This state may also appear as tension or depression.

Because fatigue is so common and often unpredictable, it is important to constantly be aware of your client's energy level. **Before you begin any exercise session**, have your client rate their fatigue on a scale of 1 – 10 in terms that both of you understand. Do not expose your client to over-estimated physical stresses that may result in an injury.

When fatigue is an issue, take precautions to prevent injury. Recommend a more stable surface to stand on, perform exercises seated or supine, and take longer rests between sets. Drink plenty of fluids that contain carbohydrates and electrolytes such as a sports drink during the activity.

Relaxation techniques should be a component of every person's program, especially for the cancer patient. A section in this manual is devoted to helping your client relax, as psychological factors have proven implications on wellness.

If the client's fatigue persists or worsens, recommend they go to their doctor to investigate the source.

### **Follow these basic guidelines when training a person with cancer-related fatigue:**

- Safety first! Modify all forms of activity to provide a safe environment for activity. Perform exercises on stable surfaces, seated, or supine.
- Take longer rest periods between sets.
- Encourage proper nutrition; *recommend a nutritionist*.
- Inquire as to source of fatigue.
- Conserve energy; use it sparingly.
- Stay hydrated during activity, recommend a sports drink.
- Work to increase aerobic capacity.
- Train to increase lean muscle mass.
- Progress work loads very gradually.
- Encourage relaxation techniques.

## **CANCER RELATED PAIN**

Many cancer patients feel pain from time to time. Appropriate exercise has been shown to decrease a person's level of pain. This pain may have any number of sources, can range in severity, and be of different types. It is first important to ask the client to describe the pain to you, and then make a decision how to react. Use a scale between 1 –10 to differentiate between discomfort and pain.

The activity your client engages in should never *cause* pain. It is possible that a client may come to you with pre-existing pain of a known source. For example, if a cancer has metastasized to bone it will likely cause pain. The American Cancer Society recommends that a person not exercise if they have unrelieved pain. In cases such as this, you should be informed in writing by the client's physician or other specialized professional to guide you in making appropriate activity recommendations.

Have your client inform you if they are taking any prescription or over-the-counter pain medications. As these medications mask feeling sensation, be particularly cautious and conservative with exercise intensity and progression. If the medications cause dizziness or drowsiness, follow the same precautions as you would with *fatigue*.

If the pain is new by all means discontinue the activity engaged in when the pain began and recommend they meet with their physician. When taking this course of action, provide the client with a release form describing the activity engaged in, describe the pain experienced, and request a recommendation from the doctor before repeating any similar activity.

Make the best decision you can and always be conservative. The source of the pain may be significant to the state of the disease.

Other remedies are available which can help to minimize the pain that your client is experiencing, such as physician-prescribed medications, relaxation techniques, and in some cases, Chinese medicine including herbs and acupuncture.

**Follow these basic guidelines when training a person with cancer-related pain:**

- Find out if your client has any pain prior to engaging in activity.
- The American Cancer Society recommends that a person not exercise if they have unrelieved pain.
- Have client provide a physician's release form with activity recommendations if pain is present.
- Establish terminology to differentiate between discomfort and pain. Use a 1–10 scale.
- Discontinue any activity that causes pain.
- Report any new pain to the client's physician and obtain a release form when necessary.
- Have your client provide you with a complete list of medications, including prescription and over-the-counter pain medications.
- Reduce exercise intensity and be conservative with exercise progression for clients taking pain medications.
- Encourage relaxation techniques.

## **NAUSEA AND VOMITING**

Nausea is a very common side effect to many types of chemotherapy, radiation and pain, as well as stress. Exercise has been shown to reduce nausea. There are some basic guidelines to follow in designing an appropriate exercise program for the person who experiences nausea. The American Cancer Society recommends that a person not exercise if they have unrelieved nausea. If they prefer to stay home, have a suggested relaxation program designed for their current state.

If a client begins to feel nauseous during activity, discontinue the activity. Try relaxation techniques, primarily deep breathing. Fresh air can help to alleviate nausea, so try to incorporate outdoor activities on days that nausea is likely to occur. Ice cubes or small sips of water may also help. If the nausea persists or worsens, stop all activity and have your client recline or lay flat. If a person's nausea is so extreme that it induces vomiting, activity should also be stopped immediately.

If the nausea subsides, try modifying the activity to prevent another bout of nausea. Reduce exercise intensity and increase rest time between sets of resistance exercises. You may have your client perform the exercise seated or with their eyes closed. Focus on relaxation techniques. Perform activities outdoors to increase fresh air consumption.

### **Follow these basic guidelines when training a person with cancer related nausea and vomiting:**

- The American Cancer Society recommends that a person not exercise if they have unrelieved nausea or are vomiting.
- If a client begins to feel nauseous during activity, discontinue the activity.
- Try relaxation techniques, primarily deep breathing.
- Fresh air can help to alleviate nausea, so try to incorporate outdoor activities.
- Alleviate symptoms by sitting down, laying flat, taking small sips of water or sucking on an ice cube.
- Reduce exercise intensity and increase rest time between sets of resistance exercises.
- Try performing activities with the client's eyes closed to reduce motion-induced nausea.

## **DECREASED BLOOD VALUES**

Many cancer treatments affect the blood cells. When red cells are low, the client may feel fatigued. When white cells are low, the body's defenses are compromised and the client is more susceptible to infection. Low platelets can cause increased bleeding, both

externally and internally. Cancer treatments typically incorporate regular blood work, so you should continue to check in with clients who are on treatments, as blood values tend to vary greatly.

It is often recommended that the patient not exercise the day following treatment to avoid problems from these affected blood counts. Be aware of factors, which may compromise the health and safety of persons with reduced blood values respectively. Sudden fatigue, infectious agents and the threat of being bumped or bruised can have potentially serious results when blood values are low.

Researchers have long observed the positive effects of moderate amounts of exercise on the immune system. Now they're beginning to look at the effects moderate exercise can have on the immune systems of cancer patients in the midst of treatment. In one small study, researchers found that moderate exercise (three or more times a week) increased the immune cell counts of women undergoing breast cancer treatment back to normal levels, and also improved the women's mood and ability to handle their feelings comfortably.

**Follow these basic guidelines when training a person with decreased blood counts:**

- Low red blood cells can cause fatigue.
  - (See *Cancer Related Fatigue* above.)
- Low white blood counts can cause compromised immune function.
  - Beware of cuts and scrapes, as well as any infection causing agents.
- Low platelets increase bruising and bleeding, both internally and externally.
  - Avoid cuts, bumping, and falling during activity.

## **LYMPHEDEMA**

Lymphedema is the swelling of tissues (edema)—usually the feet and legs—due to lymphatic obstruction or reduced lymph node availability.

Lymphatic fluid seeps out of the blood circulation into the tissues. It returns to the heart through separate channels called lymphatics, carrying waste products and germs. On its way to the heart, the fluid passes through lymph nodes, where infecting germs (including some cancers) are attacked by the body's defense mechanisms.

Cancers often occur in or spread to lymph nodes. The presence of cancer can obstruct the flow of lymphatic fluid and lead to lymphedema. Many times lymph nodes will be surgically removed if they have or are suspected to have cancer cells present.

Radiation of lymph nodes also greatly contributes to the likelihood of lymphedema as well. It is important to note that there is no way of knowing how many affected lymph nodes will lead to the occurrence of lymphedema; it varies from person to person, and can happen days or even years after treatment.

If lymphatic channels are obstructed, removed, damaged or inadequate, fluid backs up and causes edema. Tissue fluid can also return to the circulation through tissues, without using the lymphatics, but gravity hinders this flow in lower body lymphedema.

Who is at risk for lymphedema is a debatable issue among professionals in the field of lymphedema therapy. Generally people who have fewer than ten lymph nodes removed are at low risk; however, that is not always the case. Radiation of lymph nodes raises the potential for lymphedema considerably. It is best to have the clients risk level established by their physician or a lymphedema specialist to help prevent its onset. Because it is a known fact that lymphedema risk is quite individualized, it is important to learn to monitor your client to help them understand their limitations. Also be aware that the risk levels may change and will continue for the lifetime of the client.

Lymphedema develops in a number of stages, from mild to severe, referred to as Stages 1, 2 and 3:

**STAGE 1 (spontaneously reversible):**

Tissue is still at the "pitting" stage, which means that when pressed by fingertips, the area indents and holds the indentation. Usually, upon waking in the morning, the limb(s) or affected area is normal or almost normal size.

**Stage 2 (spontaneously irreversible):**

The tissue now has a spongy consistency and is "non-pitting," meaning that when pressed by fingertips, the tissue bounces back without any indentation forming). Fibrosis found in Stage 2 lymphedema marks the beginning of the hardening of the limbs and increasing size.

**Stage 3 (lymphostatic elephantiasis):**

At this stage the swelling is irreversible and usually the limb(s) is/are very large. The tissue is hard (fibrotic) and unresponsive; some patients consider undergoing reconstructive surgery called "debulking" at this stage.

## **MONITORING FOR LYMPHEDEMA**

Monitoring for lymphedema should be done at any time that you or your client think that lymphedema may be occurring. Measurements should be taken at the beginning and end of the first several sessions, and later sessions as well. Girth measurements should be taken at a minimum of three different sites on both the affected side and the

unaffected side (for comparison). When lymphedema risk is bilateral, use beginning measurements as your guide. Suggested measurement sites are as follows:

Upper body Lymphedema:

- Wrist: at narrowest point just above the styloid process
- Lower arm: 4" below olecranon process
- Upper arm: 4" above olecranon process

Lower Body Lymphedema

- Ankle: at narrowest point just above the talar joint
- Lower leg: 6" below patella
- Upper leg: 6" above patella

When monitoring for lymphedema more than three sites may be used to further confirm the occurrence of lymphedema.

Any abnormal measurements should be documented and activity stopped immediately. If swelling is mild, request that your client be seen by a physician and released before returning to the activity. If a client experiences an increase of 2 cm or greater, they should be referred to a lymphedema specialist immediately! A physician's release is mandatory before returning to activity.

## **RISK AND PREVENTION OF LYMPHEDEMA**

How to prevent the onset of lymphedema is quite a controversial topic among lymphedema specialists. The number of removed or damaged lymph nodes that will lead to lymphedema is debatable, as lymphedema risk appears to vary substantially from one person to another. The types of activities that are appropriate are also under scrutiny.

One famous study in 1996 by Dr. Urve Kuuski and Dr. Donald McKenzie investigated the health benefits of dragon-boat racing for breast-cancer survivors. They set out to determine if the extremely restrictive recommendations for lymphedema risk were solid. A team of psychologists, rehabilitation therapists and physicians from University of British Columbia launched the first breast-cancer dragon-boat team. Their goal was to increase the muscle tone and mood of women who had completed breast-cancer treatment. They found that the activity did not cause or exacerbate lymphedema, and actually improved range of motion for women with pre-existing lymphedema. Additional documented benefits included:

- Source of inspiration

- Increased body strength
- Increased cardiovascular capacity
- General boost in physical and mental health

There are several practices one can follow to best help prevent lymphedema from occurring in an affected limb. First of all, always have your client wear a lymphedema garment if they have been told by a professional to wear one during activity. Compression garments are specially designed sleeves or stockings, which apply calibrated pressure to a limb to help prevent or reduce lymphedema. It is important for you and your client to be aware that increasing or decreasing the size and dimensions of a limb due to changes in body composition will usually require that your client be fitted for a new and more suitable compression garment.

If lower body lymphedema is a risk, many lymphedema therapists recommend wearing leg compression garments during all activity, as the force of gravity makes fluid return quite problematic. Increasing range of motion in the hips, particularly the groin, may aid in opening the remaining lymphatic channels.

Upper body lymphedema is somewhat easier to prevent, as there are many practices that can be used to assist in the drainage of excess fluid. Alternating upper and lower body exercises will help to limit the amount of fluid that can build up in the affected side as well. Raising the affected arm between sets of resistance exercises (or activities of daily living) helps to allow gravity to pull the excess fluid out of the affected arm. Keeping optimal shoulder range of motion on the affected side(s) through proper stretching techniques will help open the remaining lymphatic channels for improved fluid return. Overhead hand and arm pumping as well as gentle self-effleurage (**gentle** sweeping motions with fingertips down the arm toward and across the axilla) should also be practiced during activity rest periods to assist in lymphatic drainage.

The abdominal cavity serves as a lymphatic fluid reservoir. Breathing exercises to strengthen the deep abdominal muscles which together act like a pump can help to return the fluid from the limbs. Suggest using creative visualization techniques to aid in the prevention of lymphedema: have your client visualize their abdominal muscle contractions acting as a pump. With each deep breath, suggest they imagine the lymphatic fluid returning from the limbs to the abdominal cavity reservoir.

The National Lymphedema Network has very specific guidelines outlining the risk and prevention of lymphedema for patients:

### **UPPER BODY LYMPHEDEMA**

At risk is anyone who has had either a simple mastectomy, lumpectomy or modified radical mastectomy in combination with axillary node dissection and/or radiation

therapy. Lymphedema can occur immediately postoperatively, within a few months, a couple of years, or 20 years or more after cancer therapy.

### **Eighteen Steps To Prevention - UPPER Extremities**

1. Absolutely do not ignore any slight increase of swelling in the arm, hand, fingers, or chest wall (*consult with your doctor immediately*).
2. Never allow an injection or a blood drawing in the affected arm(s). Wear a lymphedema alert bracelet.
3. Have blood pressure checked on the unaffected arm, or on the leg (thigh), if bilateral lymphedema/at-risk arms.
4. Keep the edemic or at-risk arm(s) spotlessly clean. Use lotion (Eucerin, Lymphoderm, Curel, whatever works best for you) after bathing. When drying the affected arm, be gentle but thorough. Make sure it is dry in any creases and between the fingers.
5. Avoid vigorous, repetitive movements against resistance with the affected arm (scrubbing, pushing, pulling).
6. Avoid heavy lifting with the affected arm. Never carry heavy handbags or bags with over-the-shoulder straps on your affected side.
7. Do not wear tight jewelry or elastic bands around affected fingers or arm(s).
8. Avoid extreme temperature changes when bathing or washing dishes. It is recommended that saunas and hot tubs be avoided (at least keep arm out of the hot tub). Protect the arm from the sun at all times.
9. Try to avoid any type of trauma (bruising, cuts, sunburn or other burns, sports injuries, insect bites, cat scratches) to the arm(s). (Watch for subsequent signs of infection.)
10. Wear gloves while doing housework, gardening or any type of work that could result in even a minor injury.
11. When manicuring your nails, avoid cutting your cuticles (*inform your manicurist*).
12. Exercise is important, but consult with your therapist. Do not overtire an arm at risk: if it starts to ache, lie down and elevate it. *Recommended exercises:* walking, swimming, light aerobics, bike riding and specially designed ballet or yoga. (*Do not lift more than 15 lbs.*)
13. When traveling by air, patients with lymphedema (or who are at risk) must wear a well-fitted compression sleeve. Additional bandages may be required on a long flight. Increase fluid intake while in the air.

