EXERCISE-BASED DISEASE MANAGEMENT GUIDELINES FOR INDIVIDUALS WITH CANCER: POTENTIAL APPLICATIONS IN A HIGH-RISK MID-SOUTHERN STATE

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ABSTRACT

EXERCISE-BASED DISEASE MANAGEMENT GUIDELINES FOR INDIVIDUALS WITH CANCER: POTENTIAL APPLICATIONS IN A HIGH-RISK MID-SOUTHERN STATE. Paul G. Salmon, Ann M. Swank. JEPonline. 2002;5(4):1-10. Increasing survival rates for many types of cancer signal an increasing need for disease management interventions tailored to the specific needs of cancer patients at various stages of the disease process, including a) newly diagnosed; b) in treatment; and c) post-treatment. An integrative disease management intervention with a ‘Mind/Body’ perspective is presented, emphasizing the psychological and physical needs of patients receiving treatment for this diversified, often aggressive and highly stressful disease. Beginning with the description of cancer and the underlying disease process, this review considers issues related to screening for cancer, factors such as drugs and related treatment that influence exercise testing and suggestions for exercise prescription. This review concludes with an overview of two empirically based research programs that have developed disease management intervention programs for persons with cancer within an integrative ‘Mind/Body’ perspective.

KEYWORDS: Physical Activity, Disease, Prevention

INTRODUCTION

Only recently have the effects of exercise on individuals diagnosed with cancer been studied systematically, and consequently the development and use of exercise prescriptions are at only an embryonic stage of development. The status of cancer may be likened to that of congestive heart failure 20 years ago – a challenging, frequently terminal disease accorded a poor prognosis and treated primarily with palliative techniques. It is interesting to note in this context that while the most recent American College of Sports Medicine (ACSM) Clinical Certification Review for Exercise Specialists and Program Directors (3) discusses many systemic illnesses (including coronary heart disease (CHD), dementia, diabetes, kidney disease, obesity), cancer is completely omitted.
Of particular significance for the exercise physiologist working with persons with cancer is the importance of an integrative disease management approach with a ‘Mind/Body’ perspective. The position is adopted in this paper that, depending on whether an individual is newly diagnosed, is currently receiving treatment; or is in a long- or short-term survival phase, disease management should consider a wide range of interventions ranging from those with a predominantly psychological impact (for example, meditation, progressive muscle relaxation), to more traditional exercise modalities (walking, jogging) involving progression to increased intensities. And although psychologically-oriented interventions may appear especially helpful for severely deconditioned patients receiving palliative, rather than rehabilitation-oriented care, their use as effective stress reduction techniques makes them potentially useful at virtually any stage of cancer.

Cancer mortality rates are now leveling off after consistently increasing for more than 50 years (11), and as a consequence people survive cancer longer than was previously the case. These individuals are ideal candidates for disease management interventions emphasizing nutrition, stress management and exercise. There is growing evidence that physical activity and exercise are effective adjuvant interventions for cancer and many other diseases, consistent with guidelines issued by the Surgeon General’s office emphasizing the general health benefits of regular physical activity (24). Potential and well-documented benefits include enhanced quality of life (QOL), positive psychological adjustment and symptom relief.

The disease management model for cancer patients described here is based on the premise that to be effective with this population, a program must be highly specific and individualized, taking into account a wide range of factors. Such factors include; patient characteristics; form and stage of cancer; phase of treatment and side effects; concurrent stressors; and psychological/emotional status. Three cancer subtypes - lung, breast, and prostate – will be used to suggest applications of disease management principles. Each poses unique and significant challenges for the clinical exercise specialist. Collectively, these cancer subtypes help illustrate the diversity associated with cancer in terms of symptoms, pathophysiology, functional impairment, and prognosis.

This review considers issues related to disease management of cancer including: 1) description of cancer prevalence; 2) the disease process; 3) special considerations concerning screening, risk assessment, and exercise testing including the influence of drugs and other treatments; 4) exercise prescription; and 5) current research.

