

NATIONAL COACHING INSTITUTE

Task 1

(Energy Systems)

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Basketball Overview

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INTRODUCTION

Competitive basketball involves a large number of discrete movements (over a thousand per game) that last less than three seconds on average with repeated changes in intensity. The sport places a high energy demand on participants, shown by high heart rate and blood-lactate readings.

ATHLETE PROFILE

This overview seeks to record and understand the game of basketball as played by the Eastern Commerce C.I. Senior Boys Basketball Team. The team is comprised of student-athletes aged 17 to 19. In 2008-09, the team won the provincial championship and is regarded as one of the elite high school teams in North America.

These athletes practice daily at school, during individual workouts at lunch (45 minutes) and team sessions afterschool (1.5 hours). Many of the athletes also play for clubs or participate in elite development programs during the weekend. Under the supervision of York graduate student Josh Ford, the team follows a strength training program two to three times per week.

PRINCIPAL CHARACTERISTICS OF AN ELITE YOUTH BASKETBALL TEAM

	All Players	Guards	Forwards	Centres
Age (years)	18.2	18.2	18.2	18.2
Height (m)	1.89	1.83	1.88	1.93
Body mass (kg)	90.3	76.2	77.4	87.2
Body fat (%)	8.2%	6.1%	7.8%	10.4%
B.M.I. (kg/m ²)	21.7	22.7	21.8	23.6
VO ₂ max (ml/kg per min)	52.8	52.8	53.4	51.4

Source: Abdelkrim et al.

Basketball divides players based on physical characteristics. Taller players are selected to play closer to the basket (Centres) while smaller quicker players play in the backcourt (Guards). Players with a combination of size and some quickness fulfill the roles of slashers and wing players (Forwards). Bigger players are not only taller but have a greater mass and higher percentage of body fat. Basketball players are taller than average of the same age.

Elite basketball players are fairly healthy. The body fat percentages measured in the above table are about five points lower than the rest of the population. Another study of collegiate basketball players in Australia showed a body fat percentage of seven to eleven percent, much lower than the fifteen percentage average reading. The body mass index is about average for other youths of the same age.

AVAILABLE DATA

Basketball may be the fourth most popular sport in Canada, enjoyed by 1,140,000 active people but it is not widely studied in the country. To date, two detailed analyses have been performed:

COMPARISON OF STUDIES

Author	Abdelkrim et al.	McInnes et al.
Date	2007	1995
Country	Tunisia	Australia
Age of Participants	18 and 19	Mean age: 23
Description	Elite under 19 team	Professional
Number	38	8

Basketball requires a variety of movements, classified as high intensity (sprint, jump, high-specific movement), moderate intensity (run, medium-specific movement), low intensity (jog, low-specific movement), and recovery (walk, stand). Sport-specific movements include dribbling the basketball, passing, shooting, and defensive footwork.

Time motion analyses divided the sport according to intensity of movement, number of movements, and average time of each movement. The results were sorted according to player position and time during the game. Heart rate and blood lactate measurements are also recorded. Due to the many stoppages in play, for fouls and violations, free throw attempts, and time-outs, the studies divide records live time and total time.

RULE DIFFERENCES

The studies used for this report take place under international rules, which differ slightly from common rules in North America. F.I.B.A. games comprise four ten minute quarters (twelve minutes for professionals), divided into two halves. It is only within the last three years that Canadian universities have adopted the international timing system. Previously, the schools played two twenty minute halves. North American high schools play four eight minute quarters, similar to schools abroad.

One major rule difference, adopted to accelerate play is the “no touch” rule for backcourt inbounds. In North America, the referee must always handle the ball during stoppages before it is put back into play. Internationally, the team entitled to possession simply takes the ball out of bounds and puts it back into play, similar to the procedure in soccer. The pause is reduced from twenty to thirty seconds to between five and ten seconds.

Reports have shown that the key difference between international and North American basketball is that F.I.B.A.’s rules (last changed in May 2000) are more intense. The number of high-intensity movements have increased and athletes change movements more frequently (about every two seconds).

DIVISION BY ENERGY SYSTEM

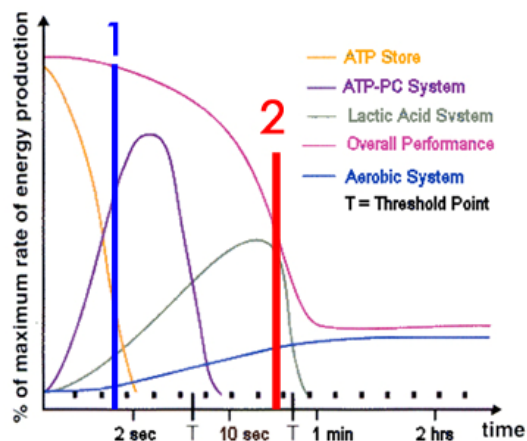
Basketball divides energy systems according to the following rough percentages:

- ATP-PC (20%)
- Anaerobic Lactic (60%)
- Aerobic Base (20%)

ENERGY SYSTEM BY TIME OF ACTIVITY

Duration	Classification	Energy Supply
1 to 4 seconds	Anaerobic	ATP (in muscles)
4 to 10 seconds	Anaerobic	ATP + CP
10 to 45 seconds	Anaerobic	ATP + CP + Muscle glycogen
45 to 120 seconds	Anaerobic, Lactic	Muscle glycogen
120 to 240 seconds	Aerobic + Anaerobic	Muscle glycogen + lactic acid
240 to 600 seconds	Aerobic	Muscle glycogen + fatty acids

BASKETBALL PLAYS BY ENERGY SYSTEM



Source: Fox et al.

LEGEND:

1 (1.8 seconds): Average duration of a high intensity movement

➔ **ATP Store and ATP-PC System**

2 (~25-30 seconds): Average duration of a collegiate basketball possession

➔ **Anaerobic Lactic and Aerobic base**

Note: Time of possession lasts from when one team takes possession until the other team recovers the ball. This varies due to tempo of play, refereeing style, and rebounding.

To perform a high intensity movement, players rely on the ATP-PC system. As the play continues, there are periods of moderate intensity, different movements, and changes in possession and athletes employ the Anaerobic Lactic system. Stoppages in play or periods of minimal activity permit players to recover; a strong Aerobic Base can assist.

GAME TIME DIVIDED INTO LIVE ACTION AND RECOVERY PERIODS

Total seconds per game (s)	Total Time	Live Time	Live Time (in action)	Live Time (recovery periods)	Stoppage Time	Work:Pause
All Players	4,520	2,122	1,488	634	2,398	2.0:1
Guards	4,474	2,301	1,648	653	2,370	1.8:1
Forwards	4,498	2,105	1,482	623	2,393	2.0:1
Centres	4,588	2,155	1,485	670	2,434	2.1:1

Source: Abdelkrim et al.

Work:Pause calculation: Live Time (in action)/Live Time (recovery) + Stoppage Time

TIME MOTION ANALYSIS

LIVE TIME BREAKDOWN

PERCENTAGE OF LIVE TIME DEVOTED TO EACH MOVEMENT

	All Players	Guards	Forwards	Centres
Sprint	5.3%	5.9%	5.4%	4.5%
High-Specific Movement	8.8%	9.3%	9.2%	7.9%
Jump	2.1%	2.0%	2.0%	2.3%
Total High Intensity	16.1%	17.1%	16.6%	14.7%
Run	10.4%	10.2%	10.1%	10.8%
Medium-Specific Movement	17.7%	19.8%	17.9%	15.5%
Total Moderate Intensity	28.1%	30.0%	28.0%	26.3%
Jog	11.6%	11.0%	11.4%	12.4%
Low-Specific Movement	14.2%	13.4%	14.4%	14.7%
Total Low Intensity	25.8%	24.5%	25.8%	27.2%
Walk	14.4%	13.9%	14.0%	15.4%
Stand	15.5%	14.5%	15.6%	16.4%
Total Recovery	29.9%	28.4%	29.6%	31.8%

Source: Abdelkrim et al.

Basketball involves multiple different movements, which vary in length and actions performed. All players must have the ability to run, jump, and perform sport-specific movements at varying degrees of intensity.

SPORT-SPECIFIC MOVEMENTS

	High Intensity	Moderate Intensity	Low Intensity
Offence	<ul style="list-style-type: none"> Fast Break Driving to the Basket in a Crowd Dunking Offensive Rebounding 	<ul style="list-style-type: none"> Executing a Set Play Dribbling Setting a Screen & Rolling to the Hoop Post Play 	<ul style="list-style-type: none"> Pivoting with the Ball Unguarded Dribbling Passing Shooting
Defence	<ul style="list-style-type: none"> Getting Back Closing Out Boxing Out Blocking a Shot Defending the Inbounder 	<ul style="list-style-type: none"> Fighting for Position Inside Defensive Pressing Defensive Footwork 	<ul style="list-style-type: none"> Defending a Stationary Player Help-Side Positioning

Initially, sport-specific movements should be performed slowly so that athletes become accustomed to the action. For young athletes, performing a technique well should be paramount. Taking short-cuts in order to reach game intensity is not appropriate. Once the movement is mastered a coach should ensure it is practiced at the right intensity.