14. Patients with large breasts should wear light breast prostheses (heavy prostheses may put too much pressure on the lymph nodes above the collar bone). Soft padded shoulder straps may have to be worn. Wear a well-fitted bra: not too tight, ideally with no underwire.
15. Use an electric razor to remove hair from axilla. Maintain electric razor properly, replacing heads as needed.
16. Patients with lymphedema should wear a well-fitted compression sleeve during all waking hours. At least every 4-6 months, see your therapist for follow-up. If the sleeve is too loose, most likely the arm circumference has reduced or the sleeve is worn.
17. **Warning:** If you notice a rash, itching, redness, pain, increase of temperature or fever, see your physician immediately. An inflammation (or infection) in the affected arm could be the beginning or worsening of lymphedema.
18. Maintain your ideal weight through a well-balanced, low sodium, high-fiber diet. Avoid smoking and alcohol. Lymphedema is a high protein edema, but eating too little protein will not reduce the protein element in the lymph fluid; rather, this may weaken the connective tissue and worsen the condition. The diet should contain easily digested protein (chicken, fish, tofu).

## **LOWER BODY LYMPHEDEMA**

At risk is anyone who has had gynecological, melanoma, prostate or kidney cancer in combination with inguinal node dissection and/or radiation therapy. Lymphedema can occur immediately postoperatively, within a few months, a couple of years, or 20 years or more after cancer therapy.

### **18 Preventive Steps For LOWER Extremities**

1. Absolutely do not ignore even slight increases of swelling in the toes, foot, ankle, leg, abdomen or genitals (*consult with your doctor immediately*).
2. Never allow an injection or a blood drawing in the affected leg(s). Wear a LYMPHEDEMA ALERT Necklace.
3. Keep the edemic or at-risk leg spotlessly clean. Use lotion (Eucerin, Lymphoderm, Curel, whatever works best for you) after bathing. When drying the affected area be gentle but thorough. Make sure it is dry in any creases and between the toes.
4. Avoid vigorous, repetitive movements against resistance with the affected legs.
5. Do not wear socks, stockings or undergarments with tight elastic bands.

6. Avoid extreme temperature changes when bathing or sunbathing (no saunas or hot tubs). Keep the leg(s) protected from the sun.
7. Try to avoid any type of trauma, such as bruising, cuts, sunburn or other burns, sports injuries, insect bites, cat scratches. (Watch for subsequent signs of infection.)
8. When clipping your toenails, avoid cutting your cuticles (*inform your pedicurist*).
9. Exercise is important, but consult with your therapist. Do not overtire a leg at risk; if it starts to ache, lie down and elevate it. Recommended exercises: walking, swimming, light aerobics, bike riding and yoga.
10. When traveling by air, patients with lymphedema and those at-risk should wear a well-fitted compression stocking. For those with lymphedema, additional bandages may be required to maintain compression on a long flight. Increase fluid intake while in the air.
11. Use an electric razor to remove hair from legs. Maintain electric razor, properly replacing heads as needed.
12. Patients who have lymphedema should wear a well-fitted compression stocking during all waking hours. At least every 4-6 months, see your therapist for follow-up. If the stocking is too loose, most likely the leg circumference has reduced or the stocking is worn.
13. **Warning:** If you notice a rash, itching, redness, pain, increase of temperature or fever, see your physician immediately. An inflammation or infection in the affected leg could be the beginning or a worsening of lymphedema.
14. Maintain your ideal weight through a well-balanced, low sodium, high-fiber diet. Avoid smoking and alcohol. Lymphedema is a high protein edema, but eating too little protein will not reduce the protein element in the lymph fluid; rather, this may weaken the connective tissue and worsen the condition. The diet should contain easily-digested protein such as chicken, fish or tofu.
15. Always wear closed shoes (high tops or well-fitted boots are highly recommended). No sandals, slippers or going barefoot. Dry feet carefully after swimming.
16. See a podiatrist once a year as prophylaxis (to check for and treat fungi, ingrown toenails, calluses, pressure areas, athlete's foot).
17. Wear clean socks & hosiery at all times.
18. Use talcum powder on feet, especially if you perspire a great deal; talcum will make it easier to pull on compression stockings. Be sure to wear rubber gloves,

as well, when pulling on stockings. Powder behind the knee often helps, preventing rubbing and irritation.

### **Lymphedema overview**

- Lymphedema is the swelling of tissues (edema), usually the feet and legs, due to lymphatic obstruction or reduced lymph node availability.
- If lymphatic channels are obstructed, removed, damaged or inadequate, fluid backs up and causes edema.
- Lymphedema occurs in cancer patients when lymph nodes are obstructed, surgically removed, or damaged.
- The likelihood of lymphedema is not always predictable, so careful monitoring is needed.
- Lymphedema develops in a number of stages, from mild to severe (referred to as Stage 1, 2 and 3) and is sometimes irreversible.

### **Follow these basic guidelines when training a person who is at risk of developing lymphedema:**

- Monitor for lymphedema by taking girth measurements before and during activity.
- Any abnormal measurements should be documented and activity stopped.
- Prevent cuts, scrapes, and infection in affected limb.
- Progress exercise intensity carefully to limit exercise induced muscle soreness.
- Familiarize yourself with the National Lymphedema Network (NLN) recommendations regarding lymphedema risk and prevention.

## **MENOPAUSE**

Menopause is defined as the cessation of menses (menstrual cycles) as a result of the slowing down or cessation of ovary functioning. It can be the result of surgery from a procedure called an oophorectomy (removal of the ovaries). This often accompanies a hysterectomy, especially if a woman is over 40 years old. An oncologist may choose to shut down the activity of the ovaries temporarily to help protect them from possible damage from chemotherapy or radiation therapies.

The consequent loss of estrogen production from the ovaries can induce early menopause. Hormone therapy with medications like Tamoxifen or Lupron can also

produce menopausal side effects because of their anti-estrogen properties. (See Hormone Therapy and Exercise above).

The most common physiological results of menopause are hot flashes, reduced bone density, weight gain, vaginal discomfort, loss of sexual desire, irritability, sleep disturbances and irregular bleeding. These symptoms can sometimes be controlled with prescription drugs and other treatments.

The mood-elevating, tension-relieving effects of aerobic exercise help reduce the depression and anxiety that often accompanies menopause. Aerobic exercise also promotes the loss of abdominal fat — the place most women more readily gain weight during menopause. In addition, some research studies have shown that the increased estrogen levels that follow a woman's exercise session coincide with an overall decrease in the severity of hot flashes. Strength training also helps. It stimulates bones to retain the minerals that keep them dense and strong, thus preventing the onset and progression of osteoporosis. Increased lean muscle mass helps to raise a person's basal metabolic rate, which also helps to normalize a person's body composition.

These effects of exercise, along with improved blood fats and physical fitness, work together to help prevent heart disease. Keep in mind, though, that good nutrition works hand in hand with a physically active lifestyle. A low-fat, high-fiber diet and adequate calcium intake are vital in order to reap the full benefits of exercise.

### **Menopause overview**

- Menopause is defined as the cessation of menses (menstrual cycles) as a result of the slowing down or cessation of ovary functioning.
- An oncologist may choose to shut down or slow the activity of the ovaries temporarily to help protect them from possible damage from chemotherapy or radiation therapies.
- The most common physiological results of menopause are hot flashes, reduced bone density, weight gain, vaginal discomfort, loss of sexual desire, irritability, sleep disturbances and irregular bleeding.

### **Follow these basic guidelines when training a person during menopause:**

- Aerobic exercise helps to reduce effects of menopause, including:
  - Reduced anxiety
  - Reduced depression
  - Reduced abdominal fat
  - Reduced hot flashes
- Strength training helps to reduce effects of menopause, including:
  - Increased bone density

- Increased basal metabolic rate
- Encourage clients to wear loose fitting clothes to reduce severity of hot flashes.
- Encourage proper hydration.
- Perform activities in cooler surroundings.
- Recommend seeking professional advice regarding diet and supplements, which may reduce effects of menopause.

## **CANCER METASTASES**

Cancerous growths can begin in any body organ or tissue. Wherever it begins, we call this site the *primary tumor* or *primary cancer*.

Primary cancers may progress to a point at which cancer cells separate from the original tumor and travel to other parts of the body, either through the blood stream or the lymphatic system. Most often these cells die, but sometimes they take root and create a new growth. This process is called *metastasis* and any secondary growths *metastases*. About half of all cancers metastasize.

Wherever the secondary cancer is located in the body, the cancerous cells at the secondary site are like those at the primary site and the secondary cancer is named after the part of the body where the cancer originated. If, for example, breast cancer spreads to the bones, the secondary cancer is *metastasized breast cancer*, not *bone cancer*, as the cancer cells are cancerous breast tissue cells and are treated as such.

Cancer cells often spread first to lymph nodes near the primary tumor. Infection of these regional lymph nodes is called *regional disease* or *nodal involvement*. When cancer cells spread to areas of the body distant from the primary tumor, doctors call this metastatic disease. When the cancer cells spread to the bone, we call these areas bone metastases. Bone metastases can occur at a number of locations, however the number one area of bone metastases to the skeleton are the pelvis, hip, femurs, and the skull.

Some patients with bone metastases experience relatively mild symptoms, such as decreased appetite and unusual sleep patterns due to discomfort. Others may notice frail or brittle bones, nausea, fatigue, muscle weakness, restlessness, and confusion.

Bone strength depends on many nutrition and metabolic factors, as well as consistent, weight-bearing exercise. Like muscle, bone is living tissue that constantly re-forms, gaining or losing strength according to how often it is used. Without exercise, bone loses density and becomes weaker. Exercise actually encourages calcium absorption in bone. Like muscles, bone responds to increased blood flow; and it is thought that the increased circulation prompted by exercise helps transport vital nutrients and minerals, such as calcium, to our bones.

The best type of exercise to promote healthier bones is resistance exercise. These exercises should be a combination of both weight bearing exercises and progressive resistance exercises using weights or resistance machines.

Weight-bearing exercises are those in which your bones and muscles work against gravity. This is any exercise in which your feet and legs are bearing your weight. Walking, dancing, climbing stairs, and certain sports are examples of weight-bearing exercises with different degrees of impact. Higher impact and more activity is associated with stronger bones, but high impact activity may not be right for everyone, including persons with bone metastases or any other factor which compromises the integrity of bone density.

The second type of exercise is resistance exercise. Resistance exercise includes using free weights on any number of surfaces and angles, and machines designed for resistance training. This mode of exercise is often preferable depending on where the bone metastases are located. It is important to understand the forces being exerted on the affected site.

Bones are constantly being subjected to multiple forces depending on the activity. Machines are valuable—particularly those with cables—to train a person with bone metastases, as you can regulate the types of forces applied to a bone during different activities. Machines with cables/pulleys are quite beneficial, as they often promote compressive forces. The best types of exercises to use for people with bone metastases (or any poor bone health) are those that apply compressive forces to the affected area. Tension forces are not as beneficial, and shearing forces are by far the most dangerous to use. Keep these factors in mind as you recommend different stretching techniques for your client.

Aquatic exercises offer a great deal of benefit for persons with bone metastases, as the forces surrounding the affected area are for the most part uniform and therefore safer. Be sure your client has been approved for aquatic activity, as sometimes the chemicals in the water may compromise local skin irritations from radiation therapy.

### **Cancer metastases overview**

- Metastasis is defined as the movement of cancer cells from their primary location to their taking root in another area of the body.
- If a cancer cell is trapped in a lymph node and begins to grow it is called Nodal Disease.
- Metastatic cancer is defined by its primary or original site.
- Bone metastases are cancers which have metastasized to bone tissue.
- Patients with side effects of bone metastases experience relatively mild symptoms such as:

- Frail or brittle bones
- Unusual sleep patterns due to discomfort
- Decreased appetite
- Nausea
- Fatigue
- Muscle weakness
- Restlessness
- Confusion
- Exercise increases calcium absorption in bone.
- The best type of exercise to promote healthier bones is resistance exercise.

**Follow these basic guidelines when training a person who has bone metastases:**

- To improve bone health, resistance exercises are recommended.
- Cardio activity should limit *pounding* activity
- Monitor the forces applied to the affected areas (greater loads may be applied to the safer forces, lighter loads to the more risky):
  - Compressive forces are safest.
  - Tension forces are less safe.
  - Shearing forces are the most risky, and should be limited to very light loads.
- Certain stretching techniques may not be appropriate for persons with frail or brittle bones. (See **FLEXIBILITY PROGRAM AND CANCER**)
- Avoid any exercise that you feel will compromise the integrity of the affected bone, i.e. jumping or exercise where a person has a higher likelihood of falling.
- Encourage the client to seek nutrition counseling to help promote healthy bones.

**A special statement must be made regarding nodal involvement. Avoid movement that causes discomfort of nodal region, and ask a medical professional if the nodal disease is extensive enough to cause lymphedema. The treatment for nodal disease has larger implications for activity. See *surgery and exercise, radiation therapy and exercise, and lymphedema and exercise.***

## **CANCER RELATED PERIPHERAL NEUROPATHY**

Many diseases and conditions can cause nerve damage. In persons with cancer, radiation treatments, chemotherapy or the cancer can be the cause of the nerve damage. Peripheral neuropathy is a term used to describe sick or injured nerves. The word *peripheral* means *away from the center*. In this case, it means the nerves that

connect the central nervous system (brain and spinal cord) to the muscles, skin and internal organs. Peripheral neuropathy most commonly presents itself in the hands and feet of people with cancer and is usually bilateral (occurring on both the left and right sides of the body). There may be no way to prevent early peripheral neuropathy from occurring; however, there are some treatments available to help ease its progression and symptoms, such as creams, medications and acupuncture. If peripheral neuropathy is caused by a chemotherapy or radiation treatment, the treatment may be discontinued. Peripheral neuropathy will sometimes resolve itself, but there are cases where some nerve damage can become permanent.

Symptoms of peripheral neuropathy depend on the type of nerve(s) affected and where the nerve is located in the body. More than one type of nerve can be damaged. If nerves to the skin are affected:

- Numbness and tingling (pins and needle feeling)
- A feeling you are wearing an invisible glove or sock
- Extreme sensitivity to touch
- Burning feeling in toes or fingers
- Freezing feeling in toes or fingers
- Can't feel hot or cold, or the ability to feel hot/cold is reduced

If the nerves to the internal organs are affected:

- Constipation
- Bladder difficulties
- Sexual dysfunction

If nerves to the muscles are affected:

- Muscle weakness
- Muscle cramping
- Muscle spasms
- Problems with balance

Exercise may benefit the person with peripheral neuropathy. When done properly exercise can increase strength, circulation, and coordination. It is important to maintain as much muscle strength and function as possible. Because the range in severity of peripheral neuropathy is so great, it is advisable to get physician clearance before recommending activity to your client.

