LIST OF TABLES AND FIGURES

Chapter 2: Historical Background, Terminology, Evolution of Recommendations, and Measurement

- Table 2-1. Glossary of terms
- Table 2-2. Selected physical activity recommendations in the United States (1965–1996)
- Table 2-3. Assessment procedures and their potential use in epidemiologic research
- Table 2-4. Classification of physical activity intensity, based on physical activity lasting up to 60 minutes
- Table 2.5. Correlation of two survey instruments with physiologic measures of caloric exchange

Chapter 3: Physiologic Responses and Long-Term Adaptations to Exercise

- Table 3-1. A summary of hormonal changes during an episode of exercise
- Table 3-2. A hypothetical example of alterations in selected physiological variables consequent to a 6-month endurance training program in a previously sedentary man compared with those of a typical elite endurance runner
- Figure 3-1. Changes in cardiac output (A), heart rate (B), and stroke volume (C) with increasing rates of work on the cycle ergometer
- Figure 3-2. Changes in arterial and mixed venous oxygen content with increasing rates of work on the cycle ergometer
- Figure 3-3. Changes in oxygen uptake and blood lactate concentrations with increasing rates of work on the cycle ergometer
- Figure 3-4. Changes in VO, max with increasing age from 6 to 18 years of age in boys and girls
- Figure 3-5. Changes in $\dot{V}O_2$ max with aging, comparing an active population and sedentary population (the figure also illustrates the expected increase in $\dot{V}O_2$ max when a previously sedentary person begins an exercise program)

Chapter 4: The Effects of Physical Activity on Health and Disease

- Table 4-1. Population-based studies of association of physical activity or cardiorespiratory fitness with total cardiovascular diseases
- Table 4-2. Population-based studies of association of physical activity or cardiorespiratory fitness with coronary heart disease
- Table 4-3. Population-based studies of association of physical activity with stroke (CVA)
- Table 4-4. Population-based cohort studies of association of physical activity with hypertension

- Table 4-5. Epidemiologic studies of leisure-time or leisure-time plus occupational physical activity and colon cancer
- Table 4-6. Epidemiologic studies of leisure-time or leisure-time plus occupational physical activity and hormone-dependent cancers in women
- Table 4-7. Epidemiologic studies of leisure-time or total physical activity or cardiorespiratory fitness and prostate cancer
- Table 4-8. Cohort studies of association of physical activity with non–insulin-dependent diabetes mellitus (NIDDM)
- Table 4-9. Longitudinal population-based studies of physical activity as related to depressive symptoms
- Table 4-10. Duration of various activities to expend 150 kilocalories for an average 70 kg adult

Chapter 5: Patterns and Trends in Physical Activity

- Table 5-1. Sources of national and state-based data on physical activity
- Table 5-2. Percentage of adults aged 18+ years reporting no participation in leisure-time physical activity, by various demographic characteristics, National Health Interview Survey (NHIS), Third National Health and Nutrition Examination Survey (NHANES III), and Behavioral Risk Factor Surveillance System (BRFSS), United States
- Table 5-3. Percentage of adults aged 18+ years reporting participation in no activity; regular, sustained activity; and regular, vigorous activity, by state,* Behavioral Risk Factor Surveillance System (BRFSS), 1994, United States
- Table 5-4. Percentage of adults aged 18+ years reporting participation in regular, sustained physical activity (5+ times per week for 30+ minutes per occasion), by various demographic characteristics, National Health Interview Survey (NHIS) and Behavioral Risk Factor Surveillance System (BRFSS), United States
- Table 5-5. Percentage of adults aged 18+ years participating in regular, vigorous physical activity (3+ times per week for 20+ minutes per occasion at 50+ percent of estimated age- and sex-specific maximum cardiorespiratory capacity) by various demographic characteristics, National Health Interview Survey (NHIS) and Behavioral Risk Factor Surveillance System (BRFSS), United States
- Table 5-6. Percentage of adults aged 18+ years reporting participation in selected common physical activities in the prior 2 weeks, by sex and age, National Health Interview Survey (NHIS), United States, 1991
- Table 5-7. Percentage of adults aged 18+ years reporting participation in any strengthening activities or stretching exercises in the prior 2 weeks, by various demographic characteristics, National Health Interview Survey (NHIS), United States, 1991

- Table 5-8. Trends in the percentage of adults aged 18+ years reporting participation in no activity; regular, sustained activity; and regular, vigorous activity, by sex, National Health Interview Survey (NHIS) and Behavioral Risk Factor Surveillance System (BRFSS), from 1985–1994
- Table 5-9. Percentage of young people reporting no participation in vigorous or moderate physical activity during any of the 7 days preceding the survey, by demographic group, 1992 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS) and 1995 Youth Risk Behavior Survey (YRBS), United States
- Table 5-10. Percentage of young people reporting participation in vigorous physical activity during 3 or more of the 7 days preceding the survey, by demographic group, 1992 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS) and 1995 Youth Risk Behavior Survey (YRBS), United States
- Table 5-11. Percentage of young people reporting participation in strengthening or toning activities during 3 or more of the 7 days preceding the survey, by demographic group, 1992 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS) and 1995 Youth Risk Behavior Survey (YRBS), United States
- Table 5-12. Percentage of young people reporting participation in stretching activities during 3 or more of the 7 days preceding the survey, by demographic group, 1992

