Do You Know The Important Risk Factor and Fitness Assessment 'Numbers'?

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Introduction

One of the principal areas of concern for exercise professionals is assessing, recognizing and explaining disease risk factors and physiological assessments for clients. From these evaluations, personal trainers have a unique, yet challenging opportunity to guide and encourage clients to make behavioral and lifestyle changes. This column article serves as an informative resource for identifying the many 'numbers' involved in clinical, fitness and health parameters.

Cholesterol, Triglycerides and C-Reactive Protein

Cholesterol, which is vital to the body, is used to assemble cell membranes, produce sex hormones, and form bile acids, which are required for the digestion of fats. When certain blood cholesterol levels are elevated, some of the excess is deposited in the arterial walls, thus the risk for heart disease is increased (See Table 1 for levels). Elevated blood triglycerides (fats) are also an independent risk factor for coronary heart disease, meaning that some particles of fat can collect on arterial walls and lead to atherosclerotic plaque.

Current research additionally suggests that inflammation plays a role in the formation of atherosclerosis (American Heart Association, 2010). C-reactive protein (CRP), a substance the body produces in response to inflammation and infection serves as a very good marker for heart disease risk. The blood vessel test for inflammation is called the high-sensitivity CRP or hs-CRP.

Table1: Cholesterol, Triglyceride and hs-CRP Levels

Total cholesterol	
Desirable	Less than <200 mg/dL
Borderline high	200-239 mg/dL
High	>240 mg/dL
LDL ("bad") cholesterol	
Optimal	<100 mg/dL
Near optimal	100-129 mg/dL
Borderline high	130-159 mg/dL
High	160-189 mg/dL
Very high	>190 mg/dL
HDL ("good") cholesterol	
Low	<40 mg/dL
High	≥60 mg/dL
Triglycerides (fats in the blood)	
Normal	<150 mg/dL
Borderline-high	150-199 mg/dL
High	200-499 mg/dL
Very high	≥500 mg/dL
C-Reactive protein (hs-CRP)	
Low CVD risk	<1.0 mg/dL
Average CVD risk	1.0-3.0 mg/dL
High CVD risk	>3.0 mg/dL

Data from American Medical Association, 2001 and American Heart Association, 2010

Body Composition

Body composition measurement is a key evaluation variable to monitor and assess for a client's physical fitness and health profile. Table 2 presents recommended levels of percent body fat by gender and age.

Table 2. Percent Body Fat Levels for Physically Active Adults

Females	**Upper**	**Middle**	**Lower**
>55 yrs	33	27	20
35-55 yrs	33	27	20
18-34 yrs	28	23	16
Males			
>55 yrs	18	12	9
35-55 yrs	18	11	7
18-34 yrs	15	10	5

Adapted from Heyward, 2006

Body Mass Index

Body mass index (BMI) is an alternative screening tool to percent fat measurement that can be used to categorize individuals as underweight, overweight, or obese, and to observe changes in body weight that may be associated to health problems (See Table 3).

Example Calculations:

With the metric system, the formula for BMI is weight in kilograms divided by height in meters squared.

Weight = 120 kg, Height = 193 cm (1.93 m)

Calculation: $120 \div (1.93)^2 = 32.2$

The BMI formula for weight in lbs and height in inches is weight (lb) divided by height $(in)^2$ x 703

Weight =150 lbs, Height = 65 inches

$(150 \div \{65\}^2) \times 703 = 24.96$

Table 3. International Classification of BMI Ranges for Adults

BMI Value	Classification
<16.00	Severe thinness
16-16.99	Moderate thinness
17-18.49	Mild thinness
18.5-24.99	Normal Range
25.0 – 29.9	Overweight (Pre-Obese)
	Obesity
30.0-34.9	Class I
35.0-39.9	Class II
≥40	Class III

Adapted from World Health Organization, 2010

Maximal Oxygen Consumption

Maximal oxygen uptake (commonly termed VO_2 max) is the most relevant measure of functional capacity of the cardiorespiratory system. It is the highest rate at which oxygen can be consumed, distributed, and used by the body during exercise. VO_2 max is commonly expressed in either relative (expressed relative to body weight) terms as milliliters of oxygen per kilogram of body weight per minute (ml O_2 /kg/min or ml/kg/min) or in absolute terms (liters per minute; L/min). Table 4 displays VO_2 max value ranges for both men and women by 10-year age stratifications.