### **Peripheral neuropathy and exercise overview:**

- Peripheral neuropathy is a term used to describe sick or injured nerves.
- In persons with cancer, peripheral neuropathy can be caused by the cancer itself, chemotherapy or radiation treatments.

- Peripheral neuropathy changes many neural sensations in the affected areas.
- If nerves to the muscles are affected, peripheral neuropathy can cause muscle weakness, muscle cramping, muscle spasms and problems with balance.
- Exercise may benefit the person with peripheral neuropathy.
- Physician's clearance is required when training a person with peripheral neuropathy.

**Assuming your client has been cleared to exercise, follow these basic guidelines when training a person who has peripheral neuropathy:**

- Exercise can increase strength, circulation, and coordination.
- It is important to maintain as much muscle strength and function as possible.
- Avoid activities that exacerbate the pain of peripheral neuropathy.
- If peripheral neuropathy occurs in the feet:
  - Closed shoes will often increase neuropathy or pain; open-toed shoes will help alleviate potential for pain. Check with your client to ensure that the shoes worn provide proper support and traction to avoid injury.
  - Dorsiflexion can push the foot forward, which may make pain worse. Avoid downhill angles.
  - As balance can become compromised, ensure that all modes of activity provide proper support.
  - Carefully assign exercises that develop better balance skills.
- If peripheral neuropathy occurs in the hands:
  - Recommend exercises that can be done without a closed grip.
  - Avoid handling weights that cannot be controlled due to the compromised neural sensation.
- Review the pain/discomfort scale to ensure proper communication and safety.
- Report any changes to the referring physician. Severe peripheral neuropathy may necessitate intervention from a physical therapist or other health professional.

# CREATING AN EFFECTIVE EXERCISE PROGRAM FOR THE PERSON WHO HAS CANCER

When writing a program for any client, a trainer must consider many factors to create the most effective, efficient and safe program possible. Writing the best program is simple, though not always easy. The trainer needs to adhere to four basic requirements:

1. Know the person for whom you are designing the exercise program. This is done by:
  - Asking the correct questions (Intake review)
  - Performing the right tests.
2. Develop appropriate goals. These should be derived from:
  - Doctor or professional recommendations
  - Client's personal desires.
  - Results from Intake and fitness tests.
3. Design a realistic plan. The plan should address the following essential factors:
  - Activities to be performed
  - Activity frequency
  - Activity intensity
  - Activity progression.
4. A useful program should encourage a high level of adherence. Consider the following:
  - How much new information are you giving to your client in a short amount of time?
  - Is the program designed using equipment that is accessible to your client?
  - Does the program exhibit appropriate progression?
  - Does the program allow for **light** or **off** days?

## KNOWING YOUR CLIENT

### INITIAL CLIENT INTAKE REVIEW

The first step in creating an effective training program is to perform a thorough intake review. Find out who your client is. Notice that the form poses questions not just about the client's body, but also about the person as a whole. The better you know a person's physical health history (and predicted health future) as well as their likes,

dislikes, hopes and fears regarding activity, the better you will be of service to them. The intake form includes the following information:

- Basic information including name, age, height, and weight of your client
- Past medical conditions and injuries not related to the cancer
- Current medical condition, including all procedures and medications that the client has had or is planning to have
- Activity history of the client
- Client's personal goals
- Personal preferences regarding activity and exercise environment
- Emergency information
- Release and consent forms.

Think in terms of the big picture with the information you gather. Remember that the client has other issues outside of cancer that must be considered. Your client will likely have a great deal of stress and fear, so consider preferences very carefully—create a positive environment and plan that will encourage program adherence. The last thing we want to do is drive a person away from physical activity due to not thoroughly considering all of the information you gather. Most importantly, respect the physician release forms. Have the treating physician review your program when possible. The physician could have insight that you might not have considered.

## **PATIENT'S TREATMENT JOURNAL**

It is often difficult to predict how a person will be feeling from day to day, so you and your client should be prepared to be very flexible. A check-in is required at the beginning of each session to insure that the activity you are planning to partake in is appropriate.

Keeping a daily journal can be a very useful tool in effectively creating an ideal exercise program for your client. It serves as a journal for the client to record how he or she feels each day following any type of procedure, whether it be chemotherapy, radiation, a surgery, or even new exercise activities. As each person's body will react uniquely to these many factors, you as a trainer can understand your client better and keep them on track.

## **BASELINE FITNESS TESTING**

Performing the correct tests will enable you to gather information critical to designing an effective and safe exercise program. There are many tests that can be performed, and the more tests you do properly, the more information you will have at your disposal. There are certain types of tests that should be done at a minimum before creating an exercise program, including:

- Baseline postural assessment
- Baseline cardio-respiratory test (sub-maximal)
- Flexibility or Range of Motion test
- Activities of Daily Living (ADL) test
- Body composition test
- Quality of life survey

## **POSTURAL ASSESSMENT**

As with any new client, it is important to assess a person's current posture. It will provide you with a starting point to help direct your program design. You can expect to discover certain postural imbalances as a result of the presence of cancer.

Imbalances occur as a result of several factors. Do not forget that the person with cancer is still prone to having postural imbalances that originated long before the cancer diagnosis. Poor posture can be a result of physical, environmental, functional, and emotional conditions. Physical factors are caused by structural changes in a person's body. These can include scar tissue from recent surgeries or pain from any number of sources. Environmental conditions include types of furniture used during relaxation or work. Functional conditions include positions in which a person performs work or other activities, as well as the asymmetric or repetitive nature of tasks performed at work or within a poorly structured exercise program. Emotional factors include looking down due to depression, or an elevated shoulder girdle from tension.

Start from the feet and work your way up as you would when performing any postural assessment. Keep in mind when doing the assessment the areas of the body affected by the cancer. Be sensitive to the nature of the imbalances you discover, and discuss with your client what you find. Let us suppose, for example, that your client is a woman who has had a partial mastectomy of her left breast. You check her range of motion (ROM) and find it to be normal, yet her left shoulder remains internally rotated and she is somewhat hunched over. It is likely that her imbalance is emotionally based: she is "protecting" or "hiding" what she considers to be a disfigurement. Making her aware of the action will help her more than doing stretches to open up the shoulder.

Employing relaxation techniques, such as positive imagery could also help to resolve certain emotion-based factors.

Repeat the postural assessment on a regular basis, as many times as imbalances return from the reformation of scar tissue or more recent procedures. Discuss the effect of fatigue on posture, so that when your client is not feeling well, they will have the awareness to hold the body in better alignment.

## **CARDIO RESPIRATORY TEST**

There are many ways to do a baseline cardio-respiratory test. The test should be chosen by assessing your client's apparent health level and by assessing your own competency in administering a given test. The test can be as basic as using a pre-programmed fitness test on cardio machines having this feature. Standardized tests as described in the ACSM's Resource Manual for Guidelines for Exercise Testing and Prescription may also be used if the proper equipment is available. Whatever method used should be used each time to track progress.

As the population of cancer patients is quite varied, it is imperative that you consider what test would be most appropriate. Sub-maximal tests are always recommended on all special populations when performed outside of a hospital or clinical setting. It is also advisable to perform the test on a "good day", as extenuating circumstances, such as fatigue and nausea could easily cloud the data.

Walking is the most functional type of cardio activity that the majority of your clients will engage in, so it is logical to perform the one-mile walk test as the baseline test. It is also a test that can be performed in many settings with little equipment and is appropriate for almost all populations. For clients who are unable to walk, modified testing techniques can be used to establish baseline cardio respiratory levels.

### **ONE-MILE WALK TEST**

This One-Mile Walk Test, which was developed in Dr. James Rippe's research laboratory, tests how aerobically fit you are. Aerobic fitness is a good indicator of overall fitness.

**What you need for the test.** Have your client wear loose comfortable clothes and comfortable shoes for walking. You will need a stop watch or watch that indicates seconds. Find a flat measured track—either a track or a flat street near your location. Because a street without hills, cross streets or traffic lights is best, walking around a block as many laps as necessary is good in city environments.

### **How to take the One-Mile Walk Test**

1. Have your client warm up and stretch for four to five minutes, particularly the leg muscles. Begin to walk slowly and gradually build up to a brisk speed.
2. Note your client's start time and walk the mile as briskly as possible, keeping a steady pace.
3. At the end of the mile record your client's time in minutes and seconds.

### One-Mile Walk Test Ratings

Key: < less than; > more than

#### Women (all times are in minutes and seconds)

Age	20-29	30-39	40-49	50-59	60-69	70+
Excellent	<13:12	<13:42	<14:12	<14:42	<15:06	<18:18
Good	13:12-14:06	13:42-14:36	14:12-15:06	14:42-15:36	15:06-16:18	18:18-20:00
Average	14:07-15:06	14:37-15:36	15:07-16:06	15:37-17:00	16:19-17:30	20:01-21:48
Fair	15:07-16:30	15:37-17:00	16:07-17:30	17:01-18:06	17:31-19:12	21:49-24:06
Poor	>16:30	>17:00	>17:30	>18:06	>19:12	>24:06

#### Men (All times are in minutes and seconds)

Age	20-29	30-39	40-49	50-59	60-69	70+
Excellent	<11:54	<12:24	<12:54	<13:24	<14:06	<15:06
Good	11:54-13:00	12:24-13:30	12:54-14:00	13:24-14:24	14:06-15:12	15:06-15:48
Average	13:01-13:42	13:31-14:12	14:01-14:42	14:25-15:12	15:13-16:18	15:49-18:48
Fair	13:43-14:30	14:13-15:00	14:43-15:30	15:13-16:30	16:19-17:18	18:49-20:18
Poor	>14:30	>15:00	>15:30	>16:30	>17:18	>20:18

The test does not require heart rate recordings; however, beginning and ending heart rates or client's RPE are beneficial markers for future comparison.

A client's heart rate should be monitored either by the use of a heart rate monitor or a client's Rating of Perceived Exertion (RPE). It is important to review the medication list for each client, as some medications may affect a person's blood pressure without showing a rise in heart rate. Therefore, it is better to educate your client in how to rate their exercise intensity using the RPE scale:

- 0 . . . . .Nothing at all
- 0.5 . . . .Very, very weak
- 1 . . . . .Very weak
- 2 . . . . .Weak
- 3 . . . . .Moderate
- 4 . . . . .Somewhat strong
- 5 . . . . .Strong
- 6
- 7 . . . . .Very strong
- 8
- 9
- 10 . . . .Very, very strong (Maximal)

The Talk-Test method should also be used when performing the cardio-respiratory

fitness test. Like the RPE, the Talk-Test method is subjective and should be used in conjunction with taking a pulse. The Talk-Test is quite useful in determining a person's comfort zone of aerobic intensity, especially if they are new to exercise and unaware of their limits. Basically the Talk-Test is: If you are able to talk during your workout without a great deal of strain, you are working within your comfort zone. Have your client work at an intensity that allows comfortable and rhythmic breathing throughout all phases of the workout. This will ensure a safe and comfortable level of exercise.

You and your client should learn to rate intensity in terms that both of you understand. This takes a great deal of practice and communication and deserves the appropriate attention early in the relationship between you and your client with cancer.

## **FLEXIBILITY / RANGE OF MOTION TEST**

As was stated earlier in this manual, many factors may affect your client's flexibility. Remember that the person facing cancer may have had poor flexibility even before the cancer diagnosis, so a thorough evaluation should be done to test for normal range of motion at all the major joints. The method of testing for range of motion should be based on the person performing the test's competency with different testing techniques.

A goniometer provides the most accurate measurement of a joint's range of motion and should be used if available. Testing joint flexibility without a goniometer is somewhat subjective and has many variables, which can render the test less effective.

**Proper use of goniometer:** The center of the goniometer is positioned at the axis of rotation of a joint, and the arms of the goniometer are aligned with the long axis of the bones of the adjacent segments or to an external reference. The measurement is the angle in degrees as read off the goniometer.

Special care should be given when performing a flexibility test using a goniometer, as it is sometimes difficult to position and maintain the device's arms along the bones of the segments throughout the measurement, and the axis of rotation is not always clear, especially for complex joints. The main point to remember is that the person performing the test is the greatest factor contributing to the margin of error, so the same person should perform the test to evaluate progress.

Special focus should be given to the areas of the person's body affected by the presence of cancer or its treatment:

- Surgical sites
- Prolonged periods in a given position (bed-rest)
- Radiation therapy

- Emotional factors (“protecting” cancer site).

## **ACTIVITIES OF DAILY LIVING (ADL) TEST**

As one of the greatest goals in training the person with cancer is to improve their quality of life, it is important to get a baseline understanding of the person’s ability to perform basic activities of daily living. The results of this test will help guide your exercise programming, particularly with functional training. Performing as many self-care tasks as possible will help your client develop and maintain independence and self-esteem. Feeling dependent on others can be defeating, and a certain satisfaction can be gained from the ability to perform daily tasks independently. These activities include:

- Standing up from seated position
- Standing up from prone position
- Picking objects up from floor
- Placing objects higher than shoulder height
- Complex moves involving rotation of body

Simply have your client perform each of these tasks if appropriate and make notes about your observations. Include comments about neutral posture, proper biomechanics, stability, range of motion and emotional impact of performing each movement.

## **BODY COMPOSITION TEST**

Weight management is often a factor important to the wellness of the person facing cancer. As was stated earlier, cancer can cause cachexia, or muscle wasting. Some procedures can contribute to weight gain, such as early menopause and certain chemical treatments including chemotherapy, hormone therapy, as well as complimentary medications including corticosteroids, which are used to counter some of the potential allergic effects of certain drugs.

In any case, body composition should be measured to establish a baseline. A simple and effective method of testing is the Body Mass Index (BMI). If the technology is available and the tester competent, one can also measure baseline body composition with an assortment of other means, including the skin-fold body composition test and the Bioelectrical Impedance Analysis (BIA) test. Again, whatever method is used to measure for the baseline reading should be repeated, preferably by the same test administrator to maximize the accuracy of the data.

## QUALITY OF LIFE SURVEY

As many of the health benefits of an exercise program reported by cancer survivors include quality of life factors, it is also recommended to have your client complete a quality of life survey. The Modified Rotterdam Quality of Life Survey is appropriate for the population at hand. The test is subjective, but gives very good insight as to the general wellness effects of the exercise program that cannot be measured any other way. As with every test used to measure progress, advances made in this area can serve as a particularly valuable tool in program adherence for the person with cancer, as quality of life is often compromised during the treatment process.