The latter section describes two active research programs that embody an integrative disease management programs with a ‘mind / body’ perspective and strong empirical foundation.

DESCRIPTION OF DISEASE AND POPULATION

The term ‘cancer’ refers to a collection of diseases marked by abnormal cell development, proliferation, and capacity for migration to distal tissue (1,11,22). Overall, both incidence and mortality rates are highest among males, African-Americans, and persons over age 65 (11). Causes (‘carcinogens’) include external factors (e.g. tobacco, hazardous chemicals, radiation exposure) and internal agents (genetic, physiological, immune system-related) (1), and are age dependent (i.e. incidence rises with age) (11). Cancers of the lung, prostate gland, breast, and colon comprise nearly two-thirds of all new cases of cancer (11). The American Cancer Society (ACS) has recently published its annual report of cancer statistics (1), of which the following are especially notable:

- After CHD, cancers are the second leading cause of death in the US, approximately 25% of deaths from all causes.
- Lung and bronchial cancers replaced breast cancer in 1987 as the most common cause of cancer-related gender-linked death in females, with rates reaching a plateau in the late 1990’s and subsequently beginning to decline.
• For males, lung and bronchial cancer are by far the most common cancer-related cause of death, although since 1990 the rates have begun to decline along with those of all cancers; next in incidence rank are prostate and colo-rectal cancers.
• The percentage of all cancer patients surviving five years after diagnosis is 62%.
• Approximately 1/3 of the more than 500,000 cancer deaths predicted in 2002 are related to lifestyle factors (such as poor nutrition, and inadequate physical activity) and are potentially preventable; those due to smoking and excessive alcohol use are completely preventable.
• There are significant variations on both regional and state-by-state bases concerning incidence rates for different forms of cancer. In contrast, mortality rates appear to be somewhat less variable, owing to increasingly standardized levels of medical care. For example, lung cancer incidence (per 100,000 population) in Kentucky over a five-year period (1994-1998) ranks first nationally for males and second for females, whereas the incidence rate for breast cancer is slightly below the national average, and that for prostate cancer lower still (Table 1).

Table 1: Lung, Breast and Prostate Cancer: Incidence & Death Rates per 100,000 population, Kentucky, vs US Population 1994-1998*

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky</td>
<td>101.9</td>
<td>23.8 (23%)</td>
<td>121.7 male</td>
<td>99.4 male (82%)</td>
<td>112.4</td>
<td>24.1 (21%)</td>
</tr>
<tr>
<td>U.S.</td>
<td>109.5</td>
<td>24.2 (22%)</td>
<td>72.6 male 43.5 female</td>
<td>68.0 male (94%)</td>
<td>142.0</td>
<td>23.7 (17%)</td>
</tr>
<tr>
<td>Rank (&lt;</td>
<td>/=</td>
<td>&gt;) female</td>
<td>(&lt;) female</td>
<td>(=) female</td>
<td>(&gt; male)</td>
<td>(&lt;) male %</td>
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*source: American Cancer Society (1); Rank: > (greater than national average); < (less than); = (equivalent to)

The high mortality rate for lung cancer appears to be due to the fact that it is almost always detected at a relatively late stage of development. On the other hand, mortality rates appear to be dropping for certain types of cancer; a fact that increases the relevance of post-diagnosis disease management as a means of improving quality of life, physical well being, and healthy psychological adaptation. Table 2 summarizes some of the main features of these three highly prevalent forms of cancer, compiled from a variety of sources.

Table 2: Comparison of Lung, Breast, and Prostate Cancers.

