



“Discovering the athlete in everyone”

Kim Bond

TSCC – Sports Conditioning Coach – Twist Conditioning
Group X Director/ Specialty Personal Trainer – Steve Nash Fitness World
Trainer of Fitness Leaders - BCRPA
kim@everydayathletes.ca / 604-786-3089

The Science Behind Fitness Assessments Article

Defining Physical Fitness

Let's start off by defining Physical Fitness. Many organizations have different definitions, so I will list a few:

1. The ability to perform muscular work satisfactorily – *World Health Organization*
2. A set of attributes that people have or achieve that relates to the ability to perform physical activity – *Centre for Disease Control*
3. The ability to perform moderate to vigorous levels of physical activity without undue fatigue and the capability of maintaining such ability through out life – *American College of Sport Medicine*
4. Ability to carry out daily tasks with vigor and alertness, without undue fatigue with ample energy to enjoy leisure-time pursuits and to meet unforeseen emergencies – *President's Council on Physical Fitness and Sports*
5. The ability to last, to bear up to withstand stress and to persevere under difficult circumstances where an unfit person would give up – *Dr. H Harrison Clark*

I challenge all fitness professionals to come up with a statement that they feel represents the term “physical fitness”. Kim Bond

The commonality of all the definitions is the emphasis on having vigor and energy to perform work and exercise. Vigor and energy are not easily measured. The debate for on the importance of measurable components has gone on for more than a century.

Element of Physical Fitness

The most recently cited components fall into two categories; Health Related and Skill Related.

Health Related Elements:

- Body Composition
 - BMI
 - Waist to Hip Ratio
- Cardiorepiratory
- Musculoskeletal fitness
 - Muscular Strength
 - Muscular Endurance
 - Flexibility

Other Health Related Elements:

- Blood Pressure
- Resting Heart Rate

Skill Related Elements:

- Balance
- Coordination

- Agility
- Speed
- Power
- Reaction Time

Some researchers believe that while the elements of skill-related fitness are important for participation in the various team sports, they have little significance for the day-to-day tasks of Americans for their general health. On the other hand, individuals who engage in regular physical activity to develop cardio respiratory endurance, musculoskeletal fitness, and optimal body fat levels appear to improve their basic energy levels and place themselves at lower risk for the common diseases of our time, including heart disease, cancer, diabetes and osteoporosis, and other chronic disorders.

Athletes who excel at throwing a ball, or swinging a gold club should understand that they may not have optimal levels of body fat or cardiorespiratory fitness, and as a consequence may be at a higher risk for chronic disease. So in reality, you may not have great coordination, but you can be very physically fit and healthy by engaging regularly in aerobic and musculoskeletal exercise. In the same sense, there are certain sports that require athletes to have both high levels of both health and skill related elements such as Basketball or Soccer.

Scientists have spent many years developing measuring tests for all the elements. With the measurement tests they have also measured certain activities and their affects on each component which is the education taught to us to improve various elements.

Science and Purpose of Fitness Assessments

We measure function to “determine status”. It is most important to determine status before someone starts their journey on a physical fitness program.

Fitness assessments combined with pre-screening and risk stratification information can:

1. Assess current fitness levels
2. Identify special needs for individual counseling
3. Evaluate progress
4. Motivate and education

A good physical fitness test:

- accurately measures what it is supposed to measure
- can consistently be used by different people
- produces results that can be compared to a data set
- is relatively inexpensive
- simple and easy to administer

When testing is done, a test administer should look for tests that are **NEVR** questioned:

1. **N = Norms** – the achievement level of a particular group to which the measured scores can be compared; provide a useful basis for interpretation and evaluation of test results
2. **E= Economy** – refers to the ease of administration, the use of inexpensive equipment, the limitation of time needed to administer it and the simplicity of the test for the client to understand.
3. **V= Validity** – the degree to which the test measures what it was designed to measure
4. **R= Reliability**-if a person is measured two separate times by the same tester, or by two different people, the results should be close to the same.