## DEVELOPING APPROPRIATE GOALS

**"The indispensable first step to getting the things you want out of life is this: decide what you want."**

**-Ben Stein**

Setting goals is a prerequisite to any accomplishment. Many factors must be considered to effectively create goals that are safe, appropriate, desirable, measurable and most importantly achievable.

The first step to ensuring the safety of your client is to gather the proper information about your client. Performing the proper Client Intake Review and administering the appropriate fitness tests as described above will have accomplished this.

Next, one must evaluate the information, including physician or other specialist restrictions and/or recommendations. One must also consult with published guidelines for the special population. Unfortunately, there is little in the way of standardized guidelines for the person with cancer who wishes to exercise. Three sources have been cited here: the American Cancer Society (ACS), The American College of Sports Medicine (ACSM), and the Centers for Disease Control (CDC).

### ***American Cancer Society (ACS) Official Guidelines***

Adults: Engage in at least moderate activity for 30 minutes or more on 5 or more days of the week; 45 minutes or more of moderate to vigorous activity on 5 or more days per week may further reduce the risk of breast and colon cancer.

Children and adolescents: Engage in at least 60 minutes per day of moderate-to-vigorous physical activity for at least 5 days per week.

### ***American College of Sports Medicine (ACSM) Official Guidelines***

The ACSM's exercise prescription focuses on performing moderately intense aerobic exercise frequently—3 to 5 times per week at 55-90% of maximum heart rate for a total of 20 to 60 minutes each day. However, the exercise can be accomplished in 10-minute increments accumulated during the day. Walking, running, cycling, swimming, and stair climbing are examples of activities that exercise the major muscle groups.

To improve muscular strength and endurance the ACSM recommends 2-3 days per week of resistance training using 40-60% of one's 1 rep. max. It further recommends 2-3 sets of each exercise performed in the 8 – 12 rep. range.

The official ACSM recommendation regarding flexibility is to perform 3 – 4 static or Proprioceptive Neuromuscular Facilitation (PNF) stretches held for a period of 10 –30 seconds each. A program should be designed that addresses all of the major muscles a minimum of 2 – 3 days per week.

The ACSM recommendations are those for “Healthy Individuals”. No official ACSM guidelines exist for persons with cancer; however, their basic guidelines can serve as a starting point to modify for individuals with compromised health.

### ***The Centers for Diseases Control (CDC) Official Exercise Guidelines***

Every US adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week. This recommendation emphasizes the benefits of moderate-intensity physical activity and of physical activity that can be accumulated in relatively short bouts. Adults who engage in moderate-intensity physical activity—i.e., enough to expend approximately 200 calories per day—can expect many of the health benefits described herein. To expend these calories, about 30 minutes of moderate-intensity physical activity should be accumulated during the course of the day. One way to meet this standard is to walk 2 miles briskly.

The CDC also has additional exercise recommendations for **special populations**. These groups include the socioeconomically disadvantaged, the less educated, persons with disabilities, and older adults:

Interventions should be designed with input from the target population. Physical activity promotional efforts targeted to people with disabilities or chronic disease, or to older adults, should emphasize the importance of being physically active by routinely carrying out their daily activities with a minimum of assistance. There is clear evidence demonstrating that physiological and performance capacities can be improved by regular physical activity in older adults and in persons with disabilities and/or chronic disease.

When setting goals with your client with cancer, it is imperative that you inform them of the many benefits they can expect to receive as a result of their specially designed cancer and exercise program that can significantly improve their quality of life. For many people in this special population, maintaining a high quality of life and countering some of the many side effects that their cancer treatment causes may be taxing enough. This is not to say that a goal of completing a triathlon during their treatment, for example, is unreasonable, as for some clients it may be. But remember that you are working with a person facing a health issue for which you can potentially provide substantial benefit; this should be at the top of the list of goals to recommend to your client.

Your client's personal desires are very important to factor into the final goals that you and your client finally decide upon. Have your client prioritize their goals, and ask questions that will help to truly understand what it is that they want to accomplish. If your client says she wants to feel strong, find out what that means to her specifically. Remember, goals should be measurable, so press your client to come up with goals for which progress can be measured and accurately tracked.

Often times we need to make short term and long term goals to bridge the gap needed to accomplish goals with certain limitations, such as the many physiological, emotional, and spiritual aspects of having cancer. Try to avoid denying a person their goal, even if it sounds unreasonable to you. Consider the following example:

Bob has been diagnosed with esophageal cancer. You find out that he has been engaged in physical activity for six months prior to his diagnosis to reduce unwanted fat and to increase lean muscle mass. He has gotten within about fifteen pounds from his ideal body weight and has told you that his goal is to lose those last fifteen pounds. He has no past injuries, and outside of his cancer he is in perfect health. The treatment plan is to do four cycles of chemotherapy followed by a surgery to remove a six-inch section of his esophagus, and finally six weeks of external radiation. You might not consider on your own that the removal of one's esophagus will cause the person to temporarily lose his ability

to swallow food. This will severely disrupt his ability to ingest the proper nutrients for weeks or months, thus potentially resulting in severe weight loss. A plan to lose weight prior to this extensive treatment plan has been contraindicated for this person prior to this procedure by his oncologist. Instead of telling Bob “no” to his desire to lose those last fifteen pounds, set short-term goals to get him through the procedures safely, then agree to readdress his goal of being at his ideal weight following the procedures when you and his oncologist agree that it can be achieved safely.

The point here is always to be positive with your client when deciding on goals. Do not compromise your ethical responsibility to your client, but let them hold on to the hope that they will be the person they wish to be along the way throughout the cancer process.

The published official exercise guidelines for persons with cancer are still quite limited. A good personal trainer will consider the many benefits that exercise can provide the client, and strive to restore those which the presence of cancer might have compromised for the given client. The list includes but is not limited to:

- Sense of empowerment
- Normal range of motion in joints
- Ideal body composition
- Improved natural defense mechanisms
- Optimal circulation (cardio respiratory fitness)
- Optimal functional capacity for activities of daily living
- Lymphedema prevention (and education)
- Skills for stress reduction (relaxation)
- Improved mood regulation
- Overall improved quality of life

## DESIGNING THE EXERCISE PROGRAM

Designing an exercise program that satisfies all of the variables that define the person whom you are training can be a daunting task. There is much information, a great deal of which is probably new to both you and your client. You will need to decipher the information and develop it into a program that not only addresses all of the recommendations from approved guidelines, but also satisfies the needs and desires of your client, their physician, and even you. Will your program be safe? Will it be effective? Is it a program that your client will adhere to? What if something unexpected happens?

First of all, relax. As you would for any other client, you have gathered the appropriate initial information; now consider each item carefully and logically. Remember that training a person with cancer is not as different from training healthy people as one might think. The intake process and fitness testing along with goal development will guide you. All of these factors are used to estimate the best exercise modality, intensity, duration and progression. Think in the same terms as you would with any special population. People within certain age groups should be advised to exercise at modified intensities. Past injuries and non-cancer related medications need to be considered just as importantly as the cancer-specific procedures and medications. True, a person undergoing cancer treatment will have to be started at more conservative levels, but do not be so intimidated by their cancer diagnosis that you don't allow appropriate progression. The skill of designing specialized cancer and exercise programs will come with experience, so until you have the expertise, always be conservative. You should also remember to refer clients back to their physician any time you feel that the guidance of other specially trained professionals, such as physical therapists, should be employed.

This section provides very specific recommendations on how to design and progress a client's program in all components of their program including:

- Cardio Respiratory Fitness
- Resistance Training
  - Core Strengthening/Stability
  - Total Body Movements (*functional exercises*)
  - Muscle Specific Exercises
- Flexibility
- Relaxation Techniques

When writing a recommendation for a person's fitness program you must also define the following elements for each of the above components:

- Exercise mode
- Exercise duration
- Exercise frequency
- Exercise intensity
- Exercise progression

It is imperative to consider what negative effects improperly designed exercise programs could have on your client with cancer. The following is a list of specific precautions one must take when designing an exercise program for the person with breast cancer; however, they could be applied to all types of cancer.

<b>Special Precautions For Exercise After Breast Cancer</b>	
<b>Complication</b>	<b>Precaution</b>
Complete blood counts: Hemoglobin <8.0 g/dL	Avoid high-intensity or other activities that require significant oxygen transport
Absolute neutrophil count $\leq 0.5 \times 10^9/\mu\text{L}$	Avoid activities that may increase risk of bacterial infection (eg, swimming)
Platelet count $< 50 \times 10^9/\text{L}$	Avoid activities that increase risk of bleeding (eg, contact sports or high-impact exercises)
Fever $> 38^\circ\text{C}$ ( $100.4^\circ\text{F}$ )	May indicate systemic infection and should be investigated. If patients are neutropenic, they should avoid exercise altogether. Patients without neutropenia should avoid high-intensity exercise if fever is $> 38^\circ\text{C}$ ( $100.4^\circ\text{F}$ ), and all exercise if fever is $> 40^\circ\text{C}$ ( $104^\circ\text{F}$ )
Ataxia, dizziness, peripheral sensory neuropathy	Avoid activities that require significant balance and coordination (eg, treadmill exercises)
Severe cachexia (loss of $> 35\%$ of pre-morbid weight)	Loss of muscle mass usually limits exercise to mild intensity, depending on degree of cachexia
Dyspnea	Investigate etiology; exercise to tolerance
Bone metastases or pain	Avoid activities that increase risk of fracture at the location of the bone pain or metastases (eg, contact sports or high-impact exercises)
Severe nausea	Investigate cause; exercise to tolerance
Extreme fatigue or muscle weakness	Exercise to tolerance
Severe lymphedema	Avoid upper-extremity exercises with affected arm
Dehydration	Ensure adequate fluid intake

Source: not provided

## **OVERTRAINING SYNDROME**

Overtraining should be avoided, as it will have a negative impact on your client's health and well being. Symptoms of overtraining include an unexpected drop in performance that cannot be attributed to factors such as illness or injury. This drop-off may be preceded by a period when performance is maintained, but at greater cost to the client. Other symptoms of overtraining syndrome include mood disturbances (such as depression, anger, or anxiety), general fatigue and malaise associated with a loss of energy and vigor, and feelings of heaviness in the limbs. Changes in sleep patterns and appetite also have been commonly noted and may be useful in diagnosing overtraining syndrome. Because the symptoms of overtraining syndrome include some of the same symptoms experienced normally by persons going through the cancer treatment process, a conservative approach in all areas of program design should be carefully maintained.

The chief cause of overtraining syndrome is a poorly conceived training program. For example, rapid increases in training volume and intensity, schedules of high volume training, along with inadequate recovery, rest and nutrition will put many people at risk of developing overtraining syndrome. Failing to consider other stresses the client is experiencing will also increase the risk. But even the most carefully planned training program can cause problems with some people. Research has shown that people with similar fitness levels respond quite differently to the same training program. Studies have been done to deduce what physiological effects overtraining have on the body leading to some of its detrimental effects. One study showed that plasma and skeletal muscle glutamine levels were lowered by many factors, including illness and overtraining. Lowered levels of plasma glutamine levels contribute at least in part to a depressed immune system. This is highly contraindicated for the person with cancer for obvious reasons.

## **CARDIO RESPIRATORY PROGRAM**

ACSM defines cardio respiratory fitness as the ability to absorb, transport, and use oxygen. This is achieved by performing activities that use the larger muscle groups over an extended time period where the energy is supplied by the oxygen utilizing process. Sample activities include walking, jogging, swimming, and cycling. Your client history from the Intake form and the baseline cardio respiratory fitness test results should be used to establish a starting point for your client's cardio respiratory program. There have been a limited number of research studies addressing the many benefits of exercise for the person with cancer. The majority of those used cardio respiratory

fitness (usually cycle ergometer) exclusively as their exercise component of the study. The studies concluded that participants experienced the following benefits:

- Increased
  - Functional capacity
  - VO<sub>2</sub>Max
  - Work load
  - Mood states
  - Lean body mass
- Decreased
  - Difficulty performing activity
  - Fatigue
  - Anxiety
  - Body dissatisfaction
  - Somatization
  - Nausea
  - Body fat
  - Overall weight gain

Cardio respiratory exercise **mode, frequency, duration, and intensity** are determined by first reviewing the published guidelines.

***American Cancer Society Official Guidelines:***

**Adults:** Engage in at least moderate activity for 30 minutes or more on 5 or more days of the week; 45 minutes or more of moderate to vigorous activity on 5 or more days per week may further reduce the risk of breast and colon cancer.

**Children and adolescents:** Engage in at least 60 minutes per day of moderate-to-vigorous physical activity for at least 5 days per week.

The **ACSM's** exercise prescription focuses on performing moderately intense aerobic exercise frequently – 3 to 5 times per week at 55-90% of their maximum heart rate – for a total of 20 to 60 minutes each day. However, the exercise can be accomplished in 10-minute increments accumulated during the day. Walking, running, cycling, swimming, and stair climbing are examples of activities that exercise the major muscle groups.

The following is a list of exercise recommendations found in “The Physician and Sports Medicine” journal. It was developed by reviewing a number of research studies specific to cancer and exercise:

## General Aerobic Exercise Recommendations for Cancer Survivors and Early-Stage Cancer Patients

Parameter	Recommendation and Comment
Mode	Most exercises involving large muscle groups are appropriate, but walking and cycling are especially recommended. The key is to modify exercise mode based on acute or chronic treatment effects from surgery, chemotherapy, and/or radiation therapy.
Frequency	At least 3-5 times/wk, but daily exercise may be preferable for deconditioned cancer patients performing lighter-intensity and shorter-duration exercises.
Intensity	Moderate intensity, depending on patient's current fitness level and severity of side effects from treatments. Guidelines include 50%-75% $VO_2\max$ or $HR_{\text{reserve}}$ , 60%-80% $HR_{\text{max}}$ , or an RPE of 11-14. $HR_{\text{reserve}}$ is the best guideline if $HR_{\text{max}}$ is estimated rather than measured.*
Duration	At least 20-30 min of continuous activity, but this goal may require multiple intermittent shorter bouts (eg, 5-10 min) with rest intervals in deconditioned patients or those experiencing severe side effects of treatment.
Progression	Initial progression should be in frequency and duration. Only when these goals are met should intensity be increased. Progression should be slower and more gradual for deconditioned patients or those with severe side effects of treatment.

\* $HR_{\text{reserve}}$  = maximal heart rate ( $HR_{\text{max}}$ ) minus standing resting heart rate ( $HR_{\text{rest}}$ ). Multiply  $HR_{\text{reserve}}$  by 0.60 and 0.80. Add each of these values to  $HR_{\text{rest}}$  to obtain the target heart rate range.  $HR_{\text{max}}$  can be estimated as 220 minus age in years.