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Age range at diagnosis</th>
<th>Pathophysiology</th>
<th>Metastatic potential</th>
<th>Co-morbid Conditions</th>
<th>Functional Impairment</th>
<th>Survival and Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung &amp; bronchus</td>
<td>50 – 70, mean = 65</td>
<td>pulmonary</td>
<td>extremely</td>
<td>restrictive lung</td>
<td>marked</td>
<td>poor (6-12 month survival)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>obstructive</td>
<td>high</td>
<td>disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>impairment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>30’s &amp; 40’s</td>
<td>structural</td>
<td>moderate</td>
<td>varies with</td>
<td>varies with</td>
<td>good (early detection)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>muscle damage</td>
<td></td>
<td>treatment</td>
<td>treatment</td>
<td></td>
</tr>
<tr>
<td>Prostate</td>
<td>&gt; 65 in more than 70%</td>
<td>genito-urinary</td>
<td>moderate</td>
<td>age-specific</td>
<td>slow</td>
<td>slow progression</td>
</tr>
<tr>
<td></td>
<td>of all cases</td>
<td>tract damage</td>
<td>health changes</td>
<td>health changes</td>
<td></td>
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</tr>
</tbody>
</table>

compilation based on data from Sarna (21), Henke and Fosella (12), and American Cancer Society (1)

Research on the role of exercise as an adjuvant treatment for these cancer subtypes is at an early stage, with breast cancer currently the most widely studied (8,17). The high mortality rate associated with lung cancer has tended to limit the development of adjuvant care practices, other than those that are palliative in nature (21). Prostate cancer should receive increasing attention in the exercise domain as screening and early detection (PSA
antigen) become more prevalent. One potential research issue related to prostate cancer concerns the extent to which disease management initiated at early detection of pre-cancer prostatic enlargement might affect the subsequent pathological course.

**DESCRIPTION OF DISEASE PROCESS**

Cancers are due to the malfunctioning regulation of cell growth and division (1). In less than 10% of cancers is the cause exclusively hereditary; the vast majority of cancers result from either external or internal agents - carcinogens - which disrupt normal cellular division. Cancers are classified as a) carcinomas, cancers of skin and organ cells, the most common type; b) lymphomas (lymphatic system cancers); c) sarcomas (bone, muscle, connective tissue) and d) leukemias (blood producing organs) (20). Unlike diseases encapsulated within a specific organ system, cancers have the ability to migrate, or metastasize, from their point of origin to distal tissue sites where the process of unregulated cell proliferation continues. The extent and/or spread of cancer are characterized by designating stages from I to IV; with I being ‘early’ and IV being ‘advanced’. One such staging procedure described by ACS takes into account a) development of the primary tumor; b) regional lymph node involvement; and c) metastasis (1).

The functional impact of cancer depends on a variety of factors, including type; stage; pre-existing medical conditions and overall health; age at time of diagnosis; and treatment status. Irrespective of the locus and functional impact of a cancerous condition, the goal of treatment is always the same: eradication of cancerous cells and prevention of subsequent proliferation and metastasis. This goal is accomplished via surgery, chemotherapy, and/or radiation, all of which are potentially quite toxic and have pronounced side effects outlined below (22). The impact of these factors has to be balanced against the aggressive, often fatal nature of undetected or untreated cancer.

**SPECIAL CONSIDERATIONS FOR SCREENING, RISK ASSESSMENT, AND EXERCISE TESTING**

Early detection is currently the most important weapon in the clinical arsenal against cancer. The ACS and ACSM have identified risk factors for various cancers and proposed screening examinations for early detection of cancer in asymptomatic individuals. Key risk factors and associated cancers are as follows (1). Note that potentially modifiable lifestyle behaviors are linked to all of these factors:

- **Tobacco use**: lung, mouth, larynx, pharynx, esophagus, pancreas, kidney, bladder, uterine, cervix.
- **Nutrition**: may reduce risk of breast, colon, other common cancers
- **Physical activity / exercise**: reduces risk of colon, breast, prostate, lung and pancreatic cancers
- **Sun exposure**: melanoma, other skin cancers
- **Occupational, environmental carcinogens**: multiple forms
- **Risky sexual activity**: cervical, other reproductive system cancers

Concerning specific screening tests for asymptomatic individuals, ACS recommends the following (1):

