

PHYSICAL ACTIVITY AND EXERCISE

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<h1> INTRODUCTION

For our ancestors, physical activity was engrained in daily life. In the early 1900s before automobiles were invented and mass-produced, walking was a common mode of transportation. Today, automobiles are used for leisurely one-mile drives to the local video store or ½ -mile treks to the grocery store. Improved technology has reduced our physical activity level by making life “easier.”

This “easier” way of life has led to increases in cardiovascular disease, hypertension, high cholesterol, strokes, heart attacks, osteoporosis, obesity, and diabetes mellitus. Cardiovascular disease is the leading cause of death for women in the United States. The American Heart Association states that one in five women have some form of blood vessel or heart disease, 5.7 million women have physician-diagnosed diabetes mellitus, and almost half (46.8%) of non-Hispanic white women are overweight; 23.2% are obese (www.aha.org). Genetics cannot be ruled out as a contributing factor to these chronic conditions, but it must also not be an excuse.

In addition to increased morbidity, physical inactivity also has a direct effect on the economy, amounting to \$76 billion of U.S. health care expenditures.¹ In 2000, obesity related medical costs totaled \$117 billion (www.cdc.gov). The yearly cost of medical care for a physically active individual is approximately \$330 less than that for an inactive person. Furthermore, if 10% of inactive people became active, \$5.6 billion in

heart disease costs could be saved (www.cdc.gov). Intuitively, these data would be an incentive for health insurance companies to embrace interventions that focus on the prevention of disease; however, that medical paradigm is not yet emphasized. Because medical costs increase around age 45 to 54 for inactive women, this is a perfect time for women to take charge of their physical, as well as financial, health.¹

<H1> BENEFITS OF EXERCISE

Case 1: Hattie is a 55-year-old first grade teacher. She has had diet-controlled type II diabetes for 2 years, although her last hemoglobin A1C was 7.8 percent and her morning fasting blood sugars are running 150 to 180 mg/dl. She weighs 185 lbs. At her regular follow-up, you discuss the effects of exercise and the possibility that it might reduce her sugars and her weight. She shrugs, saying that she is on her feet all day and that should be enough exercise.

A distinction must be made between physical activity and exercise. Physical activity refers to any bodily movement produced by skeletal muscles that results in energy expenditure, such as mowing the lawn, grocery shopping, and doing household chores.² Exercise, on the other hand, is physical activity with the purpose of improving some component(s) of fitness (muscle strength and endurance, cardiorespiratory endurance, body composition, and/or flexibility), such as regular participation in an endurance-training or strength-training program at an intensity that will confer physiological and performance benefits.³

Exercise and physical activity can improve most aspects of mental and physical health.^{4,5,6} The benefits derived, however, are specific to the type of exercise performed. (Table 2-1).

<h2> *Regular physical activity*

Moderate levels of physical activity have significant effects on a woman's health. Burning approximately 150 kilocalories per day or 1,000 kilocalories per week leads to a reduction in the risk of coronary heart disease by 50% and of hypertension, diabetes, and colon cancer by 30%.⁷ After adjusting for covariates such as age, smoking, alcohol use, history of hypertension, and history of high cholesterol, women who are regularly physically active are 50% less likely to develop type II diabetes (relative risk = 0.54) than women who are not regularly active.⁸ Vasomotor and psychosomatic symptoms associated with menopause are also reduced with moderate amounts of activity.^{5,9} Examples of moderate levels of physical activity are depicted in Table 2-2.

Regular physical activity can also reduce the risk of colon cancer, the third leading cause of cancer incidence and mortality in the United States. The risk of colon cancer is reduced 40% to 50% in highly active people compared to low active individuals.¹⁰ The mechanisms responsible for a reduction in the risk of colon cancer are:

- 1) a reduced transit time in the bowel which decreases exposure to carcinogens,
- 2) a reduction in insulin action which decreases colon mucosal cells,
- 3) an increase in prostaglandin F₂ α which increases intestinal motility, and
- 4) a reduction in prostaglandin E₂ which increases colon cell proliferation.

The evidence for exercise providing a reduction in the risk of breast cancer, however, is equivocal. In a cohort of 37,105 women who exercised regularly, there was lower risk of breast cancer compared to those who did not.¹¹ The Nurses' Health Study

suggests that the risk of breast cancer and mortality from breast cancer is reduced in physically active women.^{12,13} Decreased body fat and estrogen levels may be responsible for the reduction in breast cancer risk associated with exercise.¹⁴ Although epidemiological evidence supports a positive relationship between physical activity and cancer rates, more research is needed in this area to substantiate exercise's protective effect against specific cancers.

