



CLINICAL EXERCISE SPECIALIST MANUAL

A Fitness Professional's Guide
to Training People with
CHRONIC DISEASE

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**A FITNESS PROFESSIONAL'S GUIDE TO
EXERCISE AND CHRONIC DISEASE**

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ISBN: 978-1-946533-98-2 hardcover

ISBN: 978-1-946533-99-9 eBook

Publishing Services provided by Niche Pressworks; Indianapolis, IN

<http://NichePressworks.com>

Printed in the United States of America



CHAPTER 12

BODY COMPOSITION, OVERWEIGHT AND OBESITY

By the end of this chapter you will understand:

- Statistics
 - Comorbidities
 - Body composition measurements
 - Percentage
 - BMI
 - Waist measurements
 - Hip to waist ratio
 - Thermal activity and metabolism
 - Treatment strategies
 - Nutrition
 - Pharmacological and surgery
 - Activity
 - Risks and contraindications
 - FITT
-

Statistics

Obesity is a growing concern for the United States; to such an extent, it is now considered a chronic disease of its own. The adult obesity rate in the United States is now close to 40% and affects over 93 million Americans (Hales, Carroll, Fryar, & Ogden, 2017). The youth obesity rate is over 18%; up almost 5% in just 10 years. The annual medical cost and lost productivity from obesity is estimated to be over \$1.7 trillion. This equates to an estimated per capita cost of over \$1400 per year more than adults of normal weight (Centers for Disease Control and Prevention, 2017; Waters & Graf, 2018). Obesity can lead to cardiovascular disease (CVD) such as coronary heart disease (CHD), and stroke, metabolic conditions such as systemic inflammation, diabetes, and dyslipidemia, and pulmonary conditions such as emphysema, and some cancers (Jensen et al, 2014).

Body Composition Metrics

In addition to adipose tissue, body fat is found in almost all tissue including nerves, bone marrow, and organs. This body fat is considered essential for physiological functions. The remainder of fat is stored and used as the primary source of energy. When there is a positive energy balance (caloric intake is greater than caloric expenditure), accumulating fat leads to harmful excess adipose tissue, and ultimately an individual will become overweight and then obese. Essential body fat is around 3% for men, and 12% for women. Other body fat classifications are in Table 12.1.

Table 12.1

Body fat classifications

Males	Females	Rating
3	12	Essential
5-10	8-15	Athletic
11-14	16-23	Good
15-20	24-30	Acceptable
21-24	31-36	Overweight
>24	>37	Obese

(Jensen et al., 2014; Jeukendrup & Gleeson, 2019; Kravitz, 2015).

There are a number of metrics to determine if an individual is overweight or obese. Body mass index, or BMI, is a common tool based on height to weight. $BMI = \text{Weight (kg)} / \text{Height}^2 \text{ (m)}$ or $[\text{Weight (lb.)} / \text{Height}^2 \text{ (in)}] \times 703$. BMI should only be used as a guide and not for diagnostic purposes as it cannot distinguish fat mass from fat-free mass. There are charts available for download, as well as online calculators to calculate BMI. It is important to know a BMI of greater than 30 (obese) is considered a risk factor for CVD. The list details BMI categories (American College of Sports Medicine [ACSM], 2018; Jensen et al., 2014; Kravitz, 2015):

Weight	BMI	Weight	BMI
Underweight	<18.5	Obese	30-34.9
Normal Weight	18.5-24.9	Grade II Obesity	35-39.9
Overweight	25-29.9	Grade III Obesity	>40

Recently, attention has been given to central obesity, or visceral fat, found in the abdominal cavity. Because of its location near vital organs, excess visceral fat can contribute to health conditions such as hormonal imbalances, CVD, and metabolic diseases. Accordingly, because visceral fat is located in the abdominal cavity, waist circumference is used as a marker of metabolic health risk (Smith, 2015), and is an adjunct to BMI. For overweight and obese individuals (a BMI of > 25), waist measurements can provide insight to increased health risk (Fahey, Insel, & Roth, 2015; Jensen et al., 2014; Kravitz, 2015). Conversely, because BMI cannot differentiate between fat mass and fat-free mass, it may overestimate body fat in individuals with a muscular build. Therefore, if an individual has a BMI higher than expected, a small waist circumference may indicate a lower health risk due to a higher amount of fat-free mass. It should be noted a waist circumference of greater than 40" for males, and 35" for females is considered a separate risk factor for CVD. The waist circumference and the level of risk are listed in Table 12.2.