- **General**: Cancer-related checkup every 3 years, age 20-3; annually thereafter
- **Breast**: Annual mammogram & clinical breast exam, age 40 and older; monthly self-exam
- **Colon & Rectum**: Beginning at age 50, annual fecal occult blood test and flexible sigmoidoscopy every 5 years
- **Prostate**: Beginning at age 50 (or 45 if at high risk), annual prostate-specific antigen (PSA) test and digital rectal exam
- **Cervix**: Sexually active women or 18 or older, annual pap test and pelvic exam
• **Endometrium**: Annual biopsy, beginning at age 35 for women at risk for hereditary non-polyposis colon cancer

Risk assessment and screening procedures are advocated on a national basis, but there are regional variations in cancer epidemiology. For a high cancer risk example, based on the ACS’s recent Prevention and Early Detection statistics (2), Kentucky currently ranks as follows;

- 1st in adult tobacco use (30.5%),
- 3rd in high school student tobacco use (current smoking, 41.5%),
- 38th in per capita tobacco control funding,
- 9th in overall adult overweight (38%) and eighth in obesity rates (23%),
- last in both leisure time activity and the rate of regular & sustained physical activity, and
- 49th in regular, vigorous physical activity.

Kentucky is one of 9 states concentrated in the mid-South and Midwest with the highest reported percentage of adults (35.8 - 51.1%) who do not engage in leisure-time physical activity (10).

In sum, average and above levels of cancer incidence, high risk behavior patterns, and low habitual physical activity levels pose a significant challenge to health care practitioners engaged in planning and promoting disease management principles in this geographical region. The ACS has strongly endorsed the importance of a healthy diet and regular physical activity as means of reducing all-cause cancer risk, although to date no specific dietary or exercise parameters have been associated with specific levels of risk reduction.

With appropriate safeguards, exercise testing may be considered as a baseline measure against which to assess the impact of subsequent treatment and, hopefully, recovery. Courneya (8) recently identified the following eight potential common symptoms associated with various cancers and their treatment having implications for exercise testing and subsequent prescription: 1) deficient blood chemistry profiles (reduced hemoglobin, neutrophil, and platelet count); 2) fever; 3) sensory / motor problems; 4) cachexia; 5) dyspnea; 6) bone pain; 7) nausea; and 8) fatigue.

In addition to the above, the clinician needs to consider the influence of drugs and other treatments on disease management for individuals with cancer. Cancer treatments are of necessity aggressive and often toxic. Their sole purpose is to eradicate malignant cancer cells, and only by doing so may they effect an improvement in the functional capacity of an affected organ. In fact, many have significant side-effects that may actually result in damage to target organs, with important implications for both exercise testing and prescription. Selby (22) summarized the typical effects of cancer treatment as follows:

- **surgery**: pain; diminished flexibility; amputation; motor / sensory nerve damage
- **radiation**: diminished flexibility in exposed joints; scarring of heart and/or lungs
- **chemotherapy**: side effects include a) peripheral nerve damage; b) cardiomyopathy; c) pulmonary fibrosis; and e) anemia, the latter an especially common side effect of many anti-cancer drugs.

Keeping in mind that treatment may involve combinations of agents, the potential for significant curtailment of both cardiovascular and cardiopulmonary function is thus substantial. In combination with adverse treatment effects, it is important to keep in mind that cancer incidence is significantly correlated with age, so that the potential for co-morbid diseases, medications, and other treatment regimens that may interact in a synergistic manner is high.
Exercise testing is valuable for patients diagnosed with cancer who are undertaking a program of physical activity/exercise either during or following treatment. For newly diagnosed patients, sub-maximal exercise testing might be employed to establish baseline functional capacity to help assess the subsequent impact of treatment (chemotherapy, surgery, radiation) on physical status. Results of pre-treatment exercise assessment could also serve as a foundation for exercise prescription both during and following treatment.