 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS) and 1995 Youth Risk Behavior Survey (YRBS), United States
- Table 5-13. Percentage of young people reporting participation in walking or bicycling for 30 minutes or more during 5 or more of the 7 days preceding the survey, by demographic group, 1992 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS) and 1995 Youth Risk Behavior Survey (YRBS), United States
- Table 5-14. Percentage of young people reporting participation in selected physical activities during 1 or more of the 7 days preceding the survey, by demographic group, 1992 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS), United States
- Table 5-15. Percentage of students in grades 9–12 reporting enrollment in physical education class, daily attendance in physical education class, and participation in exercise or sports for at least 20 minutes during an average physical education class, by demographic group, 1995 Youth Risk Behavior Survey (YRBS), United States
- Table 5-16. Percentage of students in grades 9–12 reporting participation on at least one sport team run by a school or by other organizations during the year preceding the survey, by demographic group, 1995 Youth Risk Behavior Survey (YRBS), United States
- Figure 5-1. Percentage of adults aged 18+ years reporting no participation in leisure-time physical activity by sex and age
- Figure 5-2. Percentage of adults aged 18+ years reporting no participation in leisure-time physical activity by month
- Figure 5-3. Trends in leisure-time physical activity of adults aged 18+ years, NHIS
- Figure 5-4. Trends in the percentage of adults aged 18+ years participating in no leisure-time activity, BRFSS

Chapter 6: Understanding and Promoting Physical Activity

Table 6-1.	Summary of theories and models used in physical activity research
Table 6-2.	Studies of interventions to increase physical activity among adults
Table 6-3.	Summary of progress toward Healthy People 2000 objective 1.10
Table 6-4.	Percentage of all physical education courses in which more than one class period was devoted to each activity, by activity, School Health Policies and Programs Study, 1994
Table 6-5.	Studies of interventions to increase physical activity among children and adolescents
Figure 6-1.	Results of the Minnesota Heart Health Program on physical activity. Graph compares the percentage of respondents reporting regular physical activity in intervention cities and the secular trend estimated from control cities
Figure 6-2.	Moderate-to-vigorous and vigorous physical activity observed during Child and Adolescent Trial for Cardiovascular Health (CATCH) physical education classes

INDEX

A	
Abdominal fat, 135	self-efficacy, 214–215, 217, 248
Absolute intensity scale, 66	self-monitoring, 217, 226, 234
Acid-base equilibrium, 62	social support, 216, 226
Adenosine diphosphate (ADP), 65	surveys, 175
Adenosine triphosphate (ATP), 65, 66	trends, 8
Adipocytes, 128	worksites, 229-231, 234, 229
Adipose tissue, 128, 133, 134	Aerobic exercise, 66
Adolescents and physical activity	Aerobics Center Longitudinal Study, 86
bicycling activities, 200, 205	Affective disorders, 135
bone mass development, 131, 132	African Americans
breast cancer incidence, 117	adult activity interventions, 232, 236, 232
cardiovascular disease risk factors, 91, 102	bicycling activities by, 203
high school physical education, 204, 205	Fitness Through Churches Project, 245
injuries, 142	high school physical education enrollment, 205
no regular activity, 189	no regular physical activity, 177, 192, 195
obesity, 43, 47, 133	physical activity trends in, 8
recommendations, 28-29	regular, sustained physical activity, 183
regular, vigorous activity, 191, 196–197, 205	regular, vigorous physical activity, 185, 187,
school-based interventions, 6, 236-243	196–197
sports team participation 200	sports team participation, 200
stretching activities, 194, 200-201	strengthening activities by, 189, 191, 198, 193
surveys, 175, 205	stretching activities by, 191, 194, 201
trends, 8	walking activities by, 203
walking activities, 200, 205	Age factors, 74–76
Adults and physical activity	cardiorespiratory capacity and, 187
assessment procedures, 30	exercise intensity and, 31-33
cardiovascular response, 75	hypertension and, 103
communications strategies, 229-230, 231	no regular activity and, 177, 179, 192, 195
community approaches, 227-229, 234	physical activity and mortality rates, 86
determinants, modifiable, 215, 234	regular, sustained activity and, 183
exercise enjoyment, 215, 216	regular, vigorous activity and, 185, 187
health care settings, 226-227, 242	weight gain prevention and, 133, 232-233
individual approaches, 217, 226, 234	Agility. See Psychomotor performance
promotion, 217, 234	Alabama
pulmonary ventilation rates in untrained, 64	Physical Activity for Risk Reduction project,
recommendations, 24–27, 43	232