NUMBER OF MOVEMENTS PERFORMED DURING THE GAME

	All Players	Guards	Forwards	Centres
Sprint	55	67	56	43
High-Specific Movement	94	104	104	85
Jump	44	41	41	49
Total High Intensity	193	211	190	177
Run	97	103	88	101
Medium-Specific Movement	197	230	186	176
Total Moderate Intensity	294	332	274	277
Jog	113	113	110	117
Low-Specific Movement	175	176	173	175
Total Low Intensity	288	289	283	292
Walk	129	120	126	130
Stand	147	141	147	150
Total Recovery	275	271	275	280
Total (All Movements)	1,050	1,103	1,022	1,026

Source: Abdelkrim et al.

Each player performs over a thousand movements per game, ranging from 1,022 to 1,103. About half of the high intensity time is devoted to sport-specific movements, the rest to running and jumping. Most of the movements during the game are of moderate and low intensity.

Although the Centres performed fewer movements than their counterparts, the study was unable to accurately record some of the fighting for position that occurs close to the basket, which is a key component of their game.

AVERAGE LENGTH OF EACH MOVEMENT

seconds (s)	All Players	Guards	Forwards	Centres
Sprint	2.1	1.9	2.1	2.2
High-Specific Movement	2.0	1.9	2.1	2.0
Jump	1.0	0.9	1.0	1.1
Total High Intensity	1.8	1.7	1.8	1.8
Run	2.3	2.1	2.4	2.4
Medium-Specific Movement	1.9	1.8	2.0	1.9
Total Moderate Intensity	2.1	1.9	2.2	2.1
Jog	2.2	2.1	2.2	2.3
Low-Specific Movement	1.7	1.6	1.7	1.8
Total Low Intensity	1.9	1.8	1.9	2.0
Walk	2.4	2.3	2.4	2.6
Stand	2.3	2.2	2.2	2.4
Total Recovery	2.3	2.2	2.3	2.5

Source: Abdelkrim et al.

When a bigger player initiates a movement, it takes more time than a smaller, quicker player. Basketball coaches have long known that Guards are more nimble, better able to change direction and adjust to what the defence provides. Guards have also more able to alter their jumpshot in the air to move around defenders. Forwards and Centres are slower because it is harder for them to accelerate and move swiftly and also because it is infrequently demanded of their position.

SPRINTING

LENGTH OF SPRINTS

Under 1.5s	1.51s to 2.0s	2.01s to 3.0s	3.01s to 4.0s	Over 4.0s
49.0%	24.0%	15.0%	7.0%	5.0%

Source: McInnes et al.

During a game, sprinting occupies about five percent of the live time. The ability to sprint can be of great importance in several plays: an offensive player could run down the court at full-speed and score a basket in transition, a defensive player could catch-up to the opponent's fast break and prevent an easy basket, or a player could recover a loose ball. These situations of maximum effort are very brief but could influence the scoreboard. Sprinting in basketball usually lasts less than two seconds and is fueled by the ATP-PC system.

Instances of sprinting in basketball involved rapid acceleration followed by deceleration. The floor is ninety four feet (28.65m) long and fifty feet (15.24m) wide. Due to the constraints of the court and the limited time of full intensity sprinting, athletes rarely reached full speed.

In fact, the ability to accelerate, decelerate, and change direction quickly is a more critical performance factor than absolute speed. On average, basketball athletes sprint once every thirty nine seconds but change movements every two seconds.

DISTANCE TRAVELLED DURING THE GAME

A study of U.S. collegiate athletes in 1941 showed that they covered an average of 2.0km per game playing defence, with a range of 1.34 to 2.43 km. This result is no longer reliable because the game has dramatically increased in speed because of changes in rules, better skill development, and the evolution of coaching strategy.

The latter studies by Abdelkrim and McInnes did not record distance travelled because there were many intervals when a player was working at high or medium intensity but not moving their feet (i.e. while pivoting, playing defence in the post, or trapping an opponent with the ball).

INTENSITY DROP THROUGHOUT GAME

For all positions, most high-intensity activity occurred during the first quarter. The second quarter shows a roughly six percent decrease in the amount of high-intensity activity. There is a slight increase for the third quarter - likely due to the halftime intermission - but the fourth quarter shows close to a twenty percent decrease from the previous period.

Also, stoppage time increases from 6.06 minutes in the first quarter, 9.23 to in the second, 10.85 in the third, and 12.53 in the final quarter.

PERCENT OF LIVE TIME SPENT IN HIGH-INTENSITY ACTIVITY

	1Q	2Q	3Q	4Q
	% high-intensity	% high-intensity % change from prev. period	% high-intensity % change from prev. period	% high-intensity % change from prev. period
All Positions	17.58%	16.53% -5.97%	16.73% 1.21%	13.64% -18.47%
Guard	19.18%	17.49% -8.81%	17.50% 0.06%	14.29% -18.34%
Forward	17.97%	17.08% -4.95%	17.14% 0.35%	14.13% -17.56%
Centre	15.61%	15.01% -3.84%	15.54% 3.53%	12.49% -19.63%

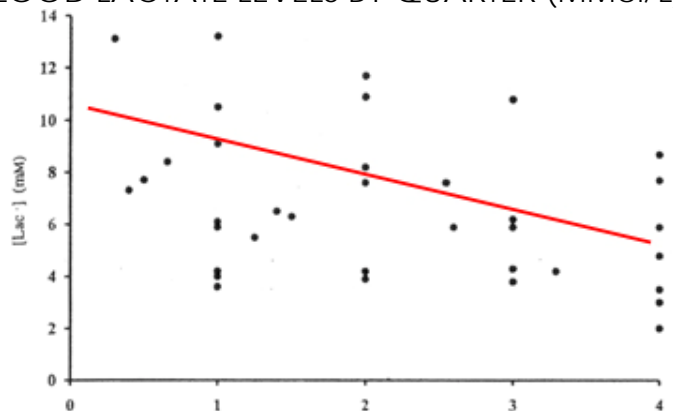
Source: Abdelkrim et al.

These readings are supported by blood-lactate concentrations. Readings are about 1.75 mmol/l at tipoff, between 5.25 and 6.75 mmol/l at halftime, and between 4.25 and 6.25 at the conclusion of the games. Blood-lactate concentrations are a good indicator of how much high-intensity activity was performed five minutes before the sample was taken. The blood-lactate levels also show that Guards perform the most high-intensity activity, followed by the forwards and Centres.

As the glycogen stores in core and leg muscles decrease throughout the game, there is less energy for high-intensity activities.

Strategically, teams play more conservatively at the end of the game. A team in the lead would eschew fast break opportunities and utilize as much time as possible to take a shot. The winning team would ensure that additional players act as “safeties” when the shot is taken in order reduce transition baskets by the opponents. If the game is close, both teams would endeavour to attempt only high percentage shots.

BLOOD LACTATE LEVELS BY QUARTER (MMol/L)



Source: McInnes et al.

In North American high school basketball, fouls are recorded by the half. After the seventh team foul, there are penalty free throws. Consequently, stoppages are longer at the end of the second and fourth periods. Internationally, fouls are recorded by the quarter. Bonus free throws are taken after the fifth team foul of the quarter. Free throws are spread out at the end of each quarter and not concentrated at the end of each half.

HEART RATE DURING COMPETITION

ABSOLUTE HEART RATE DURING THE GAME

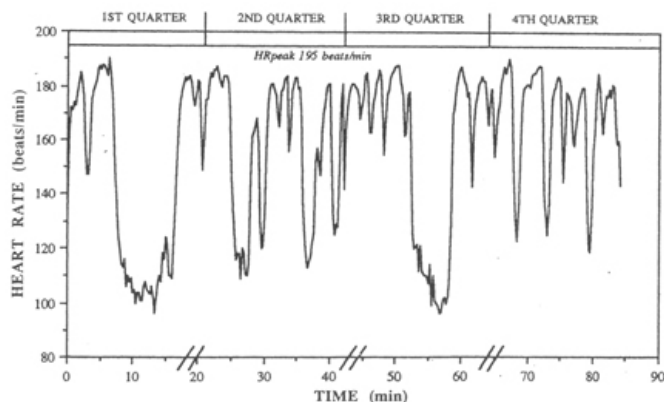
beats/min	1Q	2Q	3Q	4Q
All Positions	173	173	173	167
Guard	176	176	176	170
Forward	173	173	174	167
Centre	171	170	171	165

Source: Abdelkrim et al.