Table 4. VO_2 max (ml/kg/min) Classifications for Men and Women

Age (years)	Superior	Excellent	Good	Fair	Poor
Men					
60 - 69	46+	39 - 45	35 - 38	31 - 34	≤ 30
50 - 59	50+	43 - 49	38 - 42	35 - 37	≤ 34
40 - 49	53+	46 - 52	42 - 45	38 - 41	≤ 37
30 - 39	54+	48 - 53	44 - 47	41 - 43	≤ 40
20 - 29	56+	51 - 55	46 - 50	42 - 45	≤ 41
Women					
20 - 29	50+	44 - 49	40 - 43	36 - 39	≤ 35
30 - 39	46+	41 - 45	37 - 40	34 - 36	≤ 33
40 - 49	45+	39 - 44	35 - 38	32 - 34	≤ 31
50 - 59	35+	31 - 34	29 - 30	25 - 28	≤ 24
60 - 69	36+	32 - 35	29 - 31	26 - 28	≤ 25

Adapted from Heyward, 2006

Hypertension

High blood pressure or hypertension continues to be a clinical risk factor for cardiovascular-related diseases, such as coronary heart disease, heart attack, and stroke. The classification values for the ranges of blood pressure for adults can be seen in Table 5. Note, when systolic and diastolic pressures fall into different categories, use the higher category for classification.

Table 5. Blood Pressure Value for Adults

Systolic BP (mm/hg)	Category	Diastolic BP (mm/hg)
< 120	Normal	< 80
120-139	Pre-Hypertension	80-89
140-159	Stage 1 Hypertension	90-99
≥160	Stage 2 Hypertension	≥ 100

Adapted from Seventh Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure

Blood Glucose and Type 2 Diabetes

The three difference tests that can be used to determine if a person has pre-diabetes or diabetes are the fasting blood glucose test, the oral glucose tolerance test and the A1C test (see Tables 6-8),

The A1C test is a clinical measurement of glycemic control via a process called glycosylated hemoglobin, or HbA1c. This type of test helps to detect average blood glucose concentrations over several months.

Table 6. Fasting Blood Glucose

Normal	Pre-diabetes	Diabetes
< 100 mg/dl	< 126 mg/dl ≥ 100 mg/dl	≥ 126 mg/dl

Table 7. Oral Glucose Tolerance Test

Normal	Pre-diabetes	Diabetes

< 140 mg/dl	< 200 mg/dl ≥ 140 mg/dl	≥ 200 mg/dl

Table 8. A1C Test

Normal	Pre-diabetes	Diabetes
< 5.7%	< 6.4% ≥ 5.7%	≥ 6.5%

Source: American Diabetes Association, 2010

Metabolic Syndrome

Metabolic syndrome is a rather complex and progressive cluster of clinical disorders that increases the risk for cardiovascular disease and diabetes if a person has 3 or more of these risks. Although the World Health Organization, National Cholesterol Education Program (NCEP), and the American Heart Association have slightly difference criteria for this cluster of diseases, data from the NCEP is summarized in Table 9.

Table 9: Criteria for Recognizing Metabolic Syndrome

Clinical Measure	Nation Cholesterol Education Program (NCEP)
Waist Circumference	≥102 cm (>40 in) in men ≥88 cm (>35 in) in women
Triglycerides	≥150 mg/dl
High Density Lipoprotein (HDL) 'Healthy' Cholesterol	<40 mg/dL in men <50 mg/dL in women
Blood Pressure (BP)	≥130 mmHg (systolic BP) or ≥85 mmHg (diastolic BP) or BOTH
Glucose	Fasting glucose >110 mg/dL

Data from National Cholesterol Education Program, 2001

Other Laboratory Tests

Clients may often bring their medical reports to personal trainers for further explanation and discussion. Table 10 provides other selected blood variables (with normal values) and a brief description about the variable.

Table 1o. Other Selected Blood Variables of Clinical Importance

Selected Blood Variable	Normal Value	Description of Variable
Hematocrit	40-52% (men) 36-48% (women)	The percent volume of red blood cells in whole blood.
Hemoglobin	13.5- 17.5 g/dL (men) 11.5- 15.5 g/dL (women)	Protein molecule within red blood cells that carries oxygen and gives blood its red color
Potassium	3.5- 5.5 meq/dL	Electrolyte and a mineral. It helps keep the water (the amount of fluid inside and outside the body's cells) and electrolyte balance of the body. Potassium is also important in how nerves and muscles work.
Blood Urea Nitrogen	4-24 mg/dL	Measure of the amount of nitrogen in the blood in the form of urea, and a measurement of renal function.
Creatinine	0.3 – 1.4 mg/dL	Reliable indicator of kidney function. Also a waste product of muscles from exercise.
Iron	40-190 μ/dL (men) 35-180 μ/dL (women)	Mineral needed for production of hemoglobin, the main protein in red blood cells that carries oxygen.
Calcium	8.5-10.5mg/dL	Builds and repairs bones and teeth, helps nerves work, assists in muscle contraction, helps blood clot, and facilitates heart function.

Data from Heyward, 2006

Practical Recommendations and Applications

Given the importance of the many clinical and physiological 'numbers' discussed above, the exercise professional now has these values at his/her fingertips to provide client education and promote actions steps for wellbeing improvement. Take a proactive and communicative approach as you guide students and clients toward optimal health.

Bios:

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