Small increases in physical activity level and subsequently energy expenditure have a positive effect on psychological outcomes and physiological parameters in most, but especially middle-aged women. Women who increase their level of physical activity by at least 300 kilocalories per week have a smaller reduction in HDL cholesterol with advancing age and are less depressed and stressed than those women who remain at their current activity level.¹⁵ Women who are physically active have higher resting metabolic rates and lower body fat, but similar fat free mass, body mass index, and body weight compared to their sedentary counterparts.¹⁶ These results suggest that physical activity is a component of a healthy lifestyle.

<h2> *Resistance Training*

Although resistance training has been proven to alter positively some modifiable risk factors for disease (obesity, hypertension, low bone mass, etc.), fewer than 20% of the U.S. population between the ages of 18 to 64 years and fewer than 12% of adults over the age of 65 years regularly participates in a resistance-training program.¹⁷

Resistance training incorporates muscular exercises performed at a resistance greater than the body is used to in order to provide an overload to the muscle. Women who

participate in a resistance-training program increase muscle strength and power, alter muscle ultrastructure (Type II fiber area), increase or preserve bone mineral density, and improve cardiovascular risk factors for disease.^{18,19}

Muscle strength and power are compromised during a woman's middle-aged years because of age-associated changes in the muscle ultrastructure.²⁰ In a sedentary individual, maximal strength is reduced approximately 7.5% to 8.5% per decade beginning around age 30 and muscle power is reduced approximately 35% per decade.²¹ This reduction is relative to the remaining strength and power, so that muscle power in a 50-year old woman is 35% less than it was when she was 40-years old, but 35% more than she will have when she is 60-years old. Considering that muscle power is lost at a faster rate than muscle strength after age 65 and that muscle power is significantly related to functional performance,²² having a high strength and power base before this age could protect against losses later in life, thus serving as a buffer to functional decline.

Regular participation in a resistance-training program has profound effects on muscle ultrastructure. Resistance training attenuates the loss in muscle cross-sectional area, Type II fiber area, strength, and bone mineral density commonly associated with aging.²³ Significant increases in maximum torque, electromyography, maximal strength, and Type II mean fiber area have been observed in middle-aged women after participating in an explosive-strength training program.

Cross-sectional and longitudinal exercise data support the efficacy of resistance training as an effective modality for the prevention and treatment of osteoporosis. A

recent meta-analysis demonstrated that resistance training can increase or preserve bone mineral density in pre and post-menopausal women.²⁴ With the cessation of exercise, bone mineral density will return to pre-exercise levels at a rate similar to age-matched controls. Thus, the continued participation in a resistance-training program is essential for bone health.

<h2> Endurance Training

Case: Sarah is a 42-year-old bank teller with no known cardiac risk factors who was found to have a fasting total cholesterol level of 299 mg/dl with an LDL of 179 mg/dl at a recent screening. After 3 months of vigorous change of diet to a low-fat diet, she returns for a fasting lipid profile. Total cholesterol has only decreased to 245 mg/dl with an LDL of 145. She asks what else she can do without starting on pharmacotherapy.

You suggest walking three times a week for 30 minutes each day as a form of exercise.

She agrees; six months later, she has lost 4.5 kg, and her total cholesterol level is 195 mg/dl, with an LDL of 120 mg/dl.

Endurance training can reduce some of the risk factors associated with cardiovascular disease such as hypertension, high cholesterol, and inactivity. As little as two to three days per week are required to gain health benefits from a moderate-intensity (50% maximum oxygen consumption) endurance-training program. These health benefits include a reduction in blood pressure, total cholesterol, body mass index, and an increase in HDL cholesterol.^{25,26} Brisk walking for three or more hours per week can reduce the risk of cardiac events in middle-aged women (relative risk = 0.65).²⁷ Becoming physically active also reduces the risk of cardiac events; exercise is

preventive medicine.

Despite the age-associated reduction in aerobic capacity, endurance training can have a positive effect on the cardiovascular system. On average, maximal aerobic capacity declines at a rate of approximately 7.5% to 9% per decade after age 25.²⁸ Although endurance athletes have a greater absolute rate of decline in aerobic capacity than sedentary women, their relative ($\text{ml}/\text{kg}\cdot\text{min}^{-1}$) rate of decline in aerobic capacity is smaller.²⁹ Older endurance trained women have higher aerobic capacities throughout life, thus serving as a physiological reserve against functional decline.