HR = heart rate; RPE = rating of perceived exertion

Exercise **mode** refers to the type of activity that will be performed by the client. When deciding which mode or modes are best, consider the limiting factors and narrow down the possibilities. Factors that affect mode of cardio respiratory fitness include:

- **Safety**—Safety is always the number one consideration when designing an exercise program. Review the Intake form including Physicians recommendations and contraindications to help narrow the possibilities.
- **Preference**—Refer to the Intake Form to review which activities the client has done, likes to do, or wishes to try.
- **Comfort**—Review the person's list of symptoms; which activities will cause discomfort? Eliminate them from the list as well.
- **Adherence**—The difference between a good exercise program and an excellent exercise program is adherence. Realistically, what mode or modes of activity is your client most likely to perform?
- The activities that remain are the obvious modes that are appropriate to choose from.

Here are some points to consider when deciding which **modes** of cardio would best benefit your client with cancer:

- **Walking:** Walking is an extremely beneficial mode of exercise for the person with cancer. It is highly functional, as walking is a part of most people's every

day activities. Walking can be performed without any expensive equipment both in and outside of a gym. Intensity is easily modified by the use of inclines, increased pace, or even increased load. Proper walking technique should be taught to all clients, so that proper biomechanics are maintained throughout the activity. Consider alternate modes of exercise for people who experience pain or discomfort while walking. Persons suffering from peripheral neuropathy may fare better walking on an inclined treadmill, cycling or swimming.

- **Jogging:** This activity is appropriate for persons who have shown competency in walking and desire an increased intensity. Jogging may not be appropriate for all clients, particularly for those with orthopedic concerns, such as bone density issues including certain bone metastases, or those with pre-existing joint issues that may be worsened with the impact forces of the exercise.
- **Swimming:** Swimming is an excellent form of cardio for many people during or following cancer treatment. Some of the many advantages of aquatic exercises include:
  1. Reduces impact forces while exercising
  2. Un-weights the body through buoyancy
  3. Provides 3-dimensional resistance
  4. Provides mainly concentric muscular contraction
  5. Allows the joints to move along a natural path
  6. Helps control core body temperature
  7. Provides accommodating resistance
  8. Human cardiovascular system works more efficiently in water
  9. Allows for a full range of motion

As with any activity, proper biomechanics should be taught to your client who wishes to engage in swimming, particularly beginners. Swimming may not be appropriate for all persons with cancer, including people receiving external radiation, people at higher risk of upper body lymphedema, and people with pre-existing muscular or skeletal conditions that may be worsened by swimming.

- **Cycling:** Cycling is a form of exercise familiar to most people. It can be performed both inside and outside of the gym (don't forget a helmet!), which can contribute to program adherence. Stationary bikes provide a relatively stable environment for persons who may be experiencing cancer related fatigue or mild nausea. As with all exercises, proper form should be taught to ensure the safety of your client. People for whom cycling may not be appropriate are those who have experienced trauma to the groin region (particularly Prostate cancer, Anal or Rectal cancers, and certain gynecological cancers).
- **Dancing:** Dancing can be done by all persons with cancer. It can be modified to fit anyone's health situation. It can be performed in any position, at any time of day, and will certainly provide numerous benefits to the client.

- **Additional modes of exercise:** The list of activities that can be used to increase cardio respiratory fitness is extensive. Before recommending any activity, review your client's Intake form and consider each element to ensure that the activity you are recommending is both safe and appropriate for your client.

## **FREQUENCY**

Let the published guidelines serve as an ideal goal for your client to gradually work toward. Encourage your client to be active all days of the week, but actually perform "cardio" 3 – 5 days per week.

## **DURATION**

As with exercise frequency, the published guidelines should be used as benchmarks for progressing your client. Clients should aim for a minimum of 20 minute sessions, though progressing to 20 minutes can take as long as is necessary. Breaking sessions up into shorter bouts of 5-10 minutes may be necessary for unconditioned or energy impaired clients. Activity should be stopped for any of the following reasons:

- Activity causes pain
- Activity causes symptoms that render the activity unsafe or inappropriate
- Proper exercise intensity cannot be maintained
- Any other reason as determined by the client

## **INTENSITY**

There are no official guidelines regarding exercise intensity for the person with cancer. Use the ACSM guidelines (55-90% of Maximum Heart Rate) or "Physicians and Sports Medicine" guidelines (50-75% VO<sub>2</sub>Max or Heart rate reserve or 60–80% Maximum Heart Rate) as benchmarks, remembering to be conservative at all times. It is also wise to consider other factors, including medication related side effects, other health history, cardiac risk factors, client's age, and any other information that can be used to establish safe exercise intensity levels. It is recommended that intensity be monitored with the use of the Borg's Rating of Perceived Exertion scale (RPE) and/or heart rate monitors.

Interval training, or varying exercise intensity throughout a given exercise session is a beneficial way of designing a cardio program. Interval training enables the person to improve the workload by interspersing heavy bouts of activity with recovery periods of less intense activity. During the interval (recovery) the heart and lungs are still stimulated as they try to pay back the debt by supplying oxygen to help break down the lactates. The stresses put upon the body cause an adaptation including capillarisation, strengthening of the heart muscles, improved oxygen uptake and improved buffers to lactates. All this leads to improved performance, in particular within the cardiovascular system. The studies cited regarding cardio respiratory fitness and cancer have shown that the best results come from performing moderate to vigorous intensities of activity,

though careful consideration should be given before recommending vigorous activity for your client with cancer.

## **PROGRESSION**

Cardio respiratory progression should focus on gradually increasing frequency and duration before increasing exercise intensity. Once ideal exercise frequency has been achieved, work to increase exercise duration. Only after optimal exercise frequency and duration have been reached, consider the safety of gradually increasing exercise intensity. The following progression uses Maximum Heart Rate as a unit of measurement of exercise intensity:

Level 1 = (Beginning level) Client should maintain a heart rate correlating to 60% MHR. Participant should be able to easily carry on a conversation during this level. Participant should consider this level to be mildly challenging but not strenuous.

Level 2 = (Intermediate level) Participant should maintain a heart rate correlating to 60-70% MHR. Participant should be able to maintain a conversation during this level. Client should consider this level to be very challenging but not strenuous.

Level 3 = (Advanced level) Client should maintain a heart rate correlating to 70-80% MHR. Interval training is a safe and effective way to make cardio respiratory gains and is appropriate for advanced level clients. Exercise sessions should be designed with intervals ranging from 60 – 80% MHR. Intervals should be spaced at least 5 minutes apart at a higher intensity not to exceed 80% MHR. Interval high point intensity should be considered to be extremely challenging yet not strenuous. Client should barely be able to pass the talk test just after achieving their interval high point.

Remember these important points:

- Client needs to be properly warmed up (5-10 minutes) before beginning exercises.
- Monitor intensities carefully!
- Continuously monitor for proper biomechanics during the activity.
- Achieve exercise frequency and duration prior to increasing exercise intensity.
- Exercise intensity should correlate to 60-80% MHR.
- Ensure that competence at lower levels have been achieved before progressing a client to more advanced intensities.
- Some days will be harder than others for the clients, so you will have to modify some exercises to make them safer. Be proactive; have a "light-day" plan.
- Exercise should be stopped immediately if acceptable heart rate cannot be maintained, client becomes dizzy, disoriented, unstable, fails the talk-test or for any other reason as determined by the trainer or client.

## RESISTANCE PROGRAM

Resistance exercises are defined as activities that use muscular strength to move a weight or work against a resistant load. Resistance training has numerous proven effects on the human body including:

- Reduces risk factors associated with
  - Coronary heart disease
  - Non-insulin dependant diabetes
  - Colon cancer
- Prevents osteoporosis
- Increase bone strength
- Increases muscle strength
- Increases lean muscle mass
- Increase body's metabolism
- Help achieve and maintain ideal body weight
- Improve body image
- Improve self-esteem
- More easily perform activities of daily living (ADL)

Very few studies have been performed proving the direct benefit of resistance exercises for the cancer patient. One study however shows a direct relationship between resistance training and health benefits for men with advanced prostate cancer. According to the *Journal of Clinical Oncology* (Vol. 21, No.9: 1653-1659), researchers from the Ottawa Regional Cancer Center in Canada reported that weight training helped reduce fatigue and improved quality of life in a group of men being treated with hormone therapy for prostate cancer. The study had 155 men perform 8-12 repetitions of leg and chest exercises 3 times per week. The men who were doing resistance exercises felt less fatigued and reported a better quality of life than men in the control group. Men who trained with weights also increased their strength over the study period, while men who didn't actually lost strength in their arms and legs.

In 2002 the ACSM published very specific guidelines regarding resistance training for healthy adults. As no official guidelines have been established for resistance training for persons with cancer, it is recommended to observe the ACSM guidelines and modify them for your population based on other factors as discovered in the intake process. The guidelines published by ACSM include the following points:

- Progressive resistance training is necessary
- Use of both concentric and eccentric muscle actions
- Performance of both single and multiple joint exercises

- Sequence exercises to optimize the quality of exercise intensity
  - Large before small muscle group exercises
  - Multiple joint exercises before single joint exercises
  - Higher before lower intensity exercises
- 8-12 muscle groups
- Initial resistances correlate to 8-12 RM be used for novice clients
- 1-12 RM in periodized fashion for intermediate to advanced training
- Eventual emphasis on heavy loading (1-6 RM) using at least 3 minutes rest between sets
- For muscular endurance training, it is recommended to use light to moderate loads (40-60% of 1RM) performed at higher repetitions (>15) using short rest periods (< 90 seconds)
- Persons who are older or frail may benefit from 10 to 15 repetitions.
- 2-10% increase in load be applied when the individual can perform the current work load 1-2 repetitions over the desired number
- Training frequency should be 2-3 days per week for novice and intermediate training and 4-5 days per week for advanced training

There are numerous ways to classify and group resistance training. For the client with cancer, the resistance training aspect of the exercise program has been divided into three different classifications:

- Core-Strengthening/Stability
- Total Body Movements (*functional exercises*)
- Muscle-specific Exercises

**Core Strengthening/Stability** exercises are meant to increase your client's core strength and stability, so that the more advanced flexibility and resistance exercises as well as daily living activities can be performed with a minimum risk of injury and postural dysfunction. Achieving and maintaining neutral spine is the basis of core stability. An unstable shoulder girdle can also lead to similar risks and should therefore be addressed in the core-strengthening program. It is on this sturdy core that more advanced movements will be built. It is the foundation of the strengthening program, and therefore all other exercises will be progressed based on proficiency in this area of skill. The types of exercises that can develop better core strength and stability are numerous:

- Achieving neutral posture in a variety of positions and angles
- Breathing techniques
- Performing exercises on a Swiss ball, foam roller, wobble board, Bosu, or other unstable platform device
- Unilateral exercises
- Balance on one leg
- Uneven loads
- Pilates

- Yoga

**Total body movements** are incorporated into the exercise program for the person with cancer to help develop strength that will help them perform activities of daily living (ADL) with proficiency. These exercises should begin with the client's body weight as the main source of resistance. Loads may be added with the use of free-weights, medicine balls, cables, or any other weighted object. When teaching your client these functional movements, it is helpful to draw a relationship between the exercise and activities performed in daily living. Consider the following examples:

- Standing up from seated position
- Standing up from prone position
- Body weight squats (add resistance when proficient)
- Squat with reach
- Diagonal squat (with reach)
- Push-ups (modified if necessary)
- Pull-ups (assisted if necessary)
- Dips (assisted if necessary)
- Climbing stairs
- Jumping (when appropriate)

**Muscle-specific exercises** are useful to address weak points in the kinetic chain as well to rehabilitate specific areas of the body affected by certain cancer treatments. Muscle-specific exercises can also prove beneficial to help improve certain pre-existing muscular imbalances discovered in the postural assessment.

Before writing the resistance program for your client with cancer, consider the following recommendations for Healthy breast cancer survivors published by "The Physician and Sports Medicine." These are made specifically for breast cancer survivors; however, they provide excellent additional guidelines for one to use in designing an appropriate resistance training program for most persons with cancer. Consider each component and make appropriate adjustments when necessary for each individual client.

<b>General Resistance Exercise Recommendations for Healthy Breast Cancer Survivors</b>	
<b>Parameter</b>	<b>Guidelines and Comments</b>
Muscle group and exercise	It is important to incorporate weight training and stretching into an exercise program to increase muscle strength and endurance and to maintain and improve flexibility.  Exercises that target the muscle groups of the chest, back, arms, abdomen, and legs include: seated row, bench press, lat pull, triceps extensions, biceps curls, back extensions, sit-ups, leg curls, leg press, and calf raises.
Frequency	Three workouts per week is optimal, with a minimum of 1 day off between workouts.
Intensity	Patients should use a very light weight to start, and increases should be small (<10% of weight/wk) and gradual. <i>Proper instruction and supervision are important.</i> Patients should do

	7-10 min of stretching before and after each workout.
Duration	Two sets of 10 repetitions of each exercise for the first 2 weeks, then increase to 2 sets of 15 repetitions.
Progression	Initial progression is the number of repetitions per set. Once patients are comfortable with 2 sets of 15 repetitions, they can increase to 3 sets of 15 repetitions. Only after this is easily achieved is the resistance increased. For each increment in resistance, it is desirable to decrease the number of sets to 2 and progress as before.

## EXERCISE MODE

Regardless of the classification of resistance exercises listed previously, the most important consideration in choosing the **mode** of exercise is *specificity of training*. There is a relatively high degree of task specificity involved in human movement and adaptation. All training adaptations are specific to the stimulus applied. The physiological adaptations to training are specific to the:

- Muscle actions involved
- Speed of movement
- Range of motion
- Muscle groups trained
- Energy systems involved, and
- Intensity and volume of training.

Although there is some carryover of training effects, the most effective resistance training programs are those that target a specific goal.

Another important consideration when choosing the mode of exercise to be performed is considering what modes will encourage rather than discourage exercise adherence. If your client is coming to your facility to learn activities to achieve a particular goal, choose the mode of exercise which would best compliment their particular needs. Exercise adherence should always be factored into an exercise program, so avoid assigning an exercise on a machine or with equipment that will not be readily available to your client. You may need to encourage your client to purchase certain devices, such as foam rollers, resistance bands, dumbbells, or even a membership to a workout facility to help guarantee program adherence.

Finally and perhaps most importantly, chose a mode of exercise that will both achieve the physiological response that you desire and will at the same time not be contraindicated for your client.

## EXERCISE FREQUENCY

The **frequency** of performing core strength and stability should be the same as all other areas of resistance training: 2-3 days per week; however, encourage your client to practice core stabilization in their daily living.