Amenorrhea, 131, 143	Appetite, 135
American Academy of Pediatrics, 28	Arrhythmias, 110, 112, 143
American Alliance for Health, Physical Education,	Arterial baroreflex, resetting of, 63
Recreation and Dance, 3, 244	Arterial-mixed venous oxygen (A-vO ₂), 62, 64, 70,
American Association of Cardiovascular and	75–77
Pulmonary Rehabilitation, 23	Arterial vasodilatation, 111
American Association of Health, Physical	Arthritis, 7, 129–130, 142
Education, and Recreation (AAHPER), 18	Arthritis, rheumatoid, 129
Health Related Physical Fitness Test, 18	Asthma, 143
Youth Fitness Test, 18	Atherosclerosis, 5, 102, 103, 110-111, 128
American Cancer Society (ACS), 112	Australian Heart Week (1990) campaign, 233
American College of Sports Medicine (ACSM), 5	
cardiorespiratory fitness (endurance) and, 4, 20	
consultation for report by, 3	В
Guidelines for Exercise Testing and Prescription, 23	B-lymphocytes. See Lymphocytes
National Coalition for Promoting Physical	Balance. See Equilibrium
Activity, 244	Bank of America physical activities program, 230
physical activity recommendations, 33, 148	Basal metabolic rate, 66
American Diabetes Association, 127	Bed rest, prolonged, 71, 72
American Heart Association (AHA), 244	Behavioral sciences, adult
cardiorespiratory endurance (fitness) and, 4	ecological perspective, 214–215, 244
consultation for report by, 3	health-belief model, 213, 217
National Coalition for Promoting Physical	intervention studies. See under Intervention
Activity, 244	studies (adolescent; adult; children)
physical activity counseling	learning theories, 211, 214, 226, 228, 230
recommendation, 244	planned behavior theory, 213–214, 226
American Hospital Association, 23	reasoned action theory, 213–214, 217
American Medical Association (AMA)	relapse prevention model, 213, 226, 228
exercise and physical fitness, 17	social learning (cognitive) theory, 214, 217,
Guidelines for Adolescent Preventive Services	226, 228, 230, 235, 236
(GAPS), 28, 242	social support, 220, 214, 227, 228
Health and Fitness Program, 17	transtheoretical model, 213, 235
physical activity counseling	Behavioral sciences, children and adolescents,
recommendation, 244	234–243
Anemia, 143	planned behavior theory, 213
Angina pectoris, 45, 110–112, 143	reasoned action theory, 213
Anovulation, 143	social learning (cognitive) theory, 214
Anxiety, 8, 137, 150	Biogenic monoamines, 141
Anxiety disorders, 135, 136	Blood flow, 63, 64, 65, 71, 111, 112, 128
Aortic aneurysms, 103	2.000 110 11, 00, 01, 00, 11, 111, 112, 120
Aortic valve stenosis, 45	

Blood pressure, 16, 71, 90, 110, 111, 145	Capillaries, 71
adaptation to exercise, 73	density of, 63, 65, 73
diastolic, 63, 70, 72, 102, 110	endurance training and, 69
end-diastolic volume, 71, 72	Carbohydrate, adenosine triphosphate
mean arterial, 63	production, 66
response to resistance exercise, 65	Carbon dioxide (CO ₂), 18, 32, 61–62, 66
systolic, 63, 64, 70, 102, 110	Cardiac output (Q), 62,71
See related Hypertension; Hypotension	contribution to mean arterial blood pressure,
Blood volume, 70, 71, 72	63
Body composition, 21, 22, 35, 54, 134	and heart rate, 62
Body fat, 7, 35, 102, 128–129, 134, 135, 145	maximal (Q max), 62, 70, 71
Body mass index, 35, 90, 102, 126–127, 133, 134	rest vs. exercise, 63
Body surface area to mass ratio, 73–74	stroke volume, 62, 63, 65
Body temperature, 62, 64, 141	Cardiomyopathy, hypertrophic, 45
Body weight, loss practices, 50, 44	Cardiorespiratory endurance (fitness), 4, 6, 17
Bone density, 69, 72, 73, 75, 130, 131, 132	age and, 187
Bone marrow, 67	cholesterol, total, and, 102
Breast cancer, 7, 117–119, 123	epidemiologic studies of, 131, 137, 143, 147,
British Association for the Advancement of	182, 187, 201–205
Science, 19	interventions, 244
Building Your Fitness Futures program, 232	measurement of, 19-20, 32-37
	multiple sclerosis and, 233
	population-based studies, 85-90
C	prostate cancer and, 121-125
Calcium, balance, 72	regular, intermittent exercise, 5
Caloric expenditure, 147	sex factors and, 187
Calorimetry, 21, 29, 32	See also Physical fitness
indirect, 21, 32	Cardiovascular diseases, 87
Cancer, 43, 67, 149	of adolescents, interventions for, 236-243
breast, 7, 117–119	community-based intervention programs for
colon, 4, 5, 7, 114, 144, 145, 149	227–229
endometrial, 7, 120–121, 149	of children, interventions for, 236–243
hormone-dependent in women, 117–121	diabetes risk factors for, 127
mortality incidence, 113	health care interventions for, 242
ovarian, 7, 120, 149	myocardial infarction, 5, 43, 45, 112, 143
physical activity and, 7	physical activity and, 43–48, 43–45, 47
prostate, 7, 121–122, 124–125	Cardiovascular system adaptations, 5, 7, 19
testicular, 7, 124, 149	to exercise, 7, 21, 61–62, 65, 70, 71, 87
rectal, 7, 113, 116	myocardial wall stress in, 63–64, 71
uterine, 117, 120–121	Cartilage, 130, 143
	Catecholamine, 64, 66, 74