In addition to improvements in the cardiovascular system, endurance exercise also improves a woman's psychological outlook and the skeletal system. Women who exercise regularly are less neurotic, have greater self-esteem, and are more satisfied with life compared to their sedentary counterparts.³⁰ Weight bearing activities such as walking increase or preserve bone mineral density by approximately 5%.³¹ However, as with resistance training, the positive effects of exercise are negated when exercise is discontinued or reduced (fewer than 3 days per week). Regular exercise clearly has a significant impact on the human body.

Non-Traditional Exercise

Non-traditional styles of exercise, such as Yoga and Tai Chi, have also demonstrated positive improvements in health.³² Yoga involves various standing, seated, and supine postures and breathing and relaxation techniques designed to enhance functioning of the various physiological systems by supporting a natural posture. Tai Chi incorporates slow body movements (forms) that concentrate on

balance and body weight transfers. Young and old men and women have performed Yoga and Tai Chi for centuries in Eastern countries. Both have been purported to focus concentration and relax the body.

Yoga practice has been shown to improve muscular strength, endurance, flexibility, gait parameters, and aerobic capacity.⁶ Evidence suggests that Yoga practice reduces sympathetic activity, improves aerobic capacity, reduces perceived exertion after maximal exercise, and reduces heart rate and left ventricular end diastolic volume at rest. From a functional perspective, people who practice yoga demonstrate improved gait parameters, reduced pain and symptoms associated with knee osteoarthritis, and reduced disability, which collectively or independently has the potential to reduce the risk of falls.³³ When compared to standard care for chronic low back pain, yoga is more effective at reducing pain, use of medications, and improving physical function.³⁴ Additionally, yoga practice may retard the progression and increase the regression of atherosclerosis in patients with coronary artery disease. Thus, research demonstrates yoga's efficacy to improve health.

Tai Chi practice improves mood states, physical function, and hemodynamic parameters.³⁵ A reduction in anger, total mood disturbance, tension, confusion, and depression and an increase in self-efficacy are evident after regular Tai Chi practice.³⁵ Improvements in self-reported physical function and a reduction in falls is also reported.³⁶ Patients suffering from acute myocardial infarction can reduce blood pressure after practicing Tai Chi.³⁷ Tai Chi is an effective modality for improving several aspects of health.

Empirical evidence has demonstrated the positive benefits of exercise, such as improved strength, reduced anxiety, improved blood lipid profile, and decreased risk of cardiovascular disease. The modality required to obtain these benefits can vary from a structured exercise program (resistance training and walking/running) and non-traditional programs (Yoga and Tai Chi) to daily physical activity (mowing the lawn and climbing stairs).

<h1> EXERCISE PRESCRIPTION FOR HEALTHY POPULATIONS

The type of exercise performed depends on the desired goal. If a woman wants to build muscular strength, then resistance training is appropriate. Endurance training (walking, running, cycling, swimming) is required if a woman wants to improve her cardiovascular health and endurance. Yoga and Tai Chi are therapeutic alternatives to the rigors of strength and endurance training that can reduce stress, increase strength and flexibility, and improve cardiovascular parameters. A certified Yoga or Tai Chi instructor should be consulted for more information on the styles of each.

<h2> *Resistance Training*

Resistance training is the mode of exercise performed to stimulate the neuromuscular system. Variations of the number of sets, repetitions, rest period, and weight lifted determines the outcome of the training program. Programs designed to increase strength are typically performed at a high intensity (80% of the one-repetition maximum, 1RM) with long rest periods (2 to 3 minutes) and low to moderate volume (2 to 3 sets of 8 to 10 repetitions), whereas programs designed to promote muscle hypertrophy are performed at a moderate to high intensity (60% to 80% 1RM) with

shorter rest periods (30 to 60 seconds) and higher volume (3 to 4 sets of 10 to 12 repetitions).³⁸ A 5% increase in resistance is suggested when 12 to 15 repetitions can be performed.