Table 12.2

Waist circumference and level of risk

	Normal	Increased risk	Substantial Risk
Men	>37in	37-40in	>40in
Women	>32in	32-35in	>35in

Fahey et al., 2015; Jensen et al., 2014; Kravitz, 2015

In addition to waist circumference, waist to hip ratio has also been found to be a better indicator of CVD and metabolic health risk than BMI alone as it is more indicative of intra-abdominal fat. Increased intra-abdominal fat has been determined to be a marker for increased ectopic fat, or fat formed by triglycerides, and stored in the liver, muscle cells, heart, and pancreas. Ectopic fat can disrupt normal metabolic processes and mitochondrial function, and is associated with insulin resistance that disrupts normal organ function (Smith, 2015). Hip to waist ratio norms for men and women are listed in Tables 12.3 and 12.4.

Table 12.3

Hip to waist ratio norms for men

Age	Low risk	Moderate risk	High risk
20-29	<0.83	0.83-0.88	>0.88
30-39	<0.84	0.84-0.91	>0.91
40-49	<0.88	0.88-0.95	>0.95
50-59	<0.90	0.90-0.98	>0.96
60+	<0.91	0.91-0.98	>0.98

ACSM, 2018; Graham & Whitehead, 2018

Table 12.4

Hip to waist ratio norms for women

Age	Low risk	Moderate risk	High risk
20-29	<0.71	0.71-0.77	>0.77
30-39	<0.72	0.72-0.78	>0.78
40-49	<0.73	0.73-0.79	>0.79
50-59	<0.74	0.74-0.81	>0.81
60+	<0.76	0.76-0.83	>0.83

ACSM, 2018; Graham & Whitehead, 2018

Thermal Activity and Metabolism

When discussing caloric expenditure, it is important to understand how the body burns energy and the involvement of each component. Total energy expenditure (TEE) is the total energy expended, and can be divided into four categories: the thermal effect of metabolism (TEM), the thermal effect of food (TEF), the thermal effect of activity (TEA), and non-exercise activity thermogenesis (NEAT) (Trexler, Smith-Ryan, & Norton, 2014). TEM is based on an individual's basal metabolic rate, the bodily functions necessary for life, and accounts for 60–70% of TEE. TEF is the energy required to consume and digest food, and accounts for about 10% of TEE. TEA is the energy associated with activity and accounts for 20-30% of TEE. NEAT is activities such as fidgeting, standing, and walking and can account for half of TEA. Because TEM and TEF are generally consistent, controllable caloric expenditure is predominantly through TEA and NEAT (Trexler, et al., 2014; Villablanca et al., 2015).

Resting metabolic rate (RMR) and fat free mass (FFM) are interconnected, as skeletal muscle comprises of almost 51% of FFM, and contributes 18–25% of RMR (Alexander, 2002; St-Onge & Gallagher, 2010). It should also be noted with aging men may have up to a 5% reduction in RMR per decade, and a reduction in TEA of up to 7.5%. Similarly, women may have up to a 3% reduction in RMR per decade, and a reduction of up to 6% of TEA (St-Onge & Gallagher, 2010). The importance of this cannot be overstated and underscores the importance of a healthy amount of FFM.

Weight Loss and Dietary Guidelines

According to the ACSM (2018), the primary contributing factors to obesity are increased caloric intake and decreased caloric expenditure or physical activity. Accordingly, lifestyle modifications including dietary adjustments, regular exercise, and behavior therapy are all used to reduce and treat the obesity (Burke & Wang, 2011). Behavior change should include strategies such as goal setting, self-monitoring, stimulus control, and cognitive restructuring. Additionally, for consistent weight loss, adherences to a healthy eating plan is more important than the type of diet (Burke & Wang, 2011). A pound is about 3500 calories. Accordingly, to lose one pound per week, a deficit of 500 calories per day needs to be achieved. Keep in mind the 3500-calorie figure is a starting place as caloric expenditure occurs in a non-linear fashion based on individual thermogenics, and actual caloric expenditure may be more or less. Regardless, safe weight loss is no more than 2 pounds, roughly 7000 calories per week or 1000cal/day. General guidelines include (Burke & Wang, 2011; Kravits, 2015; Phelan & Wing, 2005):

- Eat breakfast daily.