Causality, 144–145	Community behavioral approaches, 227–229
Centers for Disease Control and Prevention	Coronary artery
(CDC), 5	perfusion pressure increase, 64
Behavioral Risk Factor Surveillance System	vasodilation of, 64
(BRFSS), 175, 205	Coronary artery bypass, 45
exercise recommendations, 23, 28, 33, 148	Coronary circulation, 63–64
Guidelines for School and Community Health	Coronary disease, 16, 23, 28, 35, 37, 49, 47, 133,
Programs to Promote Physical Activity	140, 144–147, 149
Among Youths, 237, 244	inverse association with physical activity, 91
School Health Policies and Programs Study,	physical activity and, 4, 5, 7, 87, 90–91
236–237	population-based studies, 92–101
Youth Risk Behavior Survey, 175, 176, 189,	Coronary plaque, 110, 111, 112
193–199, 205	Crime, 246–247
Cerebrovascular disorders, 7, 47, 45, 102–103,	
104–107, 110	
Child and Adolescent Trial for Cardiovascular	D
Health (CATCH) study, 239, 244	Dehydration, 75, 143
Children and physical activity, 75	Dementia, 136
assessment procedures, 29	Depression, 8, 135, 136, 140, 150
behavioral research, 234-243	Detraining, 21, 61, 72
bone mass development, 131, 132	Diabetes mellitus, 4–6, 28, 35, 37, 43, 90, 125,
cardiovascular factors, 75, 91, 102	133, 144–149, 232
environmental factors, 73–74	Diabetic retinopathy, 128
goals, 28, 43	Diastolic blood pressure. <i>See under</i> Blood pressure
hypertension, 87	Diet, 5, 12–13, 116, 127, 128, 134, 232–233
injuries, 142	Dietary Guidelines for Americans, 5, 28, 244
minimum health standard, 17-18, 19	Disability. See Physically handicapped
no regular activity, 4	Disuse atrophy, 72–73
obesity, 43, 47, 133, 134	Dyslipoproteinemia, 133
obesity interventions, 248	7 - F - F
regular, vigorous activity, 191	
school-based interventions, 6	E
school program interventions, 236–243	
Cholesterol, 19, 23, 47, 91, 102, 110–111	Eding disorders, 136
Church programs, 245	Edema, 133 Educational factors
Cognition, 135, 141, 142	
College Alumni Study, 36	no physical activity and, 177, 178, 196 regular sustained physical activity, 183
Colon cancer, 4, 5, 7, 113–117, 146, 149	regular, vigorous physical activity, 183, 187
Colorectal cancer, 113	strengthening activity, 191
Communications interventions, 230–231	stretching activity, 191
Community-based programs, 6, 227–229, 245–246	successing wearing, 191

Eisenhower, President Dwight D., 17, 18	Epicondylitis, 143
Elderly persons	Equilibrium, 35, 44
behavioral intervention programs for, 233	Ergometer tests. See under Exercise tests
cardiovascular response to exercise, 75–76	Erythropoietin, 68, 74
cold stress in, 74	Estradiol-progesterone, 68
community-based programs for, 245-246	Estrogen, 130, 131
falling, 7, 132	Estrogen replacement therapy, 132
health-related quality of life, 142	Exercise, 20, 21, 140. See also Physical activity
maximal oxygen uptake in, 32, 70	Physical activity, specific; Physical fitness;
osteoporosis, 130–133	Physical fitness programs
physical activity interventions for, 233	Exercise physiology
physical assessment procedures for, 30	research, 18–20
psychomotor performance of, 35	responses to, 61
resistance training and, 44	textbooks on, 61
Electrocardiographic changes, 111	Exercise tests
Emotional functioning, 141	accelerometers, 32
Emphysema, 140	bicycle ergometry, 62-63, 64, 66, 74-75
End-diastolic volume. See under Blood pressure	maximal, 86, 87, 90
Endocrine factors, 66, 67, 70	motion sensors, 31–32
Endocrine glands, 5, 7	for muscle fitness, 34–35
hormonal responses to exercise, 66	pedometers, 31
See related Hormones	stabilometers, 32
Endometrial cancer, 7, 114, 120, 149	submaximal, 86, 87, 89
Endorphins, 141	treadmill, 32, 34, 122
Endurance training, 4, 18, 19, 21, 61, 63, 65	Exercise training
capillary increase by, 69	American College of Sports Medicine
health benefits of, 7, 43	recommendations, 22
health-related quality of life, 142	benefits, 7
insulin sensitivity and, 127	bone adaptations, 67, 69
ischemia and, 112	cardiovascular diseases and, 45
lactate threshold and, 67	definition of, 20
metabolic adaptations, 69-70	diabetes mellitus and, 128
muscle fibers in, 67	frequency of, 61
obesity and, 135	interval vs. continuous, 19
osteoporosis and, 150	and lipoprotein, HDL, 43
Enkephalins, 141	muscle, skeletal, adaptations, 67, 69
Environmental exposure, 19, 73–74	triglycerides and, 111
air pollution, 74	ventricular fibrillation, 112
cold climate disorders, 74	
hot and humid conditions, 63, 73, 143	