In a generally healthy population, resistance training can be performed with exercise machines or with free weights. Examples of resistance-training exercises are provided in Table 2-3. Multi-joint, multi-planar exercises commonly associated with free weights may be more functional because their motor patterns mimic motor patterns of daily tasks.³⁹

Machines offer more safety for beginners and isolate muscle groups more so than free weights; however, free weights require an individual to use accessory/stabilizer muscles as they would naturally do in daily life and improve strength more than training on machines.⁴⁰ Free weights also concurrently train balance, strength, and coordination – similar to the demands of daily activities. Household items (rice bags, jugs of water, soup cans, etc.) and elastic resistance bands can also be used for resistance instead of metal weights or a cable system. For an individual with no resistance training experience, machines should be used initially to increase strength so that a progression to free weights can be safely made.

The design of the program is somewhat more of an art than a strict, regimented science. Science provides the basis for sound training principles, but creativity is needed to continually manipulate the training volume, exercise selection, and order of exercise. The exercise prescription can be written for specific combinations of muscle groups (back and hamstrings, chest and arms, etc.), agonist vs. antagonist (leg extension

vs. leg curl, chest press vs. seated row), and upper vs. lower body (legs on Monday then chest, back, and shoulders on Tuesday, etc.) muscle groups.

Regardless of the design of the program, specific guidelines should be followed. Within each session, individuals should perform large muscle groups (prime movers) before smaller muscle groups (secondary movers) to avoid fatigue of the larger muscles. However, smaller stabilizing muscles (rotator cuff, hip adductor/abductor, neck muscles, etc.) should not be neglected. If left untrained, these smaller stabilizing muscles are at risk for injury. The Valsalva maneuver, holding the breath during exertion, should never be performed. To avoid a reduction in venous return to the heart and a significant increase in blood pressure, individuals should exhale on exertion. As always, medical clearance should be sought prior to beginning an exercise program if an individual has a condition that may be made worse by exercise.

<h2> Endurance Training

The cardiovascular system is most effectively improved by endurance training. Endurance training involves rhythmic movements of large muscle groups. For example, running/walking, bicycling, swimming, and dancing are effective and common modes of endurance exercise. However, a combination of modalities within an exercise session might provide extra motivation and reduce boredom.

The exercise prescription for endurance training offers variety, similar to resistance training. The American College of Sports Medicine recommends 20 to 60 minutes a day, 3 to 5 days per week at an intensity equal to 60% to 90% of age-predicted maximum heart rate ($HR_{max} = 220 - \text{age}$).⁴¹ Intensity and duration are inversely related,

so that a reduction in intensity requires an increase in duration. Any of these variables can be manipulated within and between exercise sessions. For example, in a three day a week exercise program, day 1 = 40 minutes of treadmill walking at 65% HRmax, day 2 = 10 minutes of bicycling at 70% HRmax, 10 minutes of intervals at 90% HRmax, then 5 minutes at 60% HRmax, and day 3 = 20 minutes of swimming at 80% HRmax. All three variations can provide health and fitness benefits.

To maximize benefits and reduce the risk of injury, specific guidelines should be followed. Because large muscle groups utilize more oxygen and generate more adenosine triphosphate (ATP) than smaller muscle groups, they should be incorporated into every exercise routine. Thus, more calories are expended when training larger muscle groups.

Manipulating certain extraneous factors reduces the risk of injury while exercising outdoors. Because the ambient temperature is hottest at mid-day, outdoor exercises should be performed in the morning or evening when the temperature is cooler. Loose fitting, light-colored clothing is appropriate for warmer climates in order to circulate air and facilitate evaporative cooling.⁴² In cooler temperatures, however, layers of dark-colored clothing should be worn to trap heat or to be removed as the body temperature rises.⁴³ The inner layer of clothing should be made from a wicking material that carries moisture away from the body. Proper footwear with a supportive arch and adequate cushioning is also necessary. These guidelines can help improve performance while reducing the risk of injury.

<h1> EXERCISE PRESCRIPTION FOR SPECIAL POPULATIONS

<h2> *The Athletic Woman*

Exercise prescriptions for a female athlete are specific to the demands of her sport. Differences in energy system requirements dictate the intensity and design of the program. Training of an anaerobic athlete (sprinter, swimmer, etc.) requires high intensity, short duration activities, whereas an aerobic athlete (runner, triathlete, road cyclist, etc.) requires low to moderate intensity for longer durations. Periodized endurance- and strength-training programs alter the training variables (speed, intensity, volume, etc.) to maximize performance. The metabolic demand of the sport should match the metabolic demand of the training sessions. Thus, these programs are sport specific and require assistance from a professional in the field such as a Certified Strength and Conditioning Specialist or an Exercise Physiologist.