- Adhere to consistent eating patterns and times.
- Limit calories to no more than 1500/day for women and 1800/day for men.
- Limit fat to 25-35% of daily calories.
 - o Less than 7% from saturated fat.
 - o Less than 1% from trans-fat.
- Consume fruits and vegetables.
- Consume whole grains.
- Choose high fiber foods.
- Choose lean meat.
- Choose vegetable sources of protein.
- Reduce/minimize food and beverages with added sugar.
- Choose foods with little or no added salt.

Pharmacology and Surgery

There are a number of drugs to aid in weight loss for morbidly obese individuals (Kravitz, 2015). The main function of these drugs is to block the intestines from absorbing dietary fats. Even though there has been some success with mild weight loss, a reduction of blood pressure, and lowering LDL cholesterol, other side effects can be difficult to manage. The most evident side effect is gastrointestinal distress ranging from mild gas, to abdominal pain, to severe diarrhea. Until there is a drug to induce weight loss effectively and safely, a combination of a healthy diet, a consistent exercise program, and behavior change will most likely provide the best results.

Bariatric surgery has become synonymous with bypass surgery, and can include gastric bypass, sleeve gastrectomy or envelope, banding, or an intragastric balloon. Some individuals undergoing bariatric surgery require an invasive procedure, and other individuals have outpatient procedures with little to no down time. Currently, it is not clear, other than recovery time, if a different exercise prescription should be administered to bariatric patients (ACSM, 2018). For clients who have undergone surgery, consulting with a physician and a registered dietitian is strongly recommended.

Exercise

The main goal of an exercise program for an obese client is to achieve and maintain a negative energy balance, and the most effective means to accomplish this is via cardiovascular exercise. Although resistance training has numerous health benefits including a reduction of systemic inflammation, and when performed in conjunction with aerobic exercise can increase lean muscle and FFM, the primary focus of a training program for an obese client should be aerobic exercise. Furthermore, rather than counting steps or calories, a gradual increase of up to 60 minutes per day in exercise appears to provide the caloric

expenditure necessary for weight loss and to prevent the relapse (ACSM, 2018, Kravitz, 2015). As with most chronic conditions, there are considerations when working with an obese client.

- Non-weight bearing exercise such as a bicycle or swimming may be a more effective place to start than weight bearing exercise such as walking or an elliptical.
- Many clients will need to start slow and gradually progress.
- Low-impact exercise are necessary to avoid musculoskeletal injuries.
- If needed, start with as few as 10 minutes per day and progress to 60 minutes per day.
- Biomechanics may be altered.
 - o To avoid joint stress, an increase in duration of exercise is preferred to an increase of intensity.
 - o Clients may need demonstrations and modifications of exercises.
- Muscular strength and endurance should be used as an adjunct to aerobic conditioning.
- Protocols for each comorbidity need to be recognized and implemented as needed.

FITT recommendations for overweight and obese clients are listed in Table 12.5.

Table 12.5

FITT recommendations for overweight and obese

	Frequency	Intensity	Time	Type
Aerobic	≥ 5 days/week to maximize caloric expenditure	40-60% HRR with the goal of reaching ≥ 60% HRR RPE 12-13	30 min/day with a goal of reaching 60 min/day Limited capacity: 3-6 10-min bouts/day to accumulate 30-60 min/day	Rhythmic activities that target large mus- cle groups: Walking Cycling Swimming
Resistance Start with recommen- dations for a healthy, yet deconditioned adult, and progress accordingly	Each major muscle group 2-3 days/week	Light intensity; 40-50% 1RM	10-15 reps for strength 15-20 reps for muscu- lar endurance A single set can be effective	Resistance exercises involving each major muscle group, target- ing larger groups first

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Flexibility	≥ 2-3 days/week	Stretch to the point of feeling tightness or slight discomfort	Static stretching hold for 10-30 sec. or up to 60 sec. for older individuals For PNF stretching, a 3- to 6-sec contraction at 20%–75% maximum voluntary contraction followed by a 10-30 sec. assisted stretch	Static flexibility, Dynamic flexibility PNF
Neuromuscular exercise training The effectiveness of neuromuscular exercise training in younger and middle-aged persons has not been Established	≥2-3 days/week	N/A	≥20-30 min/bout	Exercise that challenges motor skills, coordination, and proprioception such as Yoga or Tai Chi

ACSM, 2018, Garber, 2011; Graham & Whitehead, 2018; Kravitz, 2015

Discussion and application

1. How do you, in plain words, using evidence-based research explain to a new client why lean muscle is so important in weight loss?
2. What are some concerns that need to be addressed when designing an exercise program for an obese client?

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