F	Н
Falls, 143, 150	Handicapped. See Physically handicapped
Fatty acids, 111	Harvard University, 16
Fibrinogen, 43	alumni study, 86
Fibrinolysis, 43, 112	Fatigue Laboratory, 19
Fitness Through Churches Project, 245	Health, 16–18, 22, 141
Foot injuries, 128, 143	American College of Sports Medicine 1990
Fractures, 130–132, 143	recommendations, 22-23
	exercise physiology research and, 18-20
	physical activity recommendations, 28-30
G	World Health Organization definition of, 141
Gastrointestinal system	Health and Human Services (HHS),
problems, 130	Department of, 245
transit time, 122	Office of Public Health and Science, 3
Genetic factors	Health and Religion Project (HARP), 245
diabetes mellitus, 126–127	Health-related fitness, 20, 22
maximal oxygen uptake and, 66, 70	Health-related quality of life, 141–142, 150
training and, 65	Healthy People 2000, 23
Glossary, 21	cardiorespiratory fitness, 244
Glucagon, 69	daily, moderate physical activity, 181, 200
Glucose intolerance, 72, 123	exercise intensity in, 33
Glucose tolerance, 127	leisure-time activity target, 177
Glucose-6-phosphate, 132	muscle strength, endurance, 187, 189, 192,
Glycogen, muscle storage of, 69	199, 200
Glycolysis	objectives, 5, 175, 237, 245
energy system for, 65–67	physical education, 205
muscle fiber capacity, 66	regular, vigorous activity, 182
Go For Health (GFH), 239	worksite programs, 229–231
Governor's Councils on Physical Fitness and	Heart, adaptation to exercise, 71
Sports, 245	Heart defects, congenital, 45
Guidelines for Adolescent Preventive Services	Heart disease, 142
(GAPS), 28	Heart failure, congestive, 45, 103
Guidelines for Exercise Testing and Prescription	Heart rate (HR), 31–32, 62, 72, 73
(ACSM), 23, 28	coronary circulation and, 66
Guidelines for School and Community Health	maximal, 21
Programs to Promote Physical Activity	mean daily, 31
Among Youths, 237, 244	oxygen consumption and, 63
	resting, 19, 31 training response and, 71
	Heat stress disorders, 74
	Heat exhaustion, 74
	rical canaushun, 17

Heat stroke, 74	I
Hematocrit, 43	Immobilization, 71–72, 130
Hematuria, 143	Immune system, responses to exercise, 7, 67
Hemoconcentration, 74	Immunoglobins, 67
Hemoglobinuria, 143	Immunosuppression, 143
High blood pressure See Hypertension	Inactivity. See Physical inactivity
Hill's causality criteria, 144–145	Indian Health Service, 232
Hip fracture, 130, 132	Industrywide Network for Social, Urban, and
Hispanics	Rural Efforts (INSURE) project, 227
bicycling activities by, 203	Infection control and exercise, 67
child behavioral intervention program, 232	Injuries, 5
diabetes mellitus and occupational physical	exercise-related, 8, 44, 69, 150, 248
activity, 126	joint, 129
high school physical education enrollment and,	musculoskeletal, 142–143
205	sports-related, 7
no regular activity by, 177, 195	Insulin, 44, 67, 68, 72, 125–129
physical activity trends in, 8	Intermodal Surface Transportation Efficiency Act
regular, sustained activity by, 183	247
regular, vigorous activity by, 183, 187, 183,	International Consensus Conference
196–197	of Physical Activity Guidelines for Adolescents
sports team participation by, 200	(1993), 28
strengthening activities by, 191, 193, 198,	on Physical Activity, Physical Fitness, and
stretching activities by, 191, 194, 201	Health (1988), 22
walking activities by, 203	Interpersonal relationships, 46
Home care programs, 46	behavioral sciences theories, 213,
Hyaline cartilage, 130	social support role in activity, 214, 243
Hydrogen ions (H+) concentration, 64	Intervention studies, adolescent, 8, 236
Hygiene, 11–18	accessibility, 236
Hyperglycemia, 127	church programs for, 245
Hyperinsulinism, 72	determinants, modifiable, 243
Hyperplasia, 69	factors influencing, 243
Hypertension, 4–5, 7, 23, 47, 43, 63, 66, 71,	health care settings, 242
126–127, 133	outdoor activities, 243
obesity and, 133	parental involvement, 243
physical activity and, 103, 110, 144–145, 149	school-community programs, 242, 245
population studies of, 108–109	school programs, 236-243, 236-243
Hyperthermia, 143	self-efficacy, 242, 248
Hypertrophy, 69, 71, 76, 103	societal barriers, 246–247
Hypoglycemia, 127–128, 143	societal resources, 247
Hypotension, 63, 74	