<h2> *The Career Woman*

Women with busy daily schedules can still find time to exercise and take care of their health by manipulating their daily routine. The American College of Sports Medicine has recently stated that 30 minutes of continuous exercise is not necessary to elicit health benefits, rather 30 minutes of total accumulated time is required (a minimum of 10-minute bouts).⁴⁴ The time commitment is less restrictive, which allows a woman to plan exercise sessions around her work and family schedule. For example, a 10-minute walk in the morning before work, 10-minute stair climbing during work, and a 10-minute bike ride or walk after dinner would satisfy the recommendation for 30 minutes per day. The intensity should be in the range of 65% to 90% of age-predicted HRmax and the exercise should be performed most days of the week.

With respect to strength training, the career woman should focus on multi-joint functional exercises. Utilizing large muscle groups in a whole-body training program increases the metabolic demands of each training session, which elicits a greater caloric expenditure per exercise session. Because leisure time is a limited resource, maximizing the amount of calories burned per workout is highly beneficial and effective.

h2> Middle Ages

During a woman's middle-aged years, many physiological changes occur, some of which are modifiable. Regular physical activity can reduce the risk of premature death from coronary artery disease, colon cancer, hypertension, and diabetes mellitus.⁴⁵ However, more than 60% of adult Americans are not regularly physically active, 50% of adolescents aged 12-21 years do not participate in vigorous activities, 25% of adult Americans are not active at all, and women continue to be less active than men, regardless of age.⁴⁵ The World Health Organization states that "age 50 marks a point in middle age at which the benefits of regular physical activity can be most relevant in avoiding, minimizing, and/or reversing many of the physical, psychological, and social hazards which often accompany advancing age."⁴⁶ Middle age is an opportune time for the middle-aged woman to make lifestyle changes and take charge of her life.

While much research is published about the effects of exercise in older (>60 years) and younger (18 to 25 years) women, less is available for middle-aged women (45 to 60 years). This may be due partially to the plethora of physiological changes that are occurring during those years, especially the changes in the hormonal milieu. To capture the exercise needs of women of all ages, exercise prescription guidelines for older and

younger women, as well as certain medical conditions/diseases pertaining to aging women and the application of exercise as a primary or secondary preventative tool will be briefly discussed. Regular physical activity and exercise can improve all aspects of health, spirit, mind, and body.

<h2> *Older Women*

With an increase in age there are certain physiological changes occurring that impact the ability of an older adult to complete daily tasks. Thus, exercise prescriptions for older adults aim to improve physical function by impacting the most influential variables, such as muscle strength, muscle power, and aerobic capacity. Various exercise programs for older adults have demonstrated efficacy to improve muscle strength, bone mineral density, aerobic capacity, and physical function, and to reduce falls. Recent research has questioned whether power training (fast speed of concentric movement) improves physical function more so than does strength training (slow speed of concentric movement). While power training has been proven to be more effective than strength training for improving certain functional tasks⁴⁷ and bone mineral density,⁴⁸ strength training repeatedly demonstrates increases in muscle strength, cross-sectional area, improved functional task performance, and preservation of bone mineral density.⁴⁹ Based on available evidence, the following regimen can be prescribed for older adults: strength or power training 2 days/week, 50-85% 1RM, 3 sets of 10-15 repetitions; endurance training 4-5 days/week, 60-70% HRmax, 30 minutes/day; flexibility training daily, holding each stretch for 30 seconds.

<h2> *Adolescents*

With an alarming increase in the incidence of obesity, diabetes, and the metabolic syndrome among adolescents in America, the need for regular physical activity and exercise is overwhelming.⁵⁰ Diet and exercise can reduce variables of the metabolic syndrome in youth to a level that “declassifies” them as having the metabolic syndrome, meanwhile improving lipid profiles, insulin sensitivity, and reducing blood pressure and body weight.^{51,52} Awareness that low body satisfaction in adolescents is associated with health compromising behaviors (i.e. dieting, unhealthy weight control measures, smoking) suggests that exercise strategies be designed to encourage a healthy body weight and image.⁵² Establishing a healthy mind, body, and spirit in adolescence sets the stage for a future of better health and less morbidity.