**SPECIAL CONSIDERATIONS FOR EXERCISE PRESCRIPTION**

Exercise prescription, as part of the disease management for cancer patients must be highly individualized owing to the extreme variability of the effects of cancer and treatment regimens on functional capacity. Furthermore, since cancer is strongly associated with advancing age, other concurrent or prior health problems should be anticipated and taken into account in developing any exercise prescription. McNeil (15) proposed guidelines for exercise dosage, based on the Surgeon General’s 1996 recommendations. The author recommends 30 minutes of continuous exercise (brisk walking or swimming) three to four times per week, with attention to safety measures and general health maintenance. Based on a review of 26 studies involving exercise interventions in post-diagnosis cancer patients, Courneya (8) recently proposed the following more detailed exercise guidelines for *early stage* cancer patients and survivors, to be modified as needed for specific patients. Concerning exercise mode, walking and cycling are recommended as safe and generally well tolerated exercise modes involving large muscle groups, with a recommended frequency of 3-5 times per week. More deconditioned patients should begin with daily sessions of shorter duration and lower intensity. In general, moderate intensity exercise (50-75% HR reserve, RPE 11-14) sessions of between 20 and 30 minutes duration are recommended, with modifications as needed, including very short exercise bouts (3-5 minutes) followed by rest periods.

Courneya’s proposed guidelines are also consistent with the Surgeon General’s recommendation for the population as a whole, calling for 20-30 minutes of moderate intensity exercise, most days of the week, accumulating this amount in short intervals as needed (24). They are also compatible with current ACSM recommendations for physical activity (4). However, such parameters would presumably be too demanding for late-stage (i.e. III and IV) cancer patients as well as for those experiencing especially debilitating treatment side-effects. Moreover, these guidelines, while based on empirical studies, are limited only to aerobic activity, and as a result do not address other forms of activity/exercise including strength training; flexibility; neuromuscular adaptation; and functional activity proposed by Selby (22). Concerning the latter, proposed guidelines for resistance training by the ACSM (4) might serve as a foundation upon which to develop appropriate recommendations.

One especially relevant aspect of exercise concerns its effect on the immune system, which is frequently compromised in cancer due to stressful effects of chemotherapy, radiation and other aspects of the overall experience of cancer (7). Exercise is a potent stressor, and under certain circumstances may compromise immune system functioning (23), although normally this effect is limited to relatively high exercise intensity levels. On the other hand, there is evidence that exercise can *strengthen* the immune system and reduce susceptibility to disease under some circumstances (16). The key appears to be determining an optimal exercise ‘dosage’ that minimizes disease susceptibility while maximizing immune system functioning. The shape of such a function has the appearance of an inverted ‘J’, with optimal immune system protection in the mid-range of regular, moderate exercise, minimal benefits at low/sedentary patterns, and depressed functioning at high exercise intensities (25).

Issues pertaining to immune system integrity, optimal exercise dosage, and susceptibility to disease take on added significance when one considers the relatively advanced age of many cancer patients. Older, more highly debilitated patients in particular are likely to benefit most from exercise programming that initially poses minimal demands on the cardiovascular system owing to the high likelihood of associated deconditioning.
effects and disuse atrophy. This finding is especially true in the case of lung cancer, which is frequently accompanied by concurrent or prior obstructive disease symptoms. It would be worthwhile to consider the activity/exercise continuum from a perspective that emphasizes low intensity activities, even those at or below resting levels, including even meditative/contemplative practices as a point of entry into either palliative or restorative exercise programming. Lung cancer (as well as other pulmonary disease) patients may have to be desensitized to breathing-related distress that impairs respiration and further curtails physical activity.

Figure 1, developed by the authors, provides hypothetical examples of interventions that involve very low metabolic cost that may be appropriate for patients (cancer or otherwise) who by virtue of advanced age, severe deconditioning, aggressive disease, or energy-sapping treatment may be unable to initiate or sustain moderate levels of activity. This figure proposes a link between low and higher states of activation in terms of metabolic activity level, on a continuum ranging from sleep at one extreme to high intensity, aerobic activity at the other.