Intervention studies, adult, 8, 217	K
communications, 229–230	Kennedy, President John F., 18
community approaches to, 227-229, 234,	Kilocalorie (kcal), 21, 29, 140, 143, 146-147, 148
227–229, 234, 245	Kilojoule (kjoule), 21, 29
church programs for, 245	Know Your Body (KYB) program, 238
environmental approach to, 244-245	
factors influencing, 215-217	
health care settings, 226-227	L
individual approaches, 217, 226, 234	
mental disorders, 136	Lacerations, 143
policy approaches, 244–245	Lactate threshold (LT), 66, 67, 69, 70
promotion of, 226, 234	Lactates, 66, 67, 70, 74
societal barriers, 246–247	Leukocytes, 128
societal resources, 247	Ligaments, 69
worksites, 229-231, 229-231, 236	Lipoproteins, 110
Intervention studies, children, 8, 236	HDL, 43, 91, 102
accessibility, 243	LDL, 91, 102
church programs for, 246	lipase activity, 111
determinants, modifiable, 243	profile, 111, 145
factors influencing, 243	Low back pain, 233–234
health care settings, 242	Lung diseases, obstructive, 233–234
outdoor activities, 243	Lymphocytes, 67
parental involvement, 243	
school-community programs, 242, 245	
school programs, 236-243	M
self-efficacy, 242, 248	Magnetic resonance imaging, 35
societal barriers, 246–247	Marfan syndrome, 45
societal resources, 247	Mass spectrometer, 32
Intervertebral disc displacement, 142	Maximal oxygen uptake (VO ₂ max), 21, 23, 32–34,
Intra-abdominal fat distribution, 128-129	62–63, 66, 67, 69–70, 72, 75–77, 110
Ischemia, 110, 111–112	Media. See Communications interventions
	Men and physical activity
	no regular activity, 4, 8, 177, 178, 188, 189
1	regular, sustained activity, 183, 188, 205
Johnson, President Lyndon B., 18	regular vigorous activity, 185, 187, 188, 205
Johnson & Johnson Live for Life program, 230	selected physical activities, 188
Johnson & Johnson Live for Life program, 250	strengthening activities, 191
	trends, 8
	Menopause, 130, 131
	Mental disorders, 135
	Mental health, 4, 8, 135-141, 150

Mental retardation, 73	Muscles, skeletal, 5
Metabolic equivalent (MET), 21, 29, 32, 33, 66,	adaptations to exercise, 7, 44, 65, 67, 69-70
148, 204	atrophy of, 69, 72–73
Metabolic rate, 66	capillaries in trained, 71
Metabolism	energy metabolism of, 65–67
aerobic, 20, 21	fibers in, 65, 67, 69, 73
bed rest and disturbances of, 72	immobilization and, 72-73
benefits, 7	insulin and, 125, 130
carbohydrate, 128	metabolic adaptations of, 69-70
energy expenditure, 134	multiple sclerosis and, 233-234
glucose, 65, 128	soreness in, 69
fat, 68	structural damage to, 69
muscle, skeletal, 65-67, 71-72	Muscular endurance (fitness), 21, 34-35
protein, 66	Muscular strength, 34, 44
response to exercise, 18-19, 121, 64, 69-70	Myocardial contraction, 65, 72
Metropolitan Life Insurance Company weight	Myocardial infarction, 5, 44, 45, 112, 143
tables, 133	Myocardium, 111
Minnesota Heart Health Program (MHHP),	Myosin ATP, 65
227–228, 232	
Minnesota Leisure-Time Physical Activity	
Questionnaire, 31, 36	N
Missouri "Bootheel" behavioral sciences study,	National Association for Sport and Physical
229, 232	Education, National Physical Education
Mitochondria, 66	Standards, 244
Monocyte-macrophage system, 67	National Coalition for Promoting Physical
Mortality, 85–87, 149	Activity, 244
all-cause, 133	National Institutes of Health (NIH), 5
diabetes mellitus, 125	Consensus Development Conference
heart disease, 87	Statement, Physical Activity and
lowering, 7	Cardiovascular Health, 5, 23, 28, 48, 148,
premature, 4, 16	245
traffic fatalities, 246	intervention campaigns, 245
Multiple sclerosis, 73, 233–234	National Physical Education Standards, 244
Muscle contractions, 34	Native Americans, 12
Muscle fatigue, 65	adult physical activity interventions, 232
Muscle fibers, 21	behavioral intervention program,232
fast- and slow-twitch, 65, 67, 69, 73	Neoplasms. See Cancer
	Neural factors, 67
	Neuromas, 143
	Nitric oxide, 132
	Nitrogen, balance, 72
	Tittogen, buttinee, 12