Strength training should be a component of any exercise program for any woman, regardless of age. A whole-body, multi-joint strength program performed 2 to 3 days per week could include exercises such as a lunge, squat, medicine ball swing, standing dumbbell row, and stability ball dumbbell chest press (Refer to the list of resources at the end of the chapter for more information). These exercises can be performed in the home with little equipment needed and can be adapted to fit any schedule and available space.

<h2> Disease Considerations

The most common causes of morbidity and mortality in the United States are associated with modifiable risk factors, such as obesity, sedentary lifestyle, smoking, and poor diet (www.cdc.gov). Exercise is important as a preventative measure as well as a treatment option for certain diseases, combined with a healthy-balanced diet,

relaxation practice, and continued supervision/treatment from a physician. Exercise prescriptions can be modified for those persons who have a diagnosed disease.

Exercise guidelines are given in Table 2-4 for select diseases.

In November 2000, the Centers for Disease Control and Prevention released a report on the health and economic burden of chronic disease.⁵³ Seventy percent of Americans who die, die of a chronic disease. For women age 35 to 64 years old, cardiovascular disease and lung and breast cancer are the three leading causes of death. One sixth of the American population has arthritis, the primary disabling disorder. Fifty percent of individuals with osteoporosis cannot walk unassisted and 25% require long-term care. Clearly, there is a need for exercise intervention to help mitigate the effects of aging, prevent chronic disease, and enhance quality of life.

<h1> SUMMARY

Because of the multitude of physiological changes that start occurring during early middle age, these years are a welcomed opportunity for a woman to directly impact her current and future health. Exercise and physical activity can forestall the age-associated changes (reduced muscle strength, power, aerobic capacity, and bone mineral density) that can lead to dependence and disability. As a minimum, women (and all adults) should be active for at least 30 minutes on most, if not all, days of the week to gain health benefits. To improve certain aspects of fitness (muscular strength, cardiovascular endurance, flexibility, aerobic capacity, body composition), however, a more vigorous exercise regimen would have to be adhered to.

Regular physical activity and exercise result in positive improvements in health

and fitness. Moderate amounts of physical activity can reduce the risk of certain types of cancer, heart disease, diabetes, and obesity. Resistance training can preserve or increase bone mineral density, increase muscle fiber area, strength, and power. Endurance training can reduce resting heart rate, improve blood lipid profiles, decrease blood pressure, and increase aerobic capacity. Tai Chi and Yoga complement these programs by reducing stress, increasing flexibility, reducing falls, and increasing strength. The available evidence strongly suggests that physical activity and exercise have a positive effect on morbidity and mortality, thus attenuating functional decline and increasing quality of life which could lead to a more able old age. Never let age itself be a deterrent to exercise; the human body is capable of adapting at any age.

Table 4.1: Benefits of Exercise

Resistance Training	Endurance Training	Yoga	Tai Chi
Increases muscle strength	Increases aerobic capacity	Increases muscular strength and endurance	Reduces fall rate
Increases Type II fiber area	Reduces blood pressure	Increases flexibility	Decreases depression
Increases muscle cross sectional area	Increases bone mineral density	Increases aerobic capacity	Increases positive affect
Increases or preserves bone mineral density	Reduces anxiety (state and trait)		
	Reduces fatigue in cancer patients		

Table 4.2: Examples of Moderate Levels of Physical Activity

	LESS VIGOROUS, MORE TIME
Washing a car for 45-60 minutes	
Playing volleyball for 45 minutes	
Gardening for 30-45 minutes	
Wheeling self in wheelchair for 30-40 minutes	
Walking 1.75 miles in 35 minutes (20 min/mile pace)	
Basketball (shooting baskets) for 30 minutes	
Bicycling 5 miles in 30 minutes	
Pushing a stroller 1.5 miles in 30 minutes	
Raking leaves for 30 minutes	
Walking 2 miles in 30 minutes (15 min/mile pace)	
Dancing fast (social) for 30 minutes	
Water aerobics for 30 minutes	
Bicycling 4 miles in 15 minutes	
Jumping rope for 15 minutes	
Shoveling snow for 15 minutes	
Walking stairs for 15 minutes	MORE VIGOROUS, LESS TIME

Adapted from U.S. Department of Health and Human Services. Physical Activity and Health: A report of the surgeon general. Atlanta: U.S. Dept. of Health and Human Services, Centers for Disease Control and Prevention, 1996.