## **EXERCISE DURATION**

Studies have shown that keeping total exercise sessions to under 60 minutes produces optimal exercise adherence. Time allotment for specific components of the exercise session should be carefully weighed to produce the desired results. (See exercise tempo.)

## **SETS**

A safe recommendation is to have novice clients perform two complete set of each exercise. (This does not include reps done teaching new exercises.) Eight to ten exercises should be performed including one exercise for all major muscle groups.

## **REPETITIONS**

- Clients should begin by performing 10-15 repetitions of each exercise. This range allows for the trainer and client to focus more on proper biomechanics and exercise intensity as the main gauge for completing a set. Initial resistances correlate to 8-12 RM be used for novice clients
- 1-12 RM in periodized fashion for intermediate to advanced training
- Eventual emphasis on heavy loading (1-6 RM) using at least 3 minutes of rest between sets
- For muscular endurance training, it is recommended to use light to moderate loads (40-60% of 1RM) performed at higher repetitions (>15) using short rest periods (< 90 seconds)

## **TEMPO**

The ACSM recommends that novice exercisers perform activities with slow (2 sec. concentric / 4 sec. eccentric) to moderate (1-2 sec. concentric / 1-2 sec. eccentric) velocities. For intermediate clients moderate (<1 sec. concentric / 1 sec. eccentric) velocities produce the greatest strength gains. For advanced training, the inclusion of a continuum of velocities from unintentionally slow to fast velocities is recommended for maximizing strength. It is important to note that proper techniques used for any exercise velocity in order to reduce any risk of injury. Remember to avoid prolonged eccentric contractions to limit the inflammation related to tissue damage, as it can increase the risk of lymphedema in affected limbs.

## **INTENSITY**

The trainer and the client should have a very standardized method of gauging exercise intensity. The following scale has been developed to closely resemble the modified Borg 10-point RPE scale:

1 = Client goes through the motion of the exercise with no applied resistance.

5 = (*Warm-up or learning*) Client performs exercise with less than perfect form and very light or no additional resistance. The goal is to either learn the exercise or to warm-up the muscles being used. Client could have done 8 or more repetitions.

6 = Client and trainer feel the exercise was performed with perfect form and a level of fatigue was reached where 6-7 or more repetitions could have been performed.

7 = Client and trainer feel the exercise was performed with perfect form and a level of fatigue was reached where 4 or 5 more repetitions could have been performed.

8 = Client and trainer feel the exercise was performed with perfect form and a level of fatigue was reached where 2 or 3 more repetitions could have been performed.

9 = (*Volitional Fatigue/Overload*) Client and trainer feel the exercise was performed with perfect form and a level of fatigue was reached where 0 or 1 more repetitions could have been performed.

10 = (*Total Fatigue/Overload for advanced clients*) Client and trainer feel the exercise was performed perfectly and a level of fatigue was reached with the assist of a spotter.

When monitoring exercise intensity, one must be clear on the goal of the activity being performed. To create a neural response required in the initial process of learning exercise form or technique, lower intensities are sufficient to create a physiological response (**modified Borg RPE= 5-7**). To provide increases in true muscular strength, overload is necessary, so higher levels of intensities (**modified Borg RPE= 9-10**) are required to achieve volitional and total fatigue. (See Resistance Exercise Progression.)

Due to the possibility at any time for a high level of compromising cancer-related side effects, there will be occasions when activity performed at lower intensities (**modified Borg 1-4**) is sufficient to create beneficial results, particularly empowerment. Exercise intensity should always be appropriate for whatever state of wellness your client is currently experiencing. Remember to consider the specific goal of the activity being performed when deciding appropriate exercise intensities.

## **RESISTANCE EXERCISE PROGRESSION**

Progressive overload is the gradual increase of stress placed upon the body during exercise training. The adaptive processes of the human body will only respond if the body is called upon to exert an even greater magnitude of force to meet higher physiological demands. The ACSM guidelines for exercise progression are specific to a

healthy population. It is recommended that less experienced (novice) clients and those experiencing side effects from their cancer treatments be progressed according to recommendations made for elderly populations. The recommendations are the same as those for healthy individuals with increased focus on a more gradual progression.

**Progress** participants with the following guidelines:

- Novice client able to maintain neutral spine, braced abdominals, and proper breathing while in stationary standing, sitting and prone positions.
- Intermediate client challenges but maintains neutral spine, braced abdominals, and proper breathing in standing, sitting and prone positions while:
  - Moving limbs/torso in various planes
  - Challenge stability with various unstable surfaces
- Advanced client able to perform intermediate level movements with increased resistance
- 2-10% increase in load be applied when the individual can perform the current work load 1-2 repetitions over the desired number
- Client maintains neutral spine, braced abdominals, and proper breathing throughout each repetition as workload increases.
- Client is able to perform exercises perfectly without cues from trainer.
- Progress activity to more challenging movements when client is able to perfectly execute 15 repetitions of all stability exercises within a given level for two consecutive workout sessions.

## **FLEXIBILITY PROGRAM**

Flexibility is defined as the ability to move joints through the normal, full range of motion. Range of motion (ROM) is specific to the joint, ligaments, and elasticity of the muscles and tendons across a joint. The joint's range of motion is referred to as joint mobility. The ability to adequately support a joint through its full range of motion is referred to as joint stability. It is critical that you continue to strengthen muscles through their full range of motion as your client's range of motion increases.

The person with cancer can be faced with numerous factors that may compromise joint flexibility. Physically induced factors such as surgery, radiation, and immobility as well as emotionally induced factors such as "protecting" affected areas, fatigue- or depression-related slouching, and pain-induced tension can all lead to shortened range of motion for the cancer patient. Another great benefit is that stretching increases blood supply and nutrients to joint structures. Stretching increases tissue temperature, which in turn increases circulation and nutrient transport.

Achieving and maintaining proper ROM should be a goal for all clients. The ACSM Flexibility guidelines are: Flexibility exercises should be incorporated into the overall fitness program sufficient to develop and maintain range of motion. These exercises should stretch the major muscle groups and be performed a minimum of 2-3 days/week. At least four repetitions per muscle group should be completed at each session. Stretching should include appropriate static and/or dynamic techniques.

The ACSM guidelines are designed for healthy persons and must be modified for special populations. The baseline postural assessment will cue you as to which joints require special attention to restore normal range of motion. Be sure to give special consideration to joints whose flexibility has been compromised due to the presence of cancer or from the effects of cancer treatment. Also keep in mind that adding increased loads to an unbalanced body will result in further compromising postural dysfunction. Do not add resistance to areas of the body that have compromised joint range of motion. Proper joint flexibility is a prerequisite for the progression of all strength-training components of your client's exercise program.

When deciding what method of stretching is to be employed to increase flexibility for your client with cancer, consider what mode will satisfy all of the following issues:

- Effectiveness
- Safety
- Adherence

**Ballistic stretches** are not recommended for most healthy individuals and are therefore not recommended for persons with cancer.

**Static stretches**, whether active or passive can be very useful for the client with cancer. Static stretches are both easy to learn and tend to be much gentler than other methods of increasing flexibility. Static stretches are slow and relaxed and are very useful in reducing post-workout muscle fatigue, and soreness as well as relieving spasms in muscles that are healing after trauma, including some methods of radiation and surgical procedures. In general, beginning gentle ROM exercises should be done within the first week following many surgeries and carefully progressed after the first week. It is always advisable to get physician recommendations before beginning an aggressive stretching program following surgical procedures. Keep in mind that areas affected by surgical procedures can lose elasticity from both disuse as well as the formation of scar tissue. The collagenous and fibrous properties of scar tissue make light massage another valuable tool in achieving normal range of motion in affected joints. Trained massage therapists are recommended to perform these techniques safely.

Many people use the term "passive stretching" and "static stretching" interchangeably.

**Static stretching** involves holding a position. That is, muscles are stretched to their farthest point and held. An active static stretch is one where you assume a position and then hold it there with no assistance other than using the strength of your agonist muscles. The tension of the agonists in an active stretch helps to relax the muscles being stretched (the antagonists) by reciprocal inhibition. Many of the movements (or stretches) found in various forms of yoga are active stretches. Because of their gentle self-monitored nature, active static stretches are highly recommended for the person with cancer.

**Passive stretching** is a technique in which you are relaxed and make no contribution to the range of motion. Instead, an external force is applied by an outside source, either manually or mechanically. If you are the external force used in the passive stretch, be particularly cautious of overstretching. Overstretching or straining muscles can cause pain and swelling which can contribute to the increased potential of injury and lymphedema. Be sure to establish clear dialogue between you and your client so that you do not induce pain. Remember: stretching should cause mild discomfort—not pain!

If your client has bone metastases or frail bones, be very aware of the forces created by assisting a stretch, as these fragile bones are prone to fractures. Self-monitored static stretches are in most cases optimal to ensure effectiveness, safety, and adherence.

**Dynamic stretches** involve moving parts of one's body and gradually increasing reach, speed of movement, or both. Do not confuse dynamic stretching with ballistic stretching! Dynamic stretching consists of controlled leg, arm and torso swings taken gently to their limits of range of motion. Ballistic stretches involve trying to force a part of the body *beyond* its range of motion. In dynamic stretches, there are no bounces or "jerky" movements. Dynamic stretching is useful prior to activities that involve the "swinging" of limbs, including most forms of cardio and several sports and leisure activities. If you are going to recommend dynamic stretching for your client, it is essential to educate them on how to perform the stretches safely!

## RELAXATION TECHNIQUES

In the "Mind/Body" model of integrative exercise programming, relaxation techniques are of paramount importance. The thought that the mind has a direct effect on the body has long been acknowledged, but until only recently has remained unproven. Psychoneuroimmunology is defined as the study of the interactions of the immune system (IS), the central nervous system (CNS), the psycho-and the psyche (PS). Today it is well accepted that there is significant communication between the three systems, which in turn affect the physiological behavior of each component.

Consider the following research-based results regarding the benefits of relaxation specific to persons with cancer:

...Teaching cancer patients how to relax while they undergo a variety of hard-to-tolerate cancer treatments helps them cope with symptoms such as nausea and pain, according to a new analysis of 15 studies. Relaxation techniques investigated included techniques such as **progressive muscle relaxation, hypnosis** and **mental imagery**.

Relaxation techniques can also reduce tension, depression and anxiety, yet few cancer treatment programs use these techniques on a regular basis. "Relaxation techniques learned prior to undergoing cancer treatment proved more effective at reducing anxiety than techniques taught while the patient was undergoing aggressive treatment to eradicate or slow the cancer," says lead study author Karin Luebbert of the University Hospital Hamburg.

Teaching relaxation techniques involves very little of a professional's time – usually less than two hours – making the intervention inexpensive, according to the study published in the February issue of *Psycho-Oncology*. Relaxation techniques may help patients achieve a physical restfulness that reduces their anxiety and reactivity to unpleasant stimuli. The muscular relaxation that results from these techniques may also ease the physiological cascade that leads to nausea and vomiting, the authors say.

Besides some of the documented emotional benefits of relaxation training, these techniques may also help patients feel more in control of their treatment, especially if they are encouraged to practice on their own, they say. Cancer patients can often feel helpless and hopeless. "Relaxation affords an active coping strategy for them."...

To summarize, these research-supported benefits of adopting relaxation techniques for the cancer patient include:

- Increased ability to cope with pain
- Increased ability to cope with nausea
- Reduce tension
- Reduce depression
- Reduce anxiety
- Reduced nausea and vomiting due to muscular relaxation
- Increased sense of control

Additional evidence has been shown to reduce symptoms or improve outcomes in the following conditions:

- Premenstrual syndrome
- Pain
- Irritable bowel syndrome
- Anxiety
- Infertility
- High blood pressure
- High cholesterol
- Diabetes
- Panic disorders
- Chronic tension headaches
- Fibromyalgia
- Insomnia
- Psoriasis
- Arthritis
- Hyperactivity in children

The neuro-endocrine system releases chemical "carriers" of our thoughts and feelings, which directly influence our physical health. Our emotions are actually mediated in the brain by these chemicals, called neurotransmitters, which also circulate throughout the body, carrying messages to our immune defenses and other systems.

There are three major types of relaxation techniques:

**Autogenic training:** This technique uses both visual imagery and body awareness to move a person into a deep state of relaxation. Have your client imagine a peaceful place and then focus on different physical sensations, moving from the feet to the head. For example, one might focus on warmth and heaviness in the limbs, easy, natural breathing, or a calm heartbeat. This technique is also referred to as creative visualization. An easy way to incorporate creative visualization for the person with cancer is to suggest they imagine positive actions during their exercise activity, such as "stepping on cancer cells" or "marching into a winnable battle" during a walking program, or "pulling yourself out of depression" while performing pull-ups.

**Progressive muscle relaxation:** This technique involves slowly tensing and then releasing each muscle group individually, starting with the muscles in the toes and finishing with those in the head. This activity is ideal to end an exercise session following a stretching program to provide a grounding or centering effect.

**Meditation.** The two most popular forms of meditation in the U.S. include Transcendental Meditation (students repeat a *mantra* [a single word or phrase]) and mindfulness meditation (students focus their attention on their moment-by-moment thoughts and sensations). This method could be as easy as focusing on one's breathing prior to an exercise session for the client who arrives fearful or distracted by other emotions.

If you are not practiced in performing these relaxation techniques, it is advisable to become at least basically familiar with each so that you can impart their unquestionable benefits to your client with cancer. It is also recommended to familiarize yourself with groups or specially trained individuals who can maximize the benefits that relaxation will provide.

# BREAST CANCER AND EXERCISE

## INTRODUCTION

Breast cancer is the most common type of cancer among women in the United States. The estimated number of new cases in 2003 was 212,600. Breast cancer is not limited to women, however, as an estimated 1,300 men are diagnosed with the disease each year as well. The treatment and exercise implications are similar for both sexes, however reconstructive surgeries are not commonly performed on men.

Breast cancer can occur in women of all ages, even as young as twelve. The risk of developing breast cancer for a woman in her lifetime is approximately 1 in 8. Because the population affected is so varied, you can expect that women of all fitness levels will be affected. In some regards, this makes exercise an even more valuable tool, as unlike some cancer populations, women of relatively younger ages may find adopting new exercise habits easier to accept and perform.

Many different therapies are used in the treatment of breast cancer, including but not exclusive to a wide array of surgical procedures, chemotherapy, radiation therapy, biological therapy, and hormone therapy. As each of these procedures have been explained earlier in this manual, only statements specific to breast cancer will be made to aid you in designing exercise programs for this special population.