0	Peripheral vascular disease, 45
Obesity, 7, 43, 133–135, 150, 248	Personality disorders, 136 Phosphocreatine (PCr), 65
abdominal, 35, 128–129	
adult physical activity interventions, 232-234	Physical activity, 21
behavioral intervention programs, 232–233	of adolescents. See Adolescents and physical
in adolescents, 102	activity
in children, 102	of adults. See Adults and physical activity
childhood intervention, 244	adverse effects of, 142–144
trends in, 47, 46	approaches to, 46–47
Occupational medicine, 15	of children. See Children and physical activity
Occupational physical activity, 113, 116, 175, 189.	definition of, 20
See also Worksite physical fitness programs	dosage, 146–148
	duration of, 44, 147, 148
Olympic Games, 12, 15	evolution of recommendations, 22-28
Osteoarthritis, 7, 129–130, 133, 149–150	frequency of, 44
Osteoporosis, 7, 23, 43, 69, 130–133, 150.	intensity of, 29-33, 35-36, 44
See related Bone density	measures of, 211–215
Otitis externa, 143	no regular, 15–16, 23, 50, 46–48, 177–189,
Ovarian cancer, 7, 114, 116–118, 149	188, 195, 248
Overtraining, 21, 140	regular, intermittent, 11, 148
Overweight, 133. See also Obesity	regular, sustained, 4, 6, 23, 37, 49, 43, 110,
Oxidative capacity, of muscle fibers, 65, 67	146–147, 182–183, 244
Oxidative energy system, 65, 66	regular, vigorous, 4, 6, 11, 23, 37, 50, 110,
Oxygen	127–128, 146–147, 182–187, 188, 244
arterial-mixed venous, 62, 63, 70	research considerations, 47, 150
ATP production within mitochondria, 66	social environmental approaches to, 244-245
body's use of, 61	surveys of, 175, 177
delivery, 74	Physical activity, specific
extraction, blood flow, 63	aerobics, 200, 205
myocardial demand/use, 63, 64	baseball, 129, 143, 200, 205
Oxygen consumption (VO ₂), 18, 31, 32, 34, 66,	basketball, 143, 200, 205
70, 74, 110	bicycling, 4, 143, 144, 187, 200,203
Oxygen uptake. See Maximal oxygen uptake	boxing, 143
	carpentry, 140
	dancing, 14, 143, 144, 148, 187, 200, 205,
P	football, 129, 143, 200, 205
Pain threshold, 130	Frisbee, 197-198, 205
Paleolithic rhythm, 11	gardening, 8, 140, 144, 147, 187
	golfing, 140
Pawtucket Heart Health Program (PHHP), 229	hockey, 140, 148
Pediatricians, physical activity counseling by, 244	horseback riding, 14

housecleaning, 147, 148, 200, 205	Physical fitness programs
jogging, 140, 142, 144, 148, 187, 198, 205,	detraining and, 61, 72
kickball, 12	endurance training, 61, 63, 65, 67, 69–70
lacrosse, 12	exercise training, 61, 67, 69
racquetball, 143, 197-198, 205	resistance training, 61, 65, 69, 70
running, 4, 12, 65, 66, 70, 129, 140, 142, 143,	Physical functioning, 141
144, 148, 187, 198, 205	Physical inactivity, 5, 6, 72, 73, 145–146, 148
skating, 197–198, 205	bone loss and muscle atrophy in, 69
skateboarding, 197–198, 205	diseases of, 15–16
skiing, 197–198, 205	exercise programs and, 37
soccer, 129, 143, 197–198, 205	health burden of lifestyle, 42–43
softball, 144, 197–198, 205,	mortality and, 86
stair climbing, 127, 147, 187	percentage of, 4
squash, 197–198, 205	physical activity recommendations for, 29
swimming, 140, 143, 144, 197–198, 205,	physiological alterations after endurance
tennis, 14, 140, 197–198, 205	training, 70
volleyball, 4, 148,	societal inducements for, 254-247
walking, 4, 8, 14, 33, 127, 140, 144, 148, 187,	working toward recommendations, 44
197–198, 203, 204, 205, 233	Physically handicapped, 73
weight lifting, 129, 143	behavioral intervention programs, 233-234
yard work, 4, 8, 147, 187, 202, 200,205, 205	childhood interventions, 233, 244
Physical Activity for Risk Reduction (PARR)	no regular activity and, 189
project, 232	regular, moderate activity and, 189
Physical education, 8, 16–18	regular, vigorous activity and, 189
enrollment in, 4	Physician-based Assessment and Counseling for
in high school, 205, 205	Exercise (PACE), 227
school program interventions, 243, 246-249	Plasma insulin concentration, 128
Physical examination, 6, 45, 47	Plasma lipid/lipoprotein, 110, 111
Physical fitness, 16–18, 21	Plasma volume, 71, 72, 74
assessment procedures, direct monitoring,	Platelet function, 43
31–36	Population attributable risk (PAR), 145–146
assessment procedures, self-reporting, 29-31	Postmenopause, 131
definition of, 20	Postpoliomyelitis syndrome, 73
level of, 61	Power, 21, 85
maintenance of, 71–72	President's Citizens Advisory Committee on the
maximal oxygen uptake and. See Maximal	Fitness of American Youth, 18
oxygen uptake	President's Conference on Fitness of American
measurement of, 33-35	Youth, 18
physical activity relationship, 43	President's Council on Physical Fitness, 18, 23
worksite programs, 48, 46, 48	President's Council on Physical Fitness and Sports
See also Cardiorespiratory endurance (fitness)	(PCPFS), 3, 5, 18, 227, 245