Heart rate decreases during the game. A teenaged player begins the game with an average heart rate of 173 beats per minute which gradually decreases to 167 beats by the fourth quarter. The slight decrease by the end of the game could be a result of lower intensity due to more deliberate play and more frequent pauses.

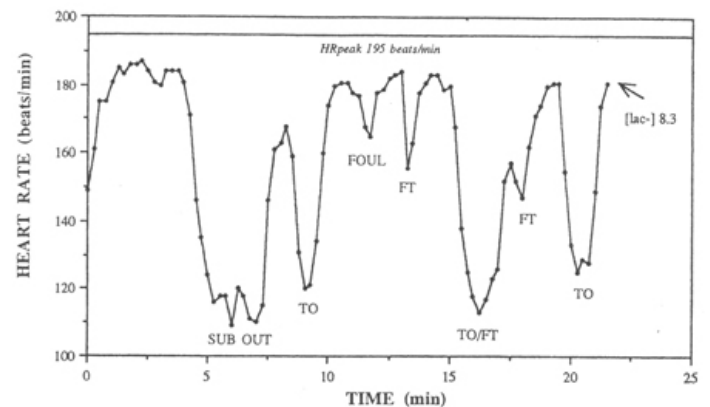
Guards have the highest heart rate throughout the game, reflecting the greater intensity of their play, but the forward and centre positions are fairly similar. The forwards (wing players) are more active than the centres (posts) but their heart rate is approximately the same. This could be due to the mental anxiety component of heart rate.

H.R. RESPONSES FOR THE ENTIRE GAME



Source: McInnes et al.

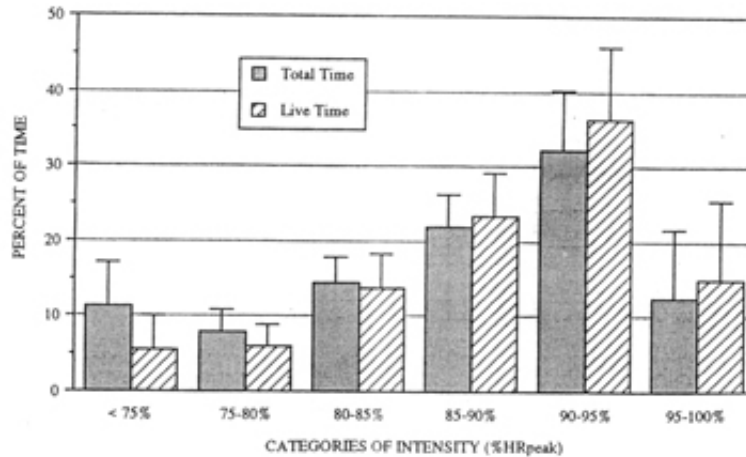
H.R. RESPONSES FOR A SINGLE QUARTER



According to the McInnes study, heart rate peaks during live play (about 185 beats per minute) and decreases when a player is subbed out, during breaks for halftime and timeouts, and when others are shooting foul shots. If the player is focused on the free throw, their heart rate remains high. The heart rate measured in the Abdelkrim study and

a study of collegiate players by J.D. Ramsay in 1970 was about 170 because of the younger age of the players.

HEART RATE BY TOTAL TIME

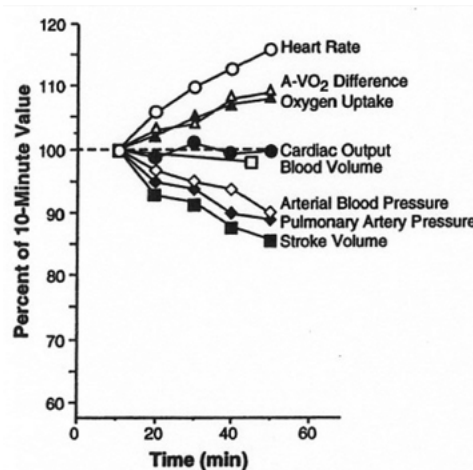


Source: McInnes et al.

A great deal of game time is spent close to the maximum heart rate (almost fifty percent of live time). Practices and workouts should always be conducted at game intensity in order to best simulate the conditions of game play.

Heart rate increases disproportionately to oxygen uptake during intermittent exercise, such as basketball. Some studies have found that it is not a reliable indicator of oxygen uptake due to upper body activity and Cardiovascular (C.V.) Drift.

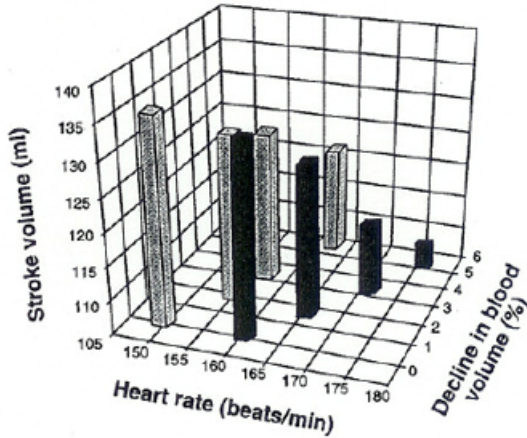
EFFECTS OF C.V. DRIFT



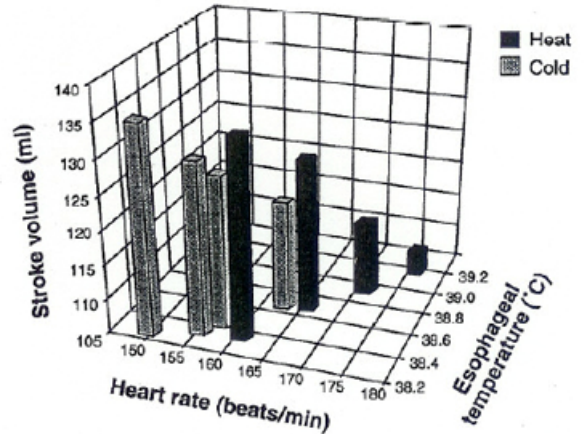
Source: Coyle and González

Stroke Volume, the amount of blood pumped with each heart beat, falls as Heart Rate rises. If Stroke Volume decreases by a greater percentage than Heart Rate increase, Cardiac Output will fall. This drop reduces cutaneous circulation and the body's ability to dissipate heat, causing dehydration and reduced performance.

C.V. DRIFT AND BLOOD VOLUME



C.V. DRIFT AND BODY TEMPERATURE

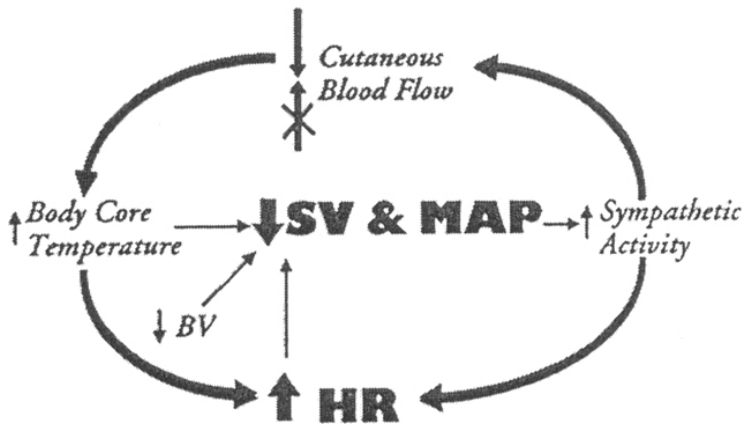


Source: Coyle and González

The entire process is inter-connected, as high body temperature also has the capacity to raise heart rate. Cardiovascular Drift occurs in basketball because of the length of the activity (60 to 90 minutes) and the possibility that athletes may be dehydrated. Dehydration during exercise may reduce body weight (and blood volume) by 3-5%.

Young basketball may experience “voluntary dehydration because they do not ingest sufficient fluids. Coaches can encourage players to remain hydrated by permitting personal water bottles and permitting players to step out of practice to get a drink when required. With at-risk athletes, coaches often need to supply water bottles themselves and could seek sponsorship.

MECHANISM FOR CARDIOVASCULAR DRIFT



Source: Coyle and González

GLOSSARY OF TERMS

- SV: Stroke Volume
- MAP: Mean Arterial Pressure
- HR: Heart Rate
- BV: Blood Volume

NOTE

Since athletes did not sure a steady heart rate during competition, it is difficult to use heart rate to measure oxygen uptake. The high heart rate conflicts with the observation that only sixteen percent of live time is spent in high-intensity activity.

