



Since I have been working with professional hockey one thing that has baffled me is the importance in the VO2 test. I like to think that with all the new studies and data on sports and energy systems, checking a players Vo2 in hockey would be a thing of the past. Unfortunately it is still a test that is held in very high regards. Coaches and scouts understand that the game of hockey is different than it once was 20 years ago. If they know it is a stronger and faster game than why follow the same old methods and ways of thinking.

What is Vo2 Max Test?

Vo2 test is used to determine an athletes capacity to perform a sustained exercise and calculate aerobic endurance. VO2 max refers to the max amount of oxygen an athlete can use during intense or maximal exercise. The results from the test are considered the best indicator of an athletes cardiovascular fitness and aerobic endurance. This test is used to get results for endurance athletes.

Below is the scoring range for the VO2 test in different sports: The higher the numbers the higher the aerobic capability.

Sport	Age	Male	Female
Baseball	18-32	48-56	52-57
Basketball	18-30	40-60	43-60
Cycling	18-26	62-74	47-57
Canoeing	22-28	55-67	48-52
Football (USA)	20-36	42-60	
Gymnastics	18-22	52-58	35-50
Ice Hockey	10-30	50-63	
Orienteering	20-60	47-53	46-60
Rowing	20-35	60-72	58-65
Skiing alpine	18-30	57-68	50-55
Skiing nordic	20-28	65-94	60-75

Soccer	22-28	54-64	50-60
Speed skating	18-24	56-73	44-55
Swimming	10-25	50-70	40-60
Track & Field - Discus	22-30	42-55	
Track & Field - Running	18-39	60-85	50-75
Track & Field - Running	40-75	40-60	35-60
Track & Field - Shot	22-30	40-46	
Volleyball	18-22		40-56
Weight Lifting	20-30	38-52	
Wrestling	20-30	52-65	

Now that we have established the purpose of the test, let's think about the game of hockey. A hockey player's shift ranges from 30 to 40 seconds average. Then a player sits down and waits for their next shift. During that time on the bench the heart rate drops down to an ideal BPM where the player is able to perform at a high level. At no point during the game does a player work long enough to go beyond **fast** glycolytic system and go into aerobic glycolysis. There is perhaps the exception of a player stuck on the ice during a penalty kill for longer than one minute, but this is rare and not ideal.

What I find to be the most important part of a hockey player's success is their heart rate recovery between shifts. The ability to work hard and recover in a short period of time, so that you can work at the same level of intensity.

Even though there is an obvious explanation of the VO2 test being useless, coaches still ask for the numbers. What is even worse is that every player stresses the results of the test. The number one question is "What was my number on the VO2?"

There are just some fights you can not win. So in the end if you can not get rid of the test, then use the VO2 test in your favor. We use the number from the test that we feel matters most: **Anaerobic threshold**. The head strength coach of San Jose Mike Potenza and my self read the results and highlight the anaerobic threshold as the indicator of a fit and physically prepared hockey player. Our responsibility as good strength coaches is to educate the players and coaches.

Anaerobic Threshold: anaerobic work means a great deal of power output is displayed in a short period of time. When this happens energy rapidly depletes in a short time. Rest is required to recharge the body for another high level of power output. Anaerobic threshold is a mix of anaerobic and aerobic work. However AT has to fall within a specific range (time of work) and high power output. Example: a hockey shift in hockey or a 400 meter race.

Measurements of Anaerobic Threshold:

- An untrained athlete or endurance athlete will range in a lower percentage of VO2 Max (55% of Vo2 max)
- An elite trained athlete will range in a higher percentage of VO2 max (80% + of VO2 max)
- Basically the higher and closer the AT is to the VO2 Peak the better the anaerobic threshold will be for the athlete.
- The quicker the heart rate drops for the player after a minute the more likely the player will be able to play each shift with high power output.

Cardio Coach VO2 Test Results

Patient Information

Name:	Date Time:	September 17, 2010 04:13 pm
Gender: Male	Trainer:	
Age: 24	Test Type:	Treadmill
Height: 68 in 173 cm	File Name:	
Weight: 175 lbs 79.4 kg		

Test Results

	Starting	AeT	AT	Peak
VO2 (ml O2/kg/min)	7.9	48.4	56.5	63.8
Heart Rate (bpm)	99	173	185	196
Calories Per Hour	181	1110	1346	1463
METS	2.3	13.8	16.1	18.2
Fitness Level	Superior			

Recovery

	Peak	1 Minute	2 Minute
Heart Rate	196	174 (23%)	138 (60%)

Gender: Male
Age: 26
Height: 71 in 180 cm
Weight: 192 lbs 87.1 kg

Trainer: Jonathan Caplan
Test Type: Treadmill
File Name:

Test Results

	Starting	AeT	AT	Peak
VO2 (ml O2/kg/min)	6.4	24.0	29.0	59.0
Heart Rate (bpm)	80	130	161	179
Calories Per Hour	163	605	757	1483
METS	1.8	6.9	8.3	16.9
Fitness Level	Superior			

Recovery

	Peak	1 Minute	2 Minute
Heart Rate	179	165 (15%)	107 (73%)

If a player does not have a high AT, it doesn't mean the player will suck on the ice. It just means that their training might have been more aerobic based opposed from anaerobic conditioning (interval training). However there is a chance that recovery will suffer during game play, and a player will need a longer period of time to recover if they hope to perform as well as the last shift.

How does a player improve their Anaerobic threshold?

They improve AT with exactly the type of conditioning I mentioned above. INTERVAL TRAINING BASED CONDITIONING! Interval training is a repeated series of short, high intensity, drill or exercises alternating with rest periods.

Example:

- Shuttle runs 3 rest / 1 work ratio
- Bike Sprints high intensity work time
- Strength training circuits
- Sled pushes with weights

References:

Tables adapted from: Wilmore JH and Costill DL. (2005) Physiology of Sport and Exercise: 3rd Edition. Champaign, IL: Human Kinetics



Jaime Rodriguez joined the MBSC staff after excelling through the Mike Boyle Strength and Conditioning Internship Program in the fall of 2003.

Jaime graduated from Lasell College with a degree in Exercise Physiology and a Business minor. While at Lasell he worked with collegiate athletes implementing strength programs consisting of speed, agility and strength. He is a Certified Strength and Conditioning Specialist (CSCS) as well as CPR certified.

Jaime has trained athletes of all ages from middle school up to college in a variety of sports as well as professional athletes from the NHL, AHL, NFL, and professional boxing. He is currently the head strength and conditioning coach for the Worcester Sharks of the American Hockey League (AHL) as well as assistant strength coach for the NHL San Jose Sharks. Jaime was invited to the prospect training camp of the Stanley Cup Anaheim Ducks in the summer of 2007 to administrate strength and conditioning programs.