## TYPES OF BREAST CANCER

- **Ductal carcinoma** is the most common type of breast cancer. It begins in the lining of the milk ducts. If it has not spread outside of the duct, it is called **ductal carcinoma in situ (DCIS)** and is considered to be a pre-cancerous condition.
- **Lobular carcinoma in situ** refers to abnormal cells in the lining of the lobules, the glands that make milk.
- **Invasive breast cancer** refers to cancer cells which have spread outside the ducts or lobules where it started. Most breast cancers are invasive.
- **Inflammatory breast cancer** is a relatively rare form of breast cancer (about 1-4%); the cancer is fast-growing and blocks the lymph vessels in the breast and skin.

- **Metastatic breast cancer** is cancer that has spread from the site of the initial cancer to other sites in the body. Involvement of lymph nodes under the arm is one of several factors that predict a high risk of spread to other parts of the body.
- **Recurrent breast cancer** is cancer that has come back (recurred) after treatment. It may recur locally (in the breast or chest wall) or in any other part of the body (such as bone, liver, or lungs).

## PROCEDURES USED TO TREAT BREAST CANCER

### SURGERY

**Tumor Biopsy:** The removal of tissue or fluid from the breast to help diagnose and classify a tumor. Biopsy procedures may be as simple as a fine needle aspiration, a thick needle or core biopsy, or a surgical biopsy.

**Lymph node biopsy:** Most patients with invasive cancer will be advised to undergo some form of lymph node removal surgery. The status of the regional lymph nodes (axillary or lymph) is one of the most important determinants of prognosis and thus is extremely important to the patient and the oncologist. Patients with negative lymph nodes have a statistically improved prognosis and patients with positive lymph nodes will typically benefit from more aggressive forms of chemotherapy. Thus, the regional lymph nodes become extremely important in planning the treatment of breast cancer.

The intercostobrachial nerve which passes through a mass of axillary lymph nodes is sometimes damaged during the removal of lymph nodes. It can result in numbness and tingling in the upper arm, but resolves within three months in most cases.

These initial draining nodes specific to the tumor location are called the **sentinel lymph nodes**. Studies have demonstrated that if the sentinel nodes are free of breast cancer cells, the overwhelming probability is that the remaining lymph nodes will be negative. It is important to remember that lymphedema risk increases directly proportionally to the number of lymph nodes that are removed or damaged.

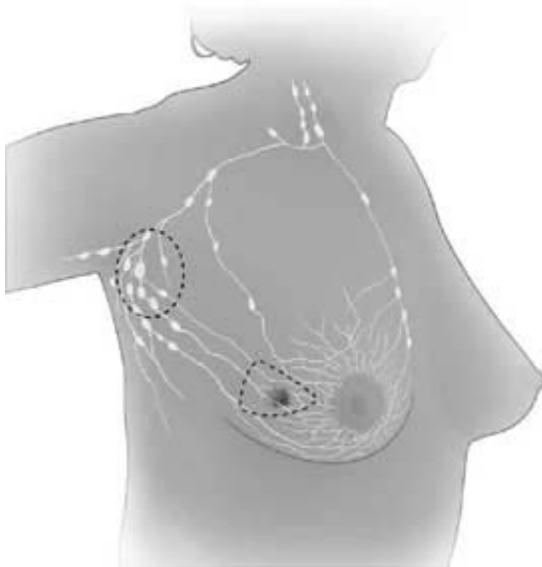
**Lumpectomy (Partial mastectomy):** Lumpectomy involves the removal of the tumor with a wide margin of normal tissue. If the margin can be adequately cleared, the breast can be saved. It is referred to as a breast sparing procedure. Most patients will then undergo a course of radiation therapy.

**Mastectomy:** Mastectomy involves removal of the entire breast, including the nipple. There are two types of mastectomies performed, the total mastectomy and the modified radical mastectomy.

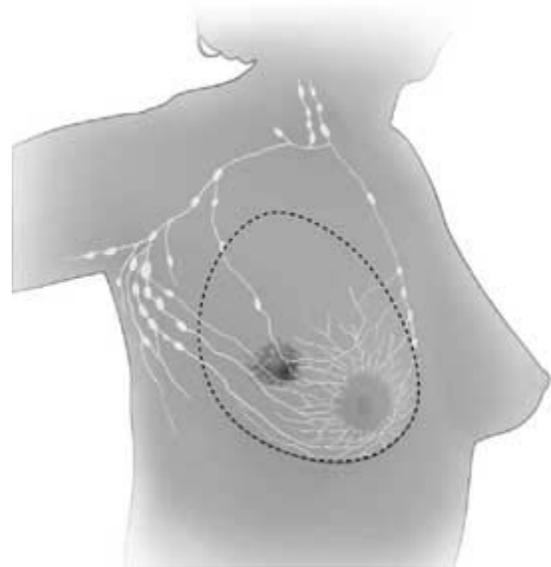
**Total simple mastectomy** refers to the removal of the entire breast. Some axillary lymph nodes may be removed with this procedure.

**Modified radical mastectomy** refers to the removal of the entire breast, most or all of the lymph nodes under the arm, and, often, the lining over the chest muscles. The smaller of the two chest muscles also may be taken out to make it easier to remove the lymph nodes.

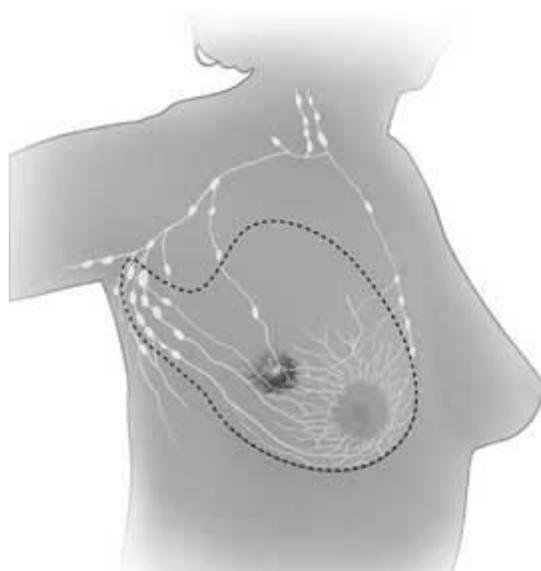
(See diagrams below)



Lumpectomy (partial mastectomy, breast conserving surgery)



Total simple mastectomy



Modified radical mastectomy

**Reconstructive surgeries** are surgeries performed to replace a removed breast. They include the following procedures:

- **Implants:** This is the most common reconstructive procedure associated with breast cancer. It involves a tissue expander to stretch the available skin so a permanent implant can eventually be placed at a later date.
- **Latissimus dorsi flap:** Another technique commonly used is the latissimus dorsi flap technique, which involves the detachment and replacement of the latissimus dorsi muscle to create a new breast.
- **TRAM flap:** The third technique is the Transverse Rectus Abdominus Flap technique. (It is important to note that the term “transverse” does not refer to the transverse abdominals.) A horizontal incision is made across the patient’s abdomen so that the unilateral vertical portion of the rectus abdominus muscle can be removed and used to reconstruct the breast. Transverse implies the direction of movement of the flap; it is turned and transversely situated to the opposite side of the chest wall. TRAM flap reconstructions retain the blood supply associated with the removed portion of the rectus abdominus muscle.
- **Free flap** reconstructive surgery is similar to the TRAM flap, however it is performed using only the smaller upper portion of the rectus abdominus muscle. Because of the section of the muscle that is used, the separated muscle used does not retain its original blood flow. The blood vessels are detached and microscopically reattached to vessels in the upper chest.

## CHEMOTHERAPY

Chemotherapy is often used to treat breast cancer. The types of chemotherapy agent(s) used vary depending on many factors. As with all clients receiving chemotherapy treatment, it is important for you to educate yourself with the sideeffects that your client is or is expecting to experience, so that appropriate exercise programming can be performed.

## RADIATION THERAPY

Radiation therapy is sometimes used to treat breast cancer. It is often used following breast-sparing surgeries to help kill any remaining cancer cells. This therapy is also

used following some mastectomies. When radiation is directed at the axillary lymph nodes, it greatly increases a person's risk for lymphedema, as many lymph nodes become impaired.

If external radiation therapy is to be used, it generally takes place on a five-day on/two-day off regimen for several weeks. Internal radiation is administered at relatively high doses and usually takes place in a hospital setting, and will therefore rarely affect your client, except for the possibility of increased fatigue following the treatment.

## **BIOLOGICAL THERAPY**

Herceptin is a biological therapy used to treat some women with breast cancer. Side effects that most commonly occur during the first treatment with Herceptin are fever and chills. Other possible side effects include pain, weakness, nausea, vomiting, diarrhea, headaches, difficulty breathing, and rashes. These side effects generally become less severe after the first treatment.

Herceptin may have adverse pulmonary reactions including dyspnea and hypotension, though these effects usually occur within 24 hours of receiving the drug. It is advised that clients receiving Herceptin not engage in strenuous activities during this 24-hour period.

Herceptin also may also cause heart damage, which may lead to heart failure. Clients receiving Herceptin will have regular cardiac tests to monitor cardiac changes. Exercise intensities should be reduced and closely monitored to help prevent against adverse cardio respiratory events.

## **HORMONE THERAPY**

Certain breast cancers are estrogen sensitive, meaning that the tumor grows rapidly in the presence of estrogen. Tamoxifen is commonly used to block the estrogen-sensitive receptor sites located on the cancer cells to help inhibit tumor growth. Hormone therapy is usually administered for up to five years following the initial cancer diagnosis. Persons taking Tamoxifen usually experience weight gain, hot flashes and vaginal discharge. Less common side effects include blood clots, strokes, and uterine cancer.

## **EXERCISE RECOMMENDATIONS AND BREAST CANCER**

First of all, it is critical that you respect your own professional limits when it comes to training any client, particularly those who may be experiencing physical problems beyond your training or comfort. It is possible that you may encounter a client who has just had a surgery who would be better in the care of a physical therapist. Do not hesitate to refer your client back to their physician for specific training guidelines (along with a signed Physician's Release) or to be sent to a physical therapist.

Exercise programming for the client with breast cancer is performed by considering the same factors that you would with any client with cancer. The following section breaks down the exercise program by components and includes recommendations that are breast cancer-specific.

## **CARDIO RESPIRATORY PROGRAM**

Review the side effects that your client may be experiencing to help guide you in recommending cardio activity. Modify exercise intensities when necessary, such as for persons taking Herceptin who have been told by their physician to reduce activity intensities. Some chemotherapy agents used to treat breast cancer have a high risk of peripheral neuropathy, which may require tailoring exercise modes that do not exacerbate symptoms. As the population of persons with breast cancer is relatively high, suggest your client join a community activity group, which encourages regular group aerobic activities.

It is also interesting to review the studies listed at the end of this manual, which were performed on persons with breast cancer, both during and following their treatment periods. All of the studies involved cardio respiratory activity, and the majority proved that there are many benefits of regular cardio activity.

## **RESISTANCE PROGRAM**

Resistance training should be structured addressing core strength and stability, total body or functional movements, as well as muscle specific exercises. Remember that each new procedure experienced by the client with cancer may have an impact on core stabilization, which is the foundation of the resistance training program. There may be situations when you will have to temporarily regress clients to ensure a strong core.

Many of the surgical procedures as well as radiation therapies will have some degree of involvement affecting shoulder range of motion on the affected side(s). Remember to first address flexibility so that proper range of motion can be restored prior to adding resistance to certain movements.

Due to the high occurrence of procedures, which may result in the removal or damage of axillary lymph nodes, lymphedema may be a factor to consider. If lymphedema is a

risk factor for your client, make sure you and your client both have a comprehensive understanding of the monitoring and prevention of lymphedema as described earlier in this manual.

Reconstructive surgeries will have a great deal of impact on your resistance program design. All of the procedures include a relatively high level of trauma to the chest area, which will certainly have an effect on shoulder range of motion. Remember to establish proper range of motion prior to adding resistance to shoulder movements.

**Implant** reconstruction uses chest expanders, which are placed between the pectoralis major and the rib cage to make room for the appropriately sized implant. The implant can shorten range of motion for the chest muscles and may contribute to shortened range of motion of the affected shoulder. Most women will be able to resume many of their regular activities after one week, but it often takes three to four weeks before patients can perform more strenuous activities or return to work.

**Latissimus dorsi flap** reconstructions actually move the latissimus dorsi to another location, rendering it functionally useless. The other muscles that perform the same movements of the relocated muscle (shoulder extension, adduction, and internal rotation) must be slowly trained to pick up the increased burden placed on them. It is important to start with very light levels of resistance and progress conservatively. It is also important to note that the latissimus dorsi will be detached from the lumbar vertebrae. The latissimus dorsi muscle contributes to lower back stabilization, so core strengthening will have to be addressed carefully.

**TRAM flap and free flap** reconstructions can cause a great deal of unfavorable imbalances in your client's body, which can be addressed with strengthening (and stretching) exercises. The client is encouraged to begin some active arm exercises two to three weeks postoperatively, including movements to restore proper flexibility. Abdominal exercise should be limited for approximately 2 months. As a general rule, it usually takes two to three weeks for patients to return to routine daily activities and six to eight weeks for a full recovery. Abdominal "crunches" should be avoided following a TRAM flap reconstruction. The initial effect of the abdominal incision is limited lumbar extension, as both procedures have the somewhat beneficial effect of a "tummy tuck". Proper range of motion should be achieved prior to performing aggressive resistance exercises. Core strengthening will have to be addressed to protect against injuries from compromised spinal stability. Unilateral reconstructions involve the relocation of one side of the rectus abdominus muscle, so particular attention should be given to spinal alignment, both in the frontal and sagittal planes. The remaining oblique muscles will perform the same movements as the missing rectus abdominus muscle, but progression will have to be gradual. There is an increased risk of developing a hernia following the TRAM and free flap procedures. Maintaining regular aerobic activity as well as maintaining ideal body weight can help to reduce the occurrence of hernias. Again,

**abdominal “crunches” should be avoided following a TRAM flap reconstruction!**

## **FLEXIBILITY PROGRAM**

Restoring proper flexibility should be a priority following any procedure that involves surgery and radiation. Many people with breast cancer consider many of the procedures to be “disfiguring”, and will attempt to hide or protect the affected area. These factors will often lead to limited range of motion in the affected shoulder(s). Gentle stretches to open up the shoulder joint and restore its full range of motion should be taught to all clients experiencing compromised shoulder flexibility. The flexibility program should begin with a gentle warm-up. Gentle “pendulum” swings and shoulder shrugs are appropriate methods of preparing the area that is to be stretched. For shoulder joints with excessively limited range of motion, including frozen shoulder, a warm blanket may be used to assist in warming-up the muscles to be stretched.