For example, a patient with Stage III lung cancer might be unable to contemplate walking due to pre-existing lung disease, muscle disuse atrophy, surgical lung excision, and dyspnea. Treatment could focus simply on breathing and associated dyspnea, a key element in effective management of lung disease (2). Basic meditation/focusing techniques could be taught to help develop centered attention and relaxed awareness of the breath (13). Progressive muscle relaxation could next be introduced as a way to demonstrate and practice muscular control without intensive physical exertion. The metabolic target range for this phase would be in the vicinity of 1 MET. This might lead to gentle yoga or stretching as a way of gradually increasing weight-bearing activity. Slow walking might be introduced, always within the context of what the patient can tolerate without frustration, anxiety, or fatigue. Ratings of Perceived Exertion (RPE) would comprise an important source of feedback at this and subsequent stages. From a psychological perspective, implementation of a graded activity pattern such as this has elements of desensitization, or gradual acclimatization to sensations that initially evoke counterproductive tension and anxiety.

Whether or not this would eventually lead to an increased capacity for exercise would be determined not only by the subsequent course of the disease, but by the patient’s motivation and capabilities as well. Whatever the outcome, however, patients with such severely curtailed capacities for activity might nonetheless derive a sense of personal meaning and accomplishment from such a program. In terms of exercise prescription, target
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exertion ranges could be established using either or both MET reserve values or RPE ratings, owing to the fact that early stage activities would not likely elevate heart rate significantly, to thresholds for either percent maximum heart rate (55%) or heart rate reserve (40%). As activity crosses the threshold into at least moderate intensity, prescriptions could then be converted to heart rate values.

Quality of life is an important factor to consider; one that encompasses but is not limited to physical well-being. Working with patients who are critically ill - perhaps those in the latter stages of cancer - requires particular sensitivity to the role that psychological, social, spiritual, and other factors play in ultimately determining how one learns to live fully and gracefully despite the challenges of serious illness. Moreover, there is good evidence that psychological factors, including perception of fitness/wellness in part account for some of the benefits of activity and exercise (19). Thus a patient who goes from being sedentary both prior to and in the aftermath of a cancer diagnosis to developing a very modest walking program may perceive health benefits that are of greater significance than any objectively measured gain in fitness.

The exercise physiologist may need to adopt an approach emphasizing ‘here and now’ experience, rather than focusing on long term rehabilitation goals, bearing in mind the comment of an active, resourceful cancer patient who commented that she “…no longer bought green bananas!” Palliative care – providing comfort and meaning to those with limited hope of recovery – figures prominently in work with seriously ill patients. Patients with end-stage cancer, pulmonary disease, and heart failure confront their mortality, as do those who care for them (14). And older, frailest individuals not accustomed to being physically active before their illness may not see exercise as a helpful step to recovery. Of course, not all cancer patients are facing such dire outcomes, and there are many individuals with cancer who in other respects are quite healthy. For these individuals, more intensive exercise programming may be entirely appropriate. Nowhere is this more apparent than with respect to breast cancer, the most highly researched area in terms of exercise benefits. Representative studies of exercise benefits for cancer survivors are reviewed below.

DISEASE MANAGEMENT: EXERCISE PHYSIOLOGY & HEALTH PSYCHOLOGY SYNERGY

This review concludes with a description of two research programs that are making substantial contributions to disease management of cancer. Both of these programs have investigated the role of exercise in cancer care with a high degree of sensitivity to psychological factors, consistent with the integrative ‘Mind / Body’ approach advocated in this paper.

The research programs of Drs. Kerry Courneya and Bernardine Pinto are notable for their interdisciplinary orientation. 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 and exercise behavior and compliance. Given the relatively low rates of exercise compliance in the general population, it is imperative in working with clinical populations to develop ways of promoting exercise behavior that can help overcome not only the general cultural inertia associated with exercising, but specific obstacles to participation and compliance associated with various disease states. This clearly calls for an interdisciplinary approach, incorporating the work of both exercise physiology and psychology.