2

Planning

- **Planning Philosophy**, page 1
- **Yearly Planning Instrument**, page 2
- **Energy Systems Comparison**, page 5

TRAINING PHILOSOPHY

Basketball in Ontario is a year-round season. Training for the high school season begins in September, the season runs from October to March, club basketball intensifies during April and May, and provincial Elite Development Programs occur in June and July. The student-athletes at Eastern Commerce are very passionate about the sport and hope that it will lead to a scholarship in the United States.

YEARLY PLANNING INSTRUMENT

The attached Yearly Planning Instrument seeks to build Energy Systems twice during the year and maintain them at other times. The first loading period is early in September and the second period in April after a “Spring Training” camp. The volume of Energy System training will be highest at those time and we will maintain with higher intensity workouts of less duration at other times. The Yearly Planning Instrument is adapted from the materials submitted for Task 12.

EXPLOSIVENESS AND ATHLETICISM

To develop explosive sport-specific movements, the team will train twice per week during the pre-season and once a week during the season. These workouts will improve the ATP-PC system because of the high intensity and short duration of each exercise.

INTERVAL TRAINING

Individual and group skill development, footwork and core training, and part-method and full-method practice drills will build up the Anaerobic Lactic system. Interval training will also help develop this system and increase the players’ Aerobic Base. The coaches want to structure training sessions so that bursts of high intensity are interspersed with periods of active recovery, instead of consistent performance at a moderate level.

MOTIVATION

To inspire players to perform at their best levels there will be periodic assessment. Coaches will meet with players to set goals and encourage everyone to reach certain benchmarks. Motivation can include playing time, a greater role on the court, the chance to showcase abilities in a skills competition, making a provincial team, or subtle acknowledgements like a “Star Board” or simple prizes.

MODELLING THE WAY

It’s important that coaches model the performance that they seek from their players by showing good personal fitness and improving their own Energy Systems and Strength capacities during the season. Coaches should create a Yearly Planning Instrument for their own fitness to show players that they practice what they preach.



Season:	Month	August			September				October				November						
2009-10	Week Date	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	
	Competitions									T	X	X	X	X	T	L	L	T*	
Details	*= <i>Important Competitions,</i> <i>T=Tournament, L=League Game,</i> <i>X=Exhibition, P=Post Season,</i> <i>H=Home, A=Away, N=Neutral</i>										T = St. Mike's Tip-Off	A = Birchmount Park	A = West Hill C.I.	A = Mother Teresa S.S.	N = Pickering H.S.	T = Pinky Lewis (Travel)	A = Northern - A = Central Commerce	H = Bloor - H = Monarch Park	T = Holiday Classic
		Periods	PREPARATION																
Training	Phases	General				Sport Specific				Pre-Competition									
	Peak/Taper					Taper	Peak					Taper	Peak						
	Macrocycles	1 - Individual Skill Building				2 - Tryouts		3 - Assemble Team		4 - Exhibition Schedule				5 - League Play P					
	Microcycles	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
	Energy Systems	LOADING Energy																	
Strength					LOADING Strength														
Power									LOADING Power										
Skills and Systems													LOADING Skills						
Volume	Balance				0.5			0.5	1.0		1.0	1.0		0.5					
	Energy Systems	Aerobic	4.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	2.0	
		Anaerobic Lactic	6.0	6.0	6.0	6.0	6.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	
		Anaerobic Alactic	3.0	3.0	4.0	4.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	4.0	2.0	2.0	
	Flexibility				0.5		0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5		
	Power	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	6.0	6.0	6.0	4.0	3.0	3.0	3.0	2.0	2.0	
	Quickness	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	
	Speed	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	1.5	1.5	1.5	1.0	1.0	1.0	1.0	1.0	
	Strength	1.0	1.0	1.0	1.0	1.5	1.5	2.0	2.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	1.0	
Intensity	Balance				50%			50%	50%		50%	50%		50%					
	Energy Systems	Aerobic	40%	40%	50%	50%	50%	50%	60%	60%	60%	60%	60%	60%	60%	60%	50%	50%	
		Anaerobic Lactic	60%	60%	70%	70%	90%	90%	80%	80%	80%	80%	80%	80%	80%	70%	60%	60%	
		Anaerobic Alactic	70%	70%	75%	75%	80%	80%	90%	90%	100%	100%	100%	100%	90%	90%	80%	80%	
	Flexibility				50%		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	
	Power	50%	50%	60%	60%	70%	70%	70%	70%	80%	80%	90%	90%	90%	90%	90%	80%	80%	
	Quickness	50%	50%	60%	60%	70%	70%	70%	70%	80%	80%	90%	90%	90%	90%	90%	80%	80%	
	Speed	70%	70%	80%	80%	90%	90%	90%	90%	95%	95%	95%	95%	90%	90%	80%	70%	70%	
	Strength	50%	50%	60%	60%	70%	70%	80%	80%	80%	80%	80%	80%	80%	80%	80%	70%	70%	

 Eastern Commerce Saints

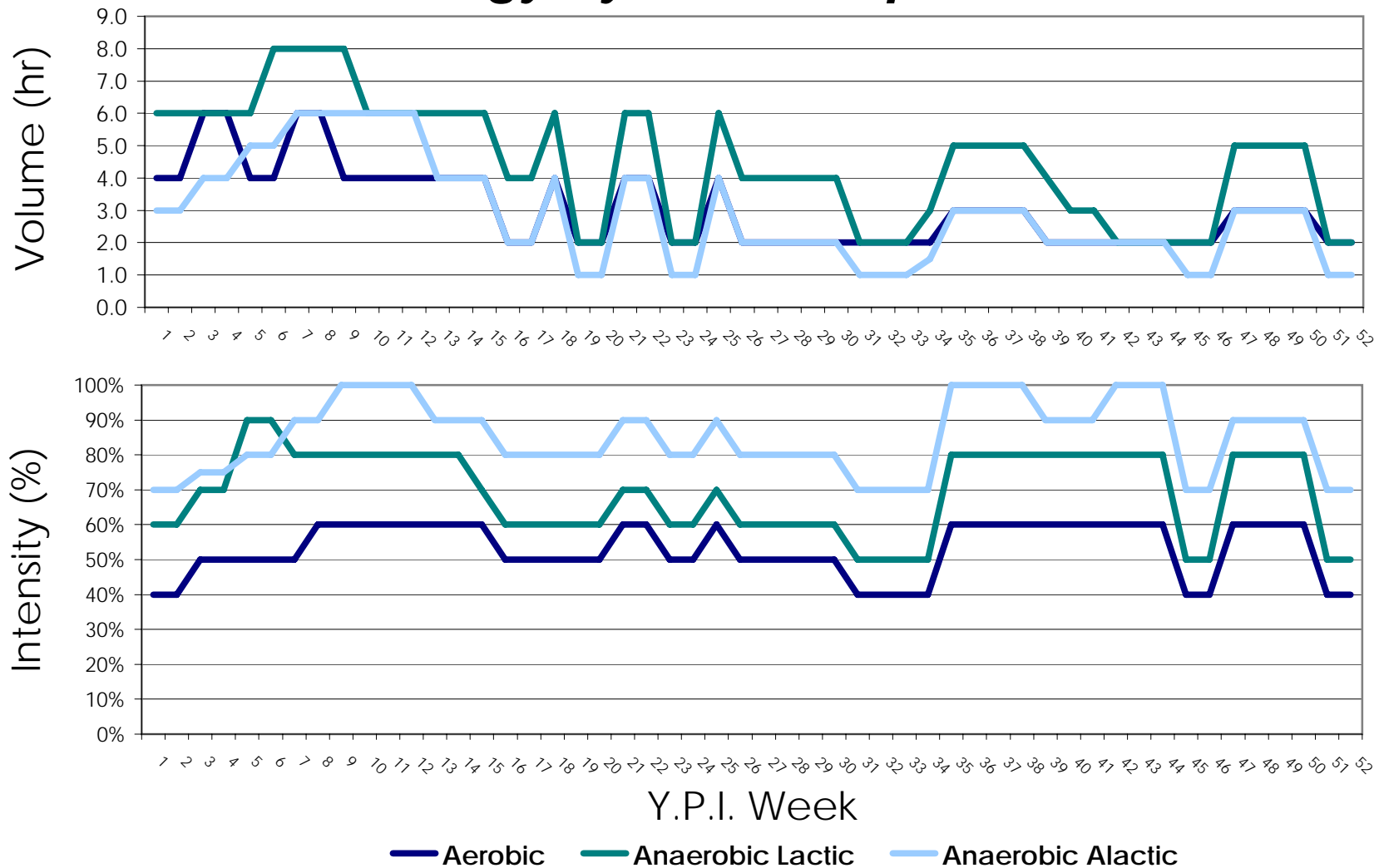
Season:	Month	December			January				February				March						
2009-10	Week Date	14	21	28	4	11	18	25	1	8	15	22	1	8	15	22	29	5	
	Competitions	L		T	T	L*			T	L	P*	P*		P**					
Details	*=Important Competitions, T=Tournament, L=League Game, X=Exhibition, P=Post Season, H=Home, A=Away, N=Neutral	A = Lawrence Park C.I.		T = Detroit (Travel)	T = St. Mike's Tournament	A = East York	H = Oakwood -		T = Guy Vertrie (Travel)	H = Leaside H.S.	P = TDSAA South Region	P = TDSAA 4A Qualifiers		P = OFSAA 4A Championships				Fundraiser: Skills Comp.	
	Periods	COMPETITION																	
Training	Phases	Main														Basketball (
	Peak/Taper									Peak		Taper	Peak	Taper	Peak				
	Macrocycles	Part I	OFF - Holidays		6 - League Part II		OFF- Exams		7 - League Part III		8 - Playoffs			OFF	9 - Recovery				
	Microcycles	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	
	Loading	Energy Systems																	
Volume	Strength																		
	Power																		
	Skills and Systems																		
	Balance				0.5				0.5										
	Energy Systems	Aerobic	4.0	2.0	2.0	4.0	4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
		Anaerobic Lactic	6.0	2.0	2.0	6.0	6.0	2.0	2.0	6.0	4.0	4.0	4.0	4.0	4.0	2.0	2.0	2.0	3.0
		Anaerobic Alactic	4.0	1.0	1.0	4.0	4.0	1.0	1.0	4.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.5
	Flexibility	0.5	0.5	0.5	1.0	0.5	0.5	0.5	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Power	3.0			2.0	2.0			3.0	1.5	1.0	1.0	1.0	1.0		1.0	1.0	1.0	
	Quickness	2.0			2.0	1.0			2.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	
Speed	1.0			1.0				1.0	1.0	1.0	1.0				0.5	0.5	0.5		
Strength	1.5	1.0		1.5	1.0			1.5	1.0		1.0	1.0			1.0	1.0	1.5		
Intensity	Balance				50%				50%										
	Energy Systems	Aerobic	50%	50%	50%	60%	60%	50%	50%	60%	50%	50%	50%	50%	50%	40%	40%	40%	40%
		Anaerobic Lactic	60%	60%	60%	70%	70%	60%	60%	70%	60%	60%	60%	60%	60%	50%	50%	50%	50%
		Anaerobic Alactic	80%	80%	80%	90%	90%	80%	80%	90%	80%	80%	80%	80%	80%	70%	70%	70%	70%
	Flexibility	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	
	Power	80%			80%	80%			80%	70%	60%	60%	50%	50%		50%	50%	60%	
	Quickness	80%			70%	70%			80%	70%	60%	60%	50%	50%		50%	50%	60%	
	Speed	70%			70%	70%			70%	60%	60%	60%	60%	60%		60%	60%	60%	
	Strength	70%			90%	90%			90%	80%	70%	70%	70%	70%		60%	60%	60%	