Breast reconstruction procedures will have many flexibility implications and should be carefully addressed. Implants will inhibit pectoralis major flexibility, latissimus dorsi flap reconstructions will affect shoulder flexibility, and TRAM flap reconstructions will affect both abdominal and shoulder flexibility.

Following lymph node dissection, some people experience fascial “cording”. It feels as though a cord extends from the mastectomy or lumpectomy or even the drain scar down the arm to the wrist. It is painful and can recur. Gentle stretching and massage can help to alleviate the condition.

## **RELAXATION TECHNIQUES**

As with all types of cancer, employing relaxation techniques has many psychological as well as physiological benefits. Due to the relatively large population of women with breast cancer, there are many community resources available that are breast cancer-specific to help your client learn and incorporate relaxation techniques. Encourage your client to seek individual or group activities to increase their ability to relax during this challenging time. Be sure to get feedback from your client as to what types of methods they are involved in, as some may need your specialized professional input. One example is yoga. Yoga is an excellent method of achieving lower stress levels, but some positions may be contraindicated for your client. Educate your client about their particular limitations and offer them tips to help advocate for themselves to ensure safe practices.

# BREAST CANCER AND EXERCISE RESEARCH STUDY RESULTS

TABLE 1. Results of Exercise During Breast Cancer Treatment					
Authors	Sample/Treatment	Design	Intervention and Measures	Outcomes and Measures	Results
<b>Correlational</b>					
Courneya and Friedenreich <sup>7</sup>	167 breast cancer survivors who had completed adjuvant therapy	Retrospective	Self-reported mild, moderate, and strenuous exercise during treatment using the Godin Leisure Time Exercise Questionnaire	Quality of life (Functional Assessment of Cancer Therapy and Satisfaction With Life Scale)	Survivors who performed moderate or strenuous exercise during treatment reported highest quality of life
Cunningham et al <sup>8</sup>	66 breast cancer survivors with metastatic disease (mean, 102 mo post diagnosis) still receiving palliative therapies	Prospective	Self-reported regular exercise (researcher developed)	Survival (medical records)	Survivors who reported regular exercise lived longer than those who did not exercise regularly
<b>Experimental</b>					
MacVicar and Winningham <sup>9</sup>	10 early-stage breast cancer patients on chemotherapy and 6 healthy controls	Pretest-posttest with matched controls (4 non-exercising patients and 6 healthy exercisers)	Supervised cycle ergometer for 10 wk, 3 times/wk, 60% to 85% HR <sub>max</sub>	Symptom-limited exercise test and Profile of Mood States	Exercising patients increased functional capacity and mood states equal to that of healthy exercisers; patient controls showed reverse effects
MacVicar et al <sup>10</sup>	45 stage-2 breast cancer patients on chemotherapy	Randomized controlled trial with placebo (stretching) and waiting-list controls	Supervised cycle ergometer for 10 wk, 3 times/wk, 60% to 85% HR <sub>reserve</sub>	Symptom-limited graded exercise	Exercise group had 40% increase in functional capacity and higher VO <sub>2</sub> max test time and workload than placebo group or controls
Mock et al <sup>11</sup>	46 early-stage breast cancer patients starting 6 wk of radiation therapy	Randomized controlled trial with usual-care controls	Home-based, self-paced walking for 20-30 min, 4-5 times/wk at 'brisk' intensity for duration of radiation therapy	12-minute walk test, symptom assessment scales, Piper fatigue scale	Exercise group walked farther on the 12-min walk test and had less difficulty, fatigue, anxiety, and body dissatisfaction than the controls
Winningham and MacVicar <sup>12</sup>	42 breast cancer patients 3 to 6 mo into chemotherapy	Randomized controlled trial with placebo (stretching) and waiting-list controls	Supervised cycle ergometer for 10 wk, 3 times/wk, 60% to 85% HR <sub>max</sub>	Somatization subscale of the Derogatis Symptom Checklist-90-Revised	Exercise group reported less somatization and nausea than the placebo and controls
Winningham et al <sup>13</sup>	24 stage-2 breast cancer patients 1 to 6 mo into chemotherapy	Randomized controlled trial with wait-list controls	Supervised cycle ergometer for 10-12 wk, 3 times/wk, 20-30	Body weight and composition (skinfold calipers)	Exercise group had decreased body fat and increased lean body mass;

			min, 60% to 85% HR <sub>max</sub>		controls showed opposite effects
Schwartz <sup>14</sup>	27 stage 1 to 3 breast cancer patients starting chemotherapy	Pretest-posttest	Home-based aerobic exercise for 8 wk, 3-4 times/wk, 15-30 min, at low-to-moderate intensity	12-min walk test, Profile of Mood States, Schwartz Cancer Fatigue Scale, and Quality of Life Index for Cancer Patients	Exercise adherents significantly increased walking distance and had significantly less weight gain and decline in quality of life than nonadherents

HR<sub>max</sub> = maximal heart rate; HR<sub>reserve</sub> = heart rate reserve

**TABLE 2. Results of Exercise in Patients After Breast Cancer Treatment**

Authors	Sample	Design	Intervention and Measures	Outcomes and Measures	Results
<b>Correlational</b>					
Baldwin and Courneya <sup>15</sup>	64 early-stage breast cancer survivors (mean, 51 mo post-diagnosis), most of whom had completed various treatments	Cross-sectional	Self-reported mild, moderate, and strenuous exercise during or after treatment using the Godin Leisure Time Exercise Questionnaire	Self-esteem (Rosenberg Self-Esteem Scale), physical acceptance (Body Image Visual Analogue Scale), physical competence (Physical Self-Efficacy Scale)	Strenuous exercise correlated positively with self-esteem and physical competence
Bremer et al <sup>16</sup>	109 breast cancer survivors (mean, 63.7 mo postdiagnosis) of mixed ethnicity from South Africa who had completed at least surgery	Cross-sectional	Self-reported post treatment exercise (instrument not reported)	Psychological adjustment (Affect Balance Scale and Index of Well Being), health locus of control (Multidimensional Health Locus of Control Scale)	No differences between survivors who did and did not report a regular exercise program
McBride et al <sup>17</sup>	500 early-stage breast cancer survivors (5-74 mo post diagnosis) who had completed various treatments	Cross-sectional	Self-reported exercise frequency, duration, length of time, and intentions using a stage-of-change measure	Psychological impact of cancer (Impact of Events Scale)	No differences between survivors who did and did not report regular exercise
Nelson <sup>18</sup>	54 stage-1 breast cancer survivors (9-344 mo post diagnosis) who had had only surgery	Cross-sectional	Self-reported post treatment exercise using Health Promoting Lifestyle Profile	Rosenberg Self-Esteem Scale and one-item perceived health scale	Among survivors, health-promoting behaviors (eg, exercise) correlated positively with self-esteem
Pinto et al <sup>19</sup>	71 stage 0 to 2 breast cancer survivors (mean, 8 mo post diagnosis)	Cross-sectional	Self-reported recent exercise	Mood, coping behaviors, cancer-related symptoms	Exercise related to less confusion, more vigor, and better coping behaviors
Young-McCaughan and Sexton <sup>20</sup>	71 stage 1 or 2 breast cancer survivors (7-80 mo post diagnosis) who had completed various	Cross-sectional	Self-reported exercise during or after treatment using researcher-developed instrument	Quality of Life Index for Patients With Cancer	Regular exercisers reported a higher quality of life than nonexercisers

	treatments				
<b>Experimental</b>					
Harris and Niesen-Vertommen <sup>21</sup>	20 breast cancer survivors (1-17 yr post diagnosis) who had received axillary dissection and/or adjuvant therapy	Pretest-posttest	Aerobic and resistance exercise for 8 mo, 3 times/wk, 20-30 min, at moderate intensity	Lymphedema (arm circumference at four locations)	No meaningful change for 99% of the data points, and no difference between ipsilateral and contralateral arms
Nieman et al <sup>22</sup>	12 breast cancer survivors who had completed mixed treatments within the past 4 yr	Randomized, controlled trial with usual care controls	Supervised walking and weight training for 60 min, 3 times/wk at 75% HR <sub>max</sub> for 8 wk	Physical functioning (treadmill test, 6-min walk test, leg strength) and natural killer cell activity (NKCA)	Experimental group had increase in 6-min walk test and strength test, decreased heart rate during testing compared with controls; no differences in NKCA
Peters et al <sup>23</sup> (1994)	24 stage 1 or 2 breast cancer survivors who were at least 6 mo post surgery	Pretest-posttest	Supervised cycle ergometer program for 5 wk, 5 times/wk, 30-40 min, moderate intensity; then self-reported exercise for 6 mo, 2-3 times/wk, at moderate intensity	Immune (CD 56) and psychological functioning (Freiburg Personality Inventory)	Exercisers had increased NKCA and satisfaction with life
Peters et al <sup>24</sup> (1995)	24 stage 1 or 2 breast cancer survivors who were at least 6 mo post surgery	Pretest-posttest	Supervised cycle ergometry for 5 wk, 5 times/wk, 30-40 min, at moderate intensity; then self-reported exercise for 6 mo, 2-3 times/wk, at moderate intensity	Immune functioning (number and percentage of granulocytes, lymphocytes, and monocytes)	Exercisers had increased number of granulocytes but decreased number of lymphocytes and monocytes
Schulz et al <sup>25</sup>	28 nonmetastatic breast cancer patients	Pretest-posttest	Supervised exercise 2 times/wk for 10 wk	Physical fitness, anxiety, and depression	Increased physical fitness; decreased anxiety and depression
Segar et al <sup>26</sup>	24 sedentary breast cancer survivors (mean, 42 mo post surgery)	Randomized controlled trial with waiting-list controls	Unsupervised exercise for 10 wk, 4 times/wk, 30 min, $\geq 60\%$ HR <sub>max</sub> controls	Depression (Beck Depression Inventory), anxiety (Spielberger State-Trait Anxiety Inventory), and Rosenberg Self-Esteem Scale	Exercise adherents had reduced anxiety and depression, while controls had no change
HR <sub>max</sub> = maximal heart rate; HR <sub>reserve</sub> = heart rate reserve					

## CONCLUSION

Hopefully the material contained in this manual will prepare you to effectively train a person with cancer. According to the American Cancer Society's latest statistics, the lifetime expectancy for the incidence of cancer in men is estimated at a little less than 1 in 2, and in women a little more than 1 in 3. It is also estimated that 1/3 of the deaths from cancer in 2004 (app. 567,300) are expected to be directly related to nutrition, physical inactivity, obesity and other lifestyle factors, and could thus be prevented.

There is little doubt that our work as health fitness instructors certainly helps keep these numbers lower than they could be by helping people create healthier lifestyle changes. According to a report issued in 2002 by the National Cancer Institute, mortality rates of the most common forms of cancer (lung, breast, prostate, and colorectal) declined between 1975 and 2000. The incidence of all cancers stabilized in the late 90's. This is encouraging news. The thought that recommending exercise to persons undergoing cancer treatment is reasonable is only recently becoming more widely accepted among health professionals. Hopefully our work will aid in changing these statistics to even more encouraging levels.

One thing is certain: becoming adept in exercise programming for the person with cancer will not only hopefully extend life, but will also enrich it. You may also find that working with this special population will enrich your life more than you thought possible. You will be helping people who are facing probably the single most life-changing experience that they have ever known. You will witness the miraculous power of survival present in all of us that has been awakened in your client. Each of us has our own way of facing adversity, and until it is called upon to rise to the occasion, we have little idea of how it will manifest itself. Have great respect for the client with cancer who comes to you for your assistance, as many of them are literally fighting hourly and daily for their lives.

You can know all of the material in this manual and design wonderful exercise programs, but make sure that each is the best exercise program you can create. Design programs as if it were the life of a loved one that you were fighting to preserve and improve. With that in mind, you will be very successful in truly helping your client with cancer.

## CASE STUDIES

### CASE 1:

Betty has breast cancer and has had a lumpectomy and seven axial lymph nodes removed. It has been eight weeks since the surgery and she has noticed mild pain at the incision site during upper body exercises that is relatively new and becoming more intense. You ask her to describe it on a scale of 1-10, and she rates it a 3 and admits that it is more like a discomfort. The discomfort is low and constant and only mildly increases when the underlying muscles are stretched to a sub-maximal state. The two of you are aware that damaged nerves from the surgery have been numb and are possibly beginning to have feeling again. The discomfort is expected, it is mild, and has not affected her performance. The trainer suggests bringing this up to her physician during her next visit, and requests to have any changes in pain or discomfort reported. Document the situation, but do not recommend a release form.

Now consider the next scenario:

### CASE 2:

Jennifer has advanced stage 3 epithelial ovarian cancer. She has had a bowel obstruction in the past, which was corrected with surgery. You know from her initial intake that she was warned that the scar tissue or the growth of another tumor was possible and to report any new pain, even mild, to her physician. You are observing her perform seated dumbbell curls and she has mentioned sudden mild pain in her abdomen and is beginning to feel bloated. She feels that the pain is nothing to be alarmed about, and wants to continue the activity. What should you do? Legally, you must discontinue the activity and recommend that she receive written clearance from her physician before returning to the gym. She finds this disheartening and begs to continue. Explain to her the goal of the activity, which is to increase her wellness, and going to the physician to find the source of the pain is really the wisest choice to make. Perform some relaxation techniques such as mild stretching, deep breathing exercises and practice creative visualization. Remember, we are not oncologists, and there may be something serious developing that we have no expertise about.

Additionally, following the surgery any exercise in a decline position will cause the fluids of the stomach to flow freely into the client's throat causing choking and difficult breathing. The point here: get the input from as many people as are necessary to write the most appropriate and effective program possible.

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4530 W. 77th St.

Minneapolis, MN 55435

phone: (952) 835-3222

fax: (952) 835-3460

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([http://cis.nci.nih.gov/fact/5\\_6.htm](http://cis.nci.nih.gov/fact/5_6.htm)) (Statistics)

(<http://www.cancer.gov/cancerinfo/wyntk/breast>) (Types)

(<http://www.breastcare.com/bcc/treatment/surgery.asp>) (Surgeries)

[http://www.breastreconstruction.ca/living\\_tram.htm#how](http://www.breastreconstruction.ca/living_tram.htm#how) (tram flap)

<http://www.oncolink.com/experts/article.cfm?c=3&s=13&ss=22&id=1899> (tram flap and exercise)

<http://www.questdiagnostics.com/kbase/topic/major/hw170907/prevent.htm> (hernia prevention)

<http://www.medhelp.org/forums/BreastCancer/messages/1604a.html> (cording)

[http://www.vashishtsurgicalservices.co.uk/breast\\_cancer/gp\\_info/management\\_axilla6.htm](http://www.vashishtsurgicalservices.co.uk/breast_cancer/gp_info/management_axilla6.htm) (Injury to the intercostobrachial nerve)