Defining and Measuring Elements

Element	Definition	Measurement	Most Accurate Measurement	Optional Measurement
Blood Pressure	The forces of blood acting against vessel walls	Sounds that are emitted as a result of these vibratory forces are called Korotkoff sounds.	Sphygmomanometer, using calibrated equipment that meets certification standards	Electronic blood pressure
Resting Heart Rate	The number of times a persons' heart beats per minute while at complete rest.	Heart rate (BPM)	Take heart rate for 30 seconds upon waking in the morning	Take heart rate after 5-10 min of sitting and relaxing
Cardio respiratory Endurance	the ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity.	VO2Max	Direct measurement of oxygen uptake during maximal, graded exercise. Performed with a bicycle ergometer or treadmill. This is expensive and requires highly trained personnel making it not practical.	Submaximal tests can include; stairclimbing, bicycle level that estimate this VO2max.
Body Composition	The body's relative amount of fat and lean body tissue (fat free mass) i.e. muscle, bone and water	Percentage of body fat	Hydrostatic (underwater) weighing	Skinfold (calipers), BMI, Hip to Waist Ratio
Musculoskeletal Strength	The ability of the muscle to exert force	Repetition Maximum	1RM Dynamometers (Grip Strength)	10RM
Musculoskeletal endurance	Muscle's ability to perform without fatigue	Repetitive motion of a specific exercise using mainly body weight	Expensive measuring equipment for specific muscle groups	Sit-up Test Pull-up Test Push-Up Test
Flexibility	Functional capacity of the joints to move through a r.o.m.	Angles of movement in appropriate plane	True Angle Goniometer Sit and Reach Box	Eye measurement Tape Ruler
	Ability to start, stop, and move the body quickly in different	Pattern movements eyed for	No gold standard of measurement	Zig Zag Lateral Bounds (Twist)

Agility	directions.	efficiency, timed for improvement		
Power	<p>Work is defined as the "product of force and distance" (Work = Force X Distance). To put this definition into practical terms I believe power is best illustrated using the following formula:</p> $\text{Power} = \frac{\text{Force} \times \text{Distance}}{\text{Time}}$	Distance of objects moved over time or distance	No gold standard	<p>Medicine Ball Explosive Squat-Throw</p> <p>Or</p> <p>Vertical Jump</p>
Speed	a rate (usually rapid) at which something happens	Distance and time of running	Specific distance measured with improvement of speed of finishing over time	Specific distance measured with improvement of speed of finishing over time
Coordination	An organized working together of muscles and groups of muscles aimed at bringing about a purposeful movement such as walking or standing.	Timed sequenced movements	No gold standard	Hand wall throwing test
Reaction Time	The time that elapses between a stimulus and the response to it	How fast can the hands (or feet) reaction with vision stimulus	No gold standard	Drop a ruler from a certain distance and measure where on the ruler the person catches it
Balance	A biological system that enables us to know where our bodies are in the environment and to maintain a desired position.	How long can someone hold their balance in one challenged position, or return to a state of balance after an interruption	No gold standard	1 Foot Vertical Jump and Land (Twist)

Which Assessments to Perform

The decision on what assessments to use or not to use is dependent on the SMART goals of a Trainer. By using a variety of assessments, it will give the fitness professional not only a starting point and a progression system, the client will be able to feel a sense of achievement and in variety of areas and will be more focused on overall improvement instead of isolated improvement.

A good example is the weight-loss scenario. When a person becomes focused on one single end result, it can become obsessive and in many instances a negative motivator, which in the end leads to the lack of long term commitment required to achieve overall wellness. By having improvements in a variety of elements the focus becomes varied. While some elements may not change quickly, others will still offering positive reinforcement for continued change enhancing exercise adherence.

Summary

Fitness Assessing should be part of every fitness professional's knowledge and tool box. Knowing what is relevant testing and using reliable assessments will be both beneficial for the trainer and the client. By participating in practical workshops will increase your ability to assess with accuracy. To offer fitness assessing, you have an avenue to increase your revenue stream.

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