Eastern Commerce Saints

Season:	Month	April			May					June				July				August		
2009-10	Week Date	12	19	26	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	
	Competitions				X		X													
Details	*=Important Competitions, T=Tournament, L=League Game, X=Exhibition, P=Post Season, H=Home, A=Away, N=Neutral				Intra-squad: Scrimmage:		Mother Teresa: Scrimmage:													
		Periods	TRANSITION																	
Training	Phases	Ontario Club Competition							Ontario Cup		School Exam Period				Elite Dev. Camps		Canadian Nationals			
	Peak/Taper							Taper	Peak						Peak for Selected Players					
	Macrocycles	10 - Spring Training		11 - Small Group Skill Building					12 - Team Study Hall and Workouts				OFF-Exams		13 - Summer League					
	Microcycles	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
	Loading	Energy Systems	LOADING Energy																	
Strength								LOADING Strength												
Power												LOADING Power								
Skills and Systems																LOADING Skills				
Volume	Balance	1.0	1.0																	
	Energy Systems	Aerobic	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	2.0	2.0
		Anaerobic Lactic	5.0	5.0	5.0	5.0	4.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	5.0	5.0	5.0	5.0	2.0	2.0
		Anaerobic Alactic	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	3.0	3.0	3.0	3.0	1.0	1.0
	Flexibility	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Power	2.0	3.0	3.0	3.0	3.0	1.0	2.0	2.0	3.0	3.0			2.5	2.5	2.5	2.5	1.0	1.0	
	Quickness	2.0	2.0	2.0	2.0	1.0	1.0	2.0	2.0	1.0	1.0			2.5	2.5	2.5	2.5	1.0	1.0	
	Speed	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			1.0	1.0	1.0	1.0	0.5	0.5	
	Strength	2.0	2.0	1.5	1.5	1.5	2.0	2.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0	1.0	1.0	
Intensity	Balance	50%	50%																	
	Energy Systems	Aerobic	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	40%	40%	60%	60%	60%	60%	40%	40%
		Anaerobic Lactic	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	50%	50%	80%	80%	80%	80%	50%	50%
		Anaerobic Alactic	100%	100%	100%	100%	90%	90%	90%	100%	100%	100%	70%	70%	90%	90%	90%	90%	70%	70%
	Flexibility	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
	Power	60%	60%	60%	60%	70%	70%	70%	80%	80%	80%			70%	70%	70%	70%	60%	60%	
	Quickness	60%	60%	60%	60%	60%	60%	60%	70%	70%	70%			70%	70%	70%	70%	60%	60%	
	Speed	75%	75%	70%	70%	70%	70%	70%	70%	80%	80%			80%	80%	80%	80%	80%	80%	
	Strength	70%	70%	80%	80%	90%	90%	90%	90%	70%	70%			60%	60%	60%	60%	60%	60%	

Yearly Planning Instrument *Energy System Comparison*



3

Sport-Specific Workouts

- **ATC-PC System**, page 1
- **Anaerobic Lactic System**, page 3
- **Aerobic System**, page 5

ATP-PC SYSTEM

CHAOTIC SPEED

Basketball is an activity that employs all three energy systems. Athletes spent 8.8% of live game time performing high-intensity movements such as sprinting, jumping, or sport-specific movements. The activity was intermittent and changes in type of action occurred once every two seconds on average.

Basketball players, especially guards, alternate between moving forward, backwards, and laterally. Any effective workout needs to develop agility as well to simulate the “chaotic” nature of the game.

START OF PRACTICE ROUTINE

To be performed at the beginning of every practice (after warm-up) before the players become tired.

- 1 minutes sprinting
 - Three to four full-court sprints
 - Get to full speed within five to six strides
 - Two strides at full-speed and decelerate
- 5 minutes high intensity 1-on-1 ballhandling
 - 10-15 seconds full-court dribbling
 - 45-50 seconds active recovery

FOOTWORK DRILLS

Each of these sequences takes about fifteen seconds and can be timed for benchmarking.

Closeout the Key

Starting Position:

- The right baseline corner of the key

Procedure:

- Closeout across the key to the left elbow
 - Keep hands up
 - Use small, choppy strides
- Drop-step and slide to the right box
- Drop-step and slide to the left baseline corner
- Repeat the same sequence from the opposite side

Lane Agility Drill

Starting Position:

- Place pylons outside the N.B.A. key
- An athletic stance at the right elbow pylon

Procedure:

- Sprint to the right baseline pylon
- Slide to the left baseline pylon
- Back-pedal to the left elbow pylon
- Slide to the right elbow pylon and touch the cone
- Repeat the sequence in reverse
- Finish by back-pedaling past the right elbow pylon

SPEED HURDLE EXERCISES

Timing:

- Ten to fifteen seconds of high-intensity movement
- 45 to 60 seconds of active recovery

Equipment:

- Use 6" to 12" speed hurdles

Safety:

- Practice without a hurdle or with the hurdle at a lower height

First Step

Starting Position:

- Set up a 6" to 12" at a 45° angle outside the right elbow
- Start in the Triple Threat position inside the hurdle

Procedure:

- Step over the hurdle with a jab-step and then back to the original position
- Sweep through, cross-step and explode to the hoop for the dunk or lay-up
- Repeat from the other side and using different ball moves

Multi-Stage Hurdle Exercise

Starting Position:

- An athletic stance next to the speed hurdle

Procedure:

- Execute a two foot jump over the hurdle
- Jump back and forth over the hurdle for fifteen to twenty seconds

Lateral Skip and Break

Starting Position:

- Set up 6" speed hurdles three feet apart
- Start in a defensive stance

Procedure:

- Skip laterally over three or four hurdles
- Pivot and sprint at full speed for five seconds

Single-Leg Hurdle Jumps

Starting Position:

- 8-10 hurdles 12 feet apart
- One foot off the ground

Procedure:

- Execute single-leg jumps over the hurdles
- Go through the course twice
- Switch feet, perform lateral hurdles, or add a three second pause between jumps to increase difficulty



Lateral Single-Leg Hurdles

ANAEROBIC LACTIC SYSTEM

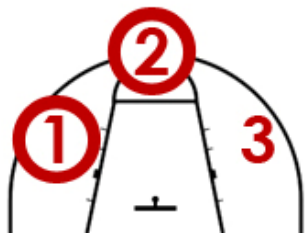
12 Minute High Intensity Shooting Workout

This twelve minute workout develops shooting (and other skills, mental training, and teamwork) at game intensity throughout the season.