President's Conference on Youth Fitness, 18 Presidential Physical Fitness Award, 18 Preventive medicine, 11–18 Prostaglandin, 68, 113–117, 124 Prostate cancer, 7, 121–122, 124–125 Proteoglycan synthesis, 130 Psychological assessments, 136–137 Psychomotor performance, 17, 19–20, 35, 44 Pulmonary ventilation, 64, 71 Pulse rate, 16	Respiratory system, 5 adaptation to exercise, 71 physiological alterations after endurance training, 70 resistance exercise and, 65 response to exercise, 61–62, 64 Retraining, 21 Rhabdomyolysis, 143 Rhode Island Department of Parks and Recreation, 229 Health and Religion Project, 245 Pawtucket Heart Health Program, 229
Q	Roosevelt, President Franklin D., 17
Quadriplegia, 75 Quality of life, 8, 141–142, 150 Quetelet's index, 133	Schizophrenia, 136
R	School program interventions, 6, 236–243, 246–248
Rating of perceived exertion (RPE) scale, 33 Reaction time, 21 Receptors, sensory, 141 Rectal cancer, 7, 113, 116, 122, 149 Relative perceived exertion (RPE), 21 Renin-angiotensin system, 68 Resistance training, 4, 19, 21, 29, 37, 44, 61, 65, 69 adolescent, 196, 198–200 elderly persons and, 7, 132–133 glucose-insulin dynamics, 128 muscle, skeletal effects of, 69 obesity and, 135 osteoporosis and, 150 risk factors, 67 strengthening activities for, 187, 189, 191–192,	sensory, 141 ser, 7, 113, 116, 122, 149 serceived exertion (RPE), 21 solutions system, 68 training, 4, 19, 21, 29, 37, 44, 61, ent, 196, 198–200 persons and, 7, 132–133 -insulin dynamics, 128 skeletal effects of, 69 and, 135 orosis and, 150 tors, 67 hening activities for, 187, 189, 191–192, self-help, 13–15, 29–31 Senior citizens. See Elderly persons Sex factors in exercise training, 70, 76–77 hormonal responses to exercise, 67 hormone-dependent cancers in men, 121–1 hormone-dependent cancers in women, 114–121 physical inactivity and, 177–178 specific physical activities and, 187–189 strengthening, stretching activities by, 191 weight gain prevention and, 232 Shoulder dislocation, 142 Skeletal muscles. See Muscles, skeletal
193, 199–200 sex factors, 70	63
Respiration rate (RR), 70, 71	Skinfold measures, 133, 134 Sleep disorders, 136

Social environment	Training heart rate (THR), 21
barriers, 246–247	Transient constriction, 111
behavioral influences, 215,	Triglycerides, 111
resources, 247	Trust for Public Land, The, 245
Social functioning, 141	
Social sciences. See Behavioral sciences, adult;	U
children and adolescents	Ulnar nerve palsies, 143
Socioeconomic factors	United Kingdom Testicular Cancer Study Group,
bicycling activities and, 203	122
physical inactivity and, 177, 178, 196	United States regions
resistance training and, 193	East, 12
stretching activities and, 194	Midwest, 229
walking activities and, 200	North central, 177, 187
Speed, 21, 203–204	Northeast, 177, 187
Splanchnic circulation, 63	South, 177, 189, 187
Sports, Play, and Active Recreation for Kids	Southwest, 12
(SPARK) study, 239	West, 177, 182, 187, 189, 187
Stanford Adolescent Heart Health Program, 238	U.S. Preventive Services Task Force, 28
Stanford Five-City Project (SFCP), 229	Urogenital system, 143
Strength, 21, 22	Uterine cancer, 114, 120–121
Strength testing, 16, 34	, , .
Strength training. See Resistance training	
Stretching activities, 187, 191–192	V
Stroke volume (SV), 62, 71–73	<u> </u>
Substance use disorders, 136	Vasoconstriction, 76
Suicide, 135, 140	Ventilatory volume (\dot{V}_{E}) , 70, 74
Systolic blood pressure (SBP), 63, 64, 70	Ventricular dysfunction, left, 103
	Ventricular end-diastolic volume, 71, 72
	Ventricular fibrillation, 112
T	Vertebral fractures, 130
T-lymphocytes. See Lymphocytes	Virginia
Tai chi chuan, 12, 113	Smyth County program, 245
Taoism, 12	
Tecumseh questionnaire, 31	
Temperature. See Body temperature	W
Tendinitis, 143	Water-electrolyte imbalance, 143
Tendons, 69	Weather factors
Testicular cancer, 7, 124, 147	seasonality, 184, 196, 196, 200, 204
Thrombosis, 102, 110, 112	summer months, 184, 187
Thymus gland, 67	walking, bicycling activities and, 204
	Weight Gain Prevention Program, 232

West Virginia Work rate, 64, 71 elderly mall walking campaign in, 233 energy metabolism and, 65 Whites energy systems and, 65-66 behavior intervention program for, 232 increasing, 62–63, 64 bicycling activities by, 203 Worksite physical fitness programs, 48, 46, 48, high school physical education enrollment, 205 184 no regular activity, 177, 188, 195 World Health Organization, definition of health, physical activity trends in, 8 141 regular, sustained activity, 183 World War I, 16 regular, vigorous activity, 183, 187, 188, World War II, 17, 18, 19 196-197 sports team participation, 200 strengthening activities by, 189, 191, 193, 199 stretching activities by, 191, 194, 201 Y walking activities by, 203 YMCA, 23 Wise Weighs program, 232 Yoga, 12 Women and physical activity no regular activity, 177, 178, 188, 205 regular, sustained activity, 183, 188, 205 Z regular, vigorous activity, 185, 187, 188, 189 Zuni Diabetes Project, 232 selected physical activities, 188 strengthening activities, 191 trends, 8