Table 4.3: Resistance Training Exercises

Muscle Group	Exercise
Quadriceps & Hamstrings	Squat*
	Lunge*
	Leg Press*
	Leg Curl
	Step-up*
Pectoralis Major & Minor	Bench Press (barbell or dumbbell)*
	Push-up*
	Fly
Lumbar extensors, Latissimus	Lat pull-down*
Dorsi, Rhomboids	Row (seated or dumbbell)*
	Trunk Extension
Deltoids	Side lateral raise
	Rear deltoid raise
	Military Press (with dumbbells)*
Triceps & Biceps	Triceps extension (cable, single arm or double arm)
	Biceps curl (dumbbell or barbell)

* Multi-joint exercises

Table 4.4: Exercise Guidelines for Select Diseased Populations

Disease	Fitness Parameter	Mode	Frequency	Intensity	Duration
Arthritis	Aerobic	Non-weight bearing	3-5	60-80% peak	5-10 minutes to
	capacity	activities, low-impact	days/week	heart rate**	begin then progress
		activities (swimming, cycling)			
Muscle		Circuit strength	2-3	1-2 sets of 3-	
Strength		training	days/week	12 repetitions	
				(start at 3	
				and progress	
Flexibility		ROM exercises	Every day	Slight	Hold each position
				discomfort,	for approximately

			no pain;	30 seconds
			never bounce	
Diabetes	Aerobic	Walking, cycling	4-7	50-90% peak 20-60
	capacity		days/week	heart rate** minutes/session
	Muscle	Free weights,	2-3	1-2 sets of 8-
	Strength	machines	days/week	10 repetitions
Osteoporosis	Aerobic	Weight bearing	3-5	40-70% peak 20-30
	capacity	activities (walking, stair climbing)	days/week	heart rate** minutes/session
	Muscle	Free weights,	2	2-3 sets of 8
	Strength	machines	days/week	repetitions
	Flexibility	ROM exercises, stretching	5-7	Slight Hold each stretched position for
			days/week	discomfort, no pain; approximately 30

				never bounce	seconds
Myocardial	Aerobic	Large muscle	3-4	40-85% heart	20-40
Infarction	Capacity	activities	days/week	rate reserve*	minutes/session
					5-10 minutes of
					warm-up and cool-
					down
Muscle		Circuit training	2-3	1-3 sets of 10-	
Strength			days/week	15 repetitions	
Valvular	Aerobic	Large muscle	3-7	60-85% peak	20-60
Heart	Capacity	activities	days/week	heart rate**	minutes/session
Disease				(Resting	
				heart rate +	
				30 beats after	

surgery)

Muscle	Machines	2-3	
Strength		days/week	
Cancer †	Aerobic	Large muscle groups	3-5
	Capacity	(walking, cycling)	days/week
		50-75% heart rate reserve	20-30 minutes/session,
			continuous

Modified from ACSM's Exercise Management for Persons with Chronic Diseases and Disabilities. Human Kinetics; Champaign, IL: 1997.

† From Courneya KS, Mackey JR, and Jones LW. Coping with cancer. Can exercise help? Phys. Sports Med. 2000;28(5):49-73.

*Heart rate reserve = [(% intensity)(220 - age - heart rate at rest)] + heart rate at rest

**Peak heart rate = maximal heart rate obtained during an exercise test

Further Resources

Books

Chu, D. (1996). Explosive Power and Strength. Human Kinetics: Champaign, IL.

Goldenberg, L. & Twist, P. (2002). Strength Ball Training. Human Kinetics: Champaign, IL.

Coulter, H.D. & McCall, T. (2001). Anatomy of Hatha Yoga: A Manual for Students, Teachers, and Practitioners. ISBN# 0980800601

Videos

Santana, J.C. Functional Training. (Perform Better, 1-888-556-7464)

Santana, J.C. The Essence of Stability Ball Training. (Perform Better, 1-888-556-7464)

Johnson, M. Tai Chi for Seniors: Self Healing Through Movement. (1-800-497-4244 or <http://www.taichiforseniorsvideo.com>)

Chapter 2 - Exercise, 2

Johnson, J.A. (1999). Power Tai Chi: Total Body Workout.

(<http://www.amazon.com>)

On-line yoga classes available at <http://www.yoga4realpeople.com>

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 - ⁷ Warburton DER, Nicol CW, Bredin SSD. Health benefits of physical activity: the evidence. *CMAJ* 2006;174(6):801-9.

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