SKILLS: shooting, moving without the ball, passing and catching, screening, game situations

PHYSICAL PERFORMANCE FACTORS: anaerobic lactic system, aerobic base, agility, speed, co-ordination, balance

DRILL #1 • 3 SHOOTERS, 2 BALLS



- 1 shoots first and follows their shot.
- 2 shoots as 1 rebounds.
- 1 rebounds, passes to an open player (3) and fills an open spot

- By the time that 2 has rebounded their shot, 1 will be open in a shooting position. The drill is continuous.

SCORING: One point for every made shot.

TIMING: Two minutes catch and shoot 2s, Two minutes one dribble pull-up jumpshots, 1 minute catch and shoot 3s.

ROTATION: Fill any open spot. The drill is continuous.

ACTIVE RECOVERY • FOUL SHOOTING

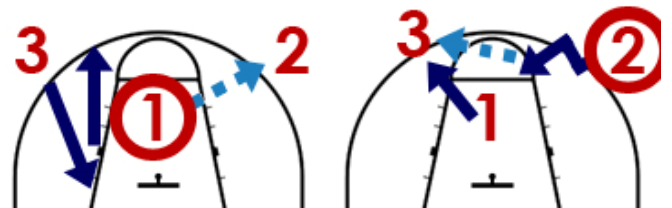
- Each player shoots two free throws.

SCORING: One point for every made FT.

TIMING: One minute.

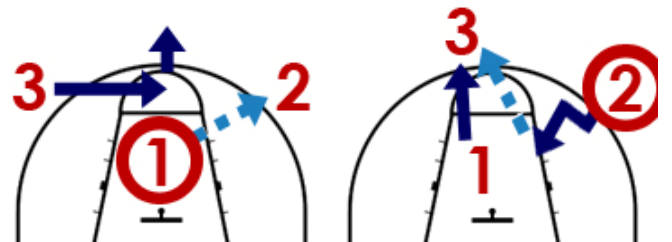
DRILL #2 • 50 SECOND DRILLS

V-CUTS



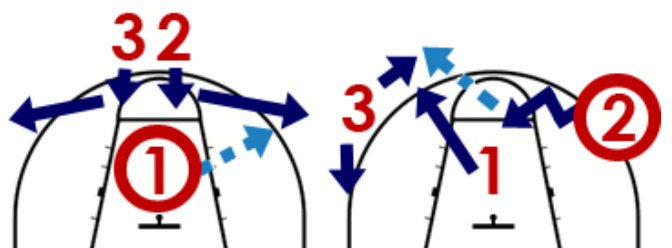
- 1 rebounds and outlets to 2.
- 3 V-cuts to get open.
- 2 penetrates into the middle and passes to 3.
- As 1 closes out, 3 catches and shoots.

L-CUTS



- 1 rebounds and outlets to 2.
- 3 L-cuts to the top of the key.
- 2 penetrates into the middle and passes to 3.
- As 1 closes out, 3 catches and shoots.

SKIP PASSES



- 2 and 3 flare out to the wings.
- 1 rebounds and outlets to 2.
- 2 dribbles into the middle and passes to 3.
- 3 moves to an open space.
- As 1 closes out, 3 catches and shoots.

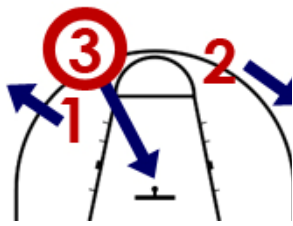
SCORING: One point for every made shot.

TIMING: Fifty seconds for each cut.

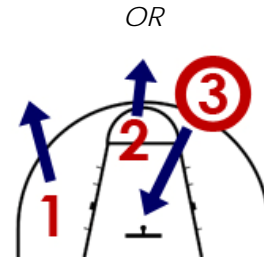
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Anaerobic Lactic Workout continued:

ROTATION:



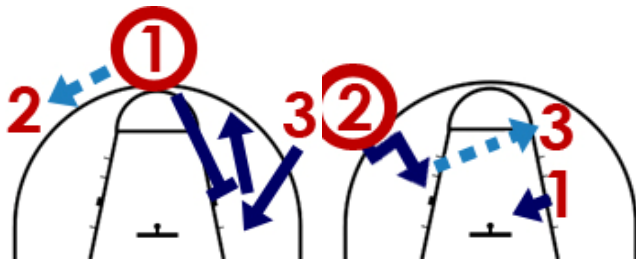
- 3 follows their shot.
- 1 fills 3's position.
- 3 outlets to 1.
- The drill is continuous.
- Each shooting drill is slightly different and players must be aware.



- 1 swings the ball to 2, who enters to the other side (3).
- The drill is continuous.
- All players will eventually fill all three spots from both sides.

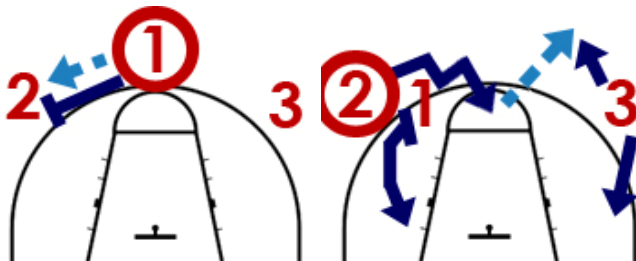
DRILL #3 • SCREENING DRILLS

DOWN-SCREENS



- 1 passes to 2 and sets a down-screen for 3.
- 3 comes reads the screen (curls, cuts, or flares).
- 2 penetrates into the middle & passes to 3.

BALL-SCREENS

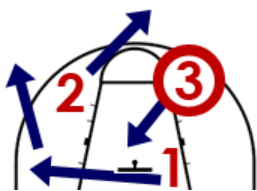


- 1 passes to 2 and sets a ball-screen for 2.
- 3 moves to an open space.
- 2 penetrates into the middle and passes to 3.

SCORING: One point for every made shot.

TIMING: Fifty seconds for each screen.

ROTATION:



- 3 follows their shot.
- 2 comes to the top of the key.
- 1 fills 2's position.
- 3 outlets to 1 and returns to their original position.

Continues opposite...

ACTIVE RECOVERY • FOUL SHOOTING

- Each player shoots two free throws.

SCORING: One point for every made FT.

TIMING: One minute.

POINTS OF EMPHASIS

TECHNIQUE:

- Catch the ball ready to shoot.
- Keep the elbow up and in at a right angle.
- Square up to the basket and remained balanced.
- Cut hard and set feet in a shooting position.

TEAMWORK:

- Communicate and push each other to get better.
- Create a positive environment.

TRAINING:

- Work at game intensity.
- Retain technique despite fatigue.
- **Work/Pause Ratio:** 1:1 to 1:2

NOTE:

This workout is complicated and tiring and not for every team. It requires repetition to perfect which take longer than twelve minutes the first few times practiced (about twenty minutes initially).

AEROBIC SYSTEM

N.B.A. SET SHOOTING WORKOUT

The inspiration for this workout was the desire to copy what excellent Toronto Raptors shooters (Dell Curry, Voshon Lenard) would do after practice and adapt it to what would be possible for a high school student-athlete. This workout can be practiced during the lunch hour and ensures successful repetitions of the shooting motion.

AROUND THE WORLD

- Work until you have made 160 shots from the following spots
 - Left corner
 - ten 2pt shots
 - ten 3pt shots
 - Left Russian spot
 - fifteen bank shots
 - Left wing spot (45°)
 - ten 2pt shots
 - ten 3pt shots
 - Left elbow
 - fifteen shots
 - Top of the key
 - ten 2pt shots
 - ten 3pt shots
 - Right elbow
 - fifteen shots
 - Right wing spot (45°)
 - ten 2pt shots
 - ten 3pt shots
 - Right Russian spot
 - fifteen bank shots
 - Right corner
 - ten 2pt shots
 - ten 3pt shots
- **Suggested Time:** As long as it takes to make the shots. Focus on keeping correct form even when you are tired. If you are working at full intensity, work in intervals of three to five minutes instead. *Work/Pause ratio: 1/1 or 1/2*

AROUND THE WORLD VARIATIONS

- Instead of three pointers, start with shorter shots, like twenty 8ft shoots and twenty 12ft shots and move out as you feel comfortable from each distance.
- If you want less structure, consider shooting for a half hour to an hour from all over the court. Benchmark your makes to compare your progress throughout the off-season. You may have to start at half and hour and work up to the hour. After a few workouts, you should be putting up 500 shots in the hour.

MICHIGAN STATE PRE-PRACTICE ROUTINE

During his last high school game, Spartan coach Tom Izzo missed the front end of a 1-on-1 that would have won the game and sent his team to the state semi-finals. Now, he shoots a hundred free throws before each practice and makes about ninety-five.

FOUL SHOTS

- Make fifty to one hundred free throws
- Use the same mechanics each time and visualize the ball going in the basket.
- **Suggested Time:** As long as it takes to make the shots. You are practicing form and focus, not physical conditioning.

4

Assessment and Evaluation

- **Individual Testing**, page 1
- **Individual Testing Scoresheet**, page 4
- **Pairs Challenge**, page 5
- **Pairs Challenge Scoresheet**, page 9
- **Team Benchmarks**, page 10

INDIVIDUAL TESTING

OBJECTIVE

The purpose of individual testing is to isolate the athlete's performance. In basketball, individual performance factors, fundamental skills, and teamwork are inextricably linked. There are some line-ups that are "better than the sum of the parts" but the testing seeks to separate the sum from the parts for accurate evaluation. There are two testing sequences for energy systems, one for individuals and a Pairs Challenge.

Some of the tests are specifically for energy systems but others are sport specific. After this program, the coach should be able to evaluate the fitness of the athlete and assess how their performance factors are affected by the sport-specific motions of basketball, like full-speed dribbling, shooting, or playing defence. Coaches may pick and choose from the various tests in order to evaluate the energy system or skill of their choice.

BEEP TEST (20M LEGER TEST) PROCEDURE

A twenty meter lane is defined for each player. Two cones on the ground at each end of the lane to define a gate at each end of the lane.

RUNNER INSTRUCTIONS

- **Start:** The runner places one foot in the start gate, facing the opposite end.
- At the first beep, start towards the opposite gates.
- Intervals are denoted by single beeps and get shorter as the test progresses.
- At each beep, the runner must have a foot in the target gate. After each beep, turn and run towards the opposite gate.
- If the runner does not arrive early enough to place a foot in the gate, a miss will be recorded. **Two misses in a row retire the runner from the test.**

RECORDER INSTRUCTIONS

- The recorder must line through the number corresponding to the repetition number at each speed as the runner completes the interval successfully.
- If the runner arrives late, circle the interval failed and warn the runner ("warning!") After the runner misses two gates in a row (or retirement from the test), the circle the second consecutive failed repetition twice.

AEROBIC ENDURANCE	
FITNESS LEVEL	TIME (S)
V	12.5≥
IV	11.0-12.0
III	9.5-10.5
II	8.0-9.0
I	≤7.5

20 YARD AGILITY TEST PROCEDURE

Three lines are marked, five yards apart.

- **Start:** The runner begins straddling the centre line
- At the signal, run to the left and touch the line with your hand.
- Run past the centre line and touch the other line with your hand
- Run through the centre line. **Time is stopped when the runner crosses the centre line for the second time.**

ANAEROBIC ENDURANCE

FITNESS LEVEL	TIME (S)
V	≤4.49
IV	4.50-4.69
III	4.70-4.89
II	4.90-5.09
I	≥5.1

300 YARD SHUTTLE RUN PROCEDURE

*A twenty five yard lane is defined for each player.
Cones on the floor denote mark the distance.*

- **Start:** The runner begins standing on one line, facing the opposite direction.
- At the signal, run towards the opposite end.
- Place a foot on the line and change direction, running back towards the start line.
- Complete six trips there and back, or twelve total lengths of the course. **Time is stopped when the runner crosses the start line after completing six trips.**

ANAEROBIC ENDURANCE

FITNESS LEVEL	TIME (S)
V	≤54.9
IV	55.0-59.9
III	60.0-64.9
II	65.0-69.9
I	≥70.0

'42' SHOOTING DRILL

SHOOTER INSTRUCTIONS

- **Start:** Outside the arc in a baseline corner
- Shoot a three-point shot
- Rebound, cut back outside the three point line and execute a one-dribble pull-up
- After rebounding, execute a shot-fake and make the lay-up from outside the arc
- Repeat from all of these spots, working from the left corner to the right (baseline corner (L/R), line of 45° (L/R), Elbow extended (L/R), top of the key.

SHOOTING

FITNESS LEVEL	PTS
V	≥35
IV	28-34
III	21-27
II	14-20
I	≤13

TIMER INSTRUCTIONS

- Begin timing one minute when the first shot is taken. If all of the shots are not completed in one minute, the score does not count.

WEAK HAND CHALLENGE

- **Start:** Under the basket
- At the signal, dribble towards the opposite hoop at full speed with your weak hand. **Pound the ball against the court. Do not push the ball ahead of yourself and run after it.**
- Make a lay-up with the weak hand, rebound your shot, and dribble back towards the starting basket.
- Dribble back and forth until six weak hand lay-ups have been made. **Time is stopped when the sixth lay-up enters the basket.**

WEAK HAND	
FITNESS LEVEL	TIME (S)
V	≤29.9
IV	30.0-34.9
III	35.0-39.9
II	40.0-44.9
I	≥45.0

IRON MAN SHOOTING

SHOOTER INSTRUCTIONS

- **Start:** Start under a basket with the ball.
- Dribble hard to the basket on the left and shoot a pull-up from ten to fifteen feet.
- If the shot counts, move to the next hoop in a clockwise fashion. Continue until you have made pull-ups at all six hoops.
- If the shot misses, get your rebound, and make a lay-up at the *previous* basket. Repeat the first step and attempt a pull-up jumpshot.

TRANSITION PULL-UPS	
FITNESS LEVEL	TIME (S)
V	≤29.9
IV	30.0-34.9
III	35.0-39.9
II	40.0-44.9
I	≥45.0

TIMER INSTRUCTIONS

- Begin timing as soon as the first dribble hits the deck and stop timing when the ball goes through the net at the final hoop.

SARGEANT VERTICAL JUMP TEST

- **Start:** The jumper stands besides the measuring poster and reaches as high as possible with the closest hand, keeping feet flat on the floor, to set the benchmark
- Jump as high as possible off both feet.
- Attempt to touch the wall at the jump's highest point. The score will be calculated by subtracting the benchmark from this reading.

VERTICAL LEAP	
FITNESS LEVEL	JUMP (CM)
V	60.0≥
IV	50.0-59.9
III	40.0-49.9
II	30.0-39.9
I	≤29.9

INDIVIDUAL TESTING SCORESHEET

NAME:

DATE:

20M BEEP TEST (AEROBIC ENDURANCE)

Instructions: Circle each missed gate. Two consecutive misses retire the runner.

LEVEL	GATE						
STAGE 0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
STAGE 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
STAGE 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
STAGE 1 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
STAGE 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
STAGE 2 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
STAGE 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
STAGE 3 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
STAGE 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
STAGE 4 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
STAGE 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
STAGE 5 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
STAGE 6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
STAGE 6 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
STAGE 7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
STAGE 7 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
STAGE 8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 8 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
STAGE 9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 9 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 10 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
STAGE 11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 11 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 12 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 13	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STAGE 13 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 14	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STAGE 14 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 15	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STAGE 15 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 16	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STAGE 16 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 17	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STAGE 17 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 18	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STAGE 18 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 19	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STAGE 19 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
STAGE 20	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STAGE 20 1/2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

← MINIMUM STANDARD

20YD SHUTTLE RUN (AGILITY)

Instructions: Stop the timer when the runner crosses the centre (start line) for the 2nd time.

1 ST TIME	2 ND TIME
. s	. s

300YD RUN (ANAEROBIC ENDURANCE)

Instructions: Record the time after six trips there and back (twelve lengths of the course.)

1 ST TIME	2 ND TIME
. s	. s

SARGEANT JUMP TEST (VERTICAL LEAP)

Instructions: Subtract the height jumped by the baseline reading to calculate vertical leap.

BASELINE	. cm	SCORE
1 ST JUMP	. cm	. cm
2 ND JUMP	. cm	. cm

'42' (SHOOTING / ANAEROBIC LACTIC)

Instructions: Count 1 pt for lay-ups, 2 pts for pull-up jump-shots, 3 pts for 3pt shots.

1 ST SCORE	2 ND SCORE
PTS	PTS

FULLCOURT LAY-UPS (AN. LACTIC)

Instructions: Stop the timer and record the score after the sixth made lay-up.

	WEAK-HAND	IRONMAN
1 ST TIME	. s	. s
2 ND TIME	. s	. s

TIMER/SCORER: _____

PAIRS CHALLENGE

OBJECTIVE

These tests are sport-specific but heavily influenced by energy systems. If the pairs tire, their accuracy and score will decline. Like the double-play combination in baseball, it is important that players work together, for example by accurately passing the ball under pressure. The Pairs Challenge also simulates game situations.

As a team building exercise, the coach should keep the same pairs of players together throughout the season and monitor their improvement, not their score relative to other team members.

An ideal time for the Pairs Challenge is during a lunchtime workout, perhaps at the end of the week, to focus the efforts of a small (4 to 6 players) group.

ELBOW JUMPSHOTS

- **Start:** One player stands on the elbow and another rebounds under the hoop.
- After one minute, a whistle will sound and the partners will switch. Count the number of field goals made in two minutes aloud.

15' SHOOTING	
FITNESS LEVEL	MADE FGs
V	≥24
IV	20-23
III	16-19
II	12-15
I	≤11

SHOOTER INSTRUCTIONS

- Receive a pass, catch, and shoot.
- Cut to the opposite elbow as your partner rebounds the shot. **Give a target and set yourself before the ball gets there.**
- Catch and shoot and repeat, going from side to side.

REBOUNDER INSTRUCTIONS

- At the signal, pass the ball to your partner.
- Rebound before the ball hits the ground and pass to your partner. Repeat.

SHOT-FAKE, ONE DRIBBLE PULL-UPS

- **Start:** Player A spots up on the perimeter and receives a pass from Player B, under the basket.
- Player A square-ups and shot-fakes.
 - Show the ball to the side opposite the direction you want to go, sweep through, and drive to the hoop.
 - Take one dribble to beat the defender running at you, jump stop, get under control, and take the jump-shot.
- Player A rebounds and passes to Player B, who repeats the same one dribble pull-up
- Both players continue to shoot, rebound, outlet, and spot-up, alternating roles. **The team's score is the number of field goals made in one minute.**

MIDRANGE SHOOTING	
FITNESS LEVEL	MADE FGs
V	≥12
IV	11
III	9-10
II	7-8
I	≤6

FORTY-FIVE SECOND TRANSITION DRILL

- **Start:** Player A enters the ball to Player B on the wing.
- Player B drives middle and finishes, as Player A fills the Russian spot.
- Player A rebounds and takes the ball out of bounds; Player B touches the baseline and gets wide for an outlet pass.
- Player A inbounds and runs wide down the court. Player B receives the pass and dribbles hard up the middle of the court to the top of the key.
- The players repeat the wing entry action listed above with roles reversed. **The team switches roles for forty five seconds, counting the number of made hoops.**

TRANSITION BASKETS	
FITNESS LEVEL	MADE FGs
V	≥10
IV	9
III	7-8
II	6
I	≤5

THREE-SPOT CATCH AND SHOOT

- **Start:** One player starts in the right short-corner and another rebounds in the key.
- Each player will complete the circuit from the right corner and then both partners will repeat the shots from left short-corner.

SHOOTING ON THE MOVE	
FITNESS LEVEL	TIME(s)
V	≤39.9
IV	40.0-49.9
III	50.0-59.9
II	60.0-69.9
I	≥70.0

SHOOTER INSTRUCTIONS

- Cut out to midway up the lane, plant and come back ready to shoot.

- Catch and shoot in the short corner.
 - If the shot counts, go to the next spot.
 - If the shot misses, cut again, and repeat until you make the shot.
- Cut under the basket and curl up to the opposite elbow for a shot.
- Flare to the left wing and shoot.
 - If the final shot counts, switch roles with the rebounder.
 - If the shot misses, flare back to the wing and shoot again.

REBOUNDER INSTRUCTIONS

- Rebound the shot, pivot, and pass the ball so that your partner can catch and shoot.

TIMER INSTRUCTIONS

- Another pair of players will time the drill. Start timing when the shooter begins the first cut and stop after the last shot has fallen through the net.

TWO-MAN SHOOTING

*One player begins in the short-corner with the ball.
The other stands under the basket with another ball.*

CATCH AND SHOOT	
FITNESS LEVEL	MADE FGs
V	≥34
IV	29-33
III	24-28
II	19-23
I	≤18

SHOOTER INSTRUCTIONS

- **Start:** Shoot the first ball
- **After the release, get into a shooting position.**
- The rebounder will pass the other ball and rebound the shot
- Shoot five shots from each of the following spots:
 - Short-corners (L/R)
 - Elbows / line of 45° (L/R)
 - Top of the key

REBOUNDER INSTRUCTIONS

- **Start:** Pass the ball to the shooter as soon as the first shot is released
- Continue to rebound and pass to the shooter until twenty shots have been attempted.

SCORING INSTRUCTIONS

- Switch after the first shooter has completed shooting from all five spots. The team will shoot fifty shots in total.
- There is no time limit but the goal is to catch and shoot quickly.

LONG PASS DRILL

- **Start:** Player A takes the ball out of bounds at the free throw lane extended and Player B begins running from the corner on the same side of the court.
- Player A throws a long pass the length of the court and starts running.
- Player B catches the pass in the mid-post, gets under control, and makes the lay-up.
- Player B rebounds the shot and takes the ball out of bounds on the opposite side of the court. Player A touches the baseline and turns back to the original end.
- The players continue to switch roles, until four lay-ups have been made.

FULLCOURT PASSING

FITNESS LEVEL	TIME (s)
V	≤15.9
IV	16.0-19.9
III	20.0-23.9
II	24.0-27.9
I	≥28.0

DEFENSIVE CLOSEOUT RELAY

- **Start:** One player starts in one of the baseline corners of the key while the other stands to the side, jogging on the spot.
- The first player closes out the key.
 - Close-out to the opposite elbow.
 - Drop step with your inside foot and slide across the key to the block.
 - Drop step with your inside foot and slide across the key to the original corner.
- After one circuit, the player tags out to their partner, who completes a circuit.
- The goal is to complete as many circuits as possible in one minute.

DEFENSIVE FOOTWORK

FITNESS LEVEL	CIRCUITS
V	≥12
IV	11
III	10
II	9
I	≤8

PRESSURE FREE THROWS

- **Start:** One player shoots a set of 1-and-1 free throws at a time.
- After each set, the shooter runs to the opposite end and back for each miss.
 - Missing the front end counts as two misses.
- As the first shooter is running, if necessary, the partner shoots a set of 1-and-1.
- Alternate until the team has shot ten 1-and-1 sets, five per player.
- The maximum total possible is twenty for twenty

PRESSURE SHOOTING

FITNESS LEVEL	MADE FTs
V	≥14
IV	12-13
III	10-11
II	8-9
I	≤7

PAIRS CHALLENGE SCORESHEET

NAMES: 1 2	DATE:
----------------------------------------------------------------------------------------------------------------------------------------	--------------

ELBOW JUMPSHOTS (AN. LACTIC)
Instructions: Each player catches and shoots from the elbows for one minute. Count made FGs in two minutes.

FIRST SCORE	SECOND SCORE
FGs	FGs

1 DRIBBLE PULL-UPS (AN. LACTIC)
Instructions: Players alternate shot-fake, one dribble pull-up jump-shots for a minute total. Each partner rebounds their own shot.

FIRST SCORE	SECOND SCORE
FGs	FGs

45. SEC TRANSITION (AN. LACTIC)
Instructions: Start the timer when the first entry pass is made and time the number of made transition baskets in forty-five seconds.

FIRST SCORE	SECOND SCORE
FGs	FGs

THREE SPOT SHOOTING (AGILITY)
Instructions: Start the time when the first player begins to cut and stop after the ball goes through the hoop for the last basket.

FIRST TIME	SECOND TIME
. s	. s

TWO MAN SHOOTING (AEROBIC)
Instructions: Each player shoots five shots from each spot (short-corner (L/R), elbow (L/R), the top of the key) in a clockwise order. Count the number of field goals per team.

FIRST SCORE	SECOND SCORE
FGs	FGs

LONG PASS DRILL (AN. ALACTIC)
Instructions: Start timing when the first partner starts running from the corner and stop when the ball goes through the hoop for the fourth lay-up.

FIRST TIME	SECOND TIME
. s	. s

DEFENSIVE RELAYS (AGILITY)
Instructions: One player closes out the key while the other jogs on the spot. Switch roles after each circuit and count the number of completed circuits after one minute.

FIRST SCORE	SECOND SCORE
circuits	circuits

PRESSURE FREE THROWS (AEROBIC)
Instructions: Partners alternate shooting 1-and-1 free throws. Run to the opposite end and back for each miss. Shoot ten sets