Perhaps the most influential current research program evaluating the role of exercise in cancer treatment and survival is that of Dr. Kerry Courneya and colleagues, University of Alberta (Canada) Faculty of Physical Education and Recreation. Beyond publishing two recent literature reviews of exercise as an adjuvant cancer treatment (8,9), Dr. Courneya and colleagues have developed a systematic research program. These researchers are investigating a) the effects of exercise on cancer prevention, coping and survival, b) social-cognitive explanations of exercise behavior in the context of cancer (for example, the Theory of Planned Behavior; Transtheoretical Model), and c) the use of psychological interventions (within a Cognitive Behavioral framework) as forms of adjuvant treatment. Since 1995, Courneya and his interdisciplinary research group have
published more than 40 articles and research studies in these areas, including a recent study demonstrating the anxiolytic effect of brief cycle ergometry in post-treatment breast cancer survivors (6). Their research has been funded by a series of grants from the National Cancer Institute of Canada, Canadian Institutes of Health Research, National Institutes of Health, and the Research Council of Canada. The comprehensive and productive research agenda established by Dr. Courneya and colleagues is likely to have a significant impact on exercise-based interventions for cancer patients for years to come.

A second influential line of clinical research is that of Dr. Bernardine Pinto, Brown University School of Medicine. Pinto’s research team has focused on women breast cancer survivors, and in a series of research publications since 1997 has investigated the relationship between exercise and a range of concomitants of the experience of cancer, including changes in physical attributes, readiness for physical activity and associated maintenance factors, and mood states. In a recent review of the research literature concerning exercise and breast cancer (17), Pinto enumerated a number of negative factors associated with the experience of cancer markedly affecting quality of life that may be addressed via exercise, including a) psychological distress; b) fatigue; c) weight gain; d) premature menopause; and e) changes in body image. This review concluded with a recommendation that outcome research with cancer patients focus on developing measures that are highly sensitive to individual difference factors. Significantly, in a recent prospective, longitudinal study, Pinto et al. (18) concluded that exercise levels in breast cancer survivors, especially older women, were below the recommended minimum, consistent with the general population. In general, Pinto’s research emphasizes the importance of social support factors in promoting use of and adherence to complementary healthcare resources, including exercise. More specific recommendations emphasized the importance of the following:

- Identifying stress symptoms in cancer patients and determining the most appropriate modality for exercise-based interventions (e.g. individual vs group; moderate vs vigorous, etc.), with particular consideration to health and safety factors.
- Assessing the impact of exercise-based interventions independently of psychological factors such as group support and/or personalized attention.
- Developing interventions sensitive to sub-groups of cancer patients within specific diagnostic groupings (e.g. breast or lung cancer). This requires attention not only to physiological aspects of different forms of cancer, but also to accompanying psychological factors (cognitive, emotional, and motivational) that may potentially affect not only treatment outcome, but subsequent adherence to lifestyle changes as well.

In summary, there is compelling evidence that disease management incorporating both physiology and psychology is establishing a secure foothold in contemporary cancer treatment. Interdisciplinary research is beginning to demonstrate that not only is exercise beneficial in improving mood state and quality of life for persons afflicted with cancer, but that exercise may have measurable, and potentially beneficial effects on immune system and other physically-oriented parameters. Much of the early work on exercise for cancer patients focused on aerobic conditioning, but studies are now beginning to appear evaluating the potential benefits of resistance training on behavioral, cognitive, and physiological components of cancer as well. Much of this research is interdisciplinary in nature, drawing on both exercise physiology and health psychology to address the challenges inherent in encouraging people who are afflicted with a serious, often fatal illness to initiate or maintain patterns of physical activity which, though clearly beneficial, are difficult for most individuals to sustain even under conditions of good health and low levels of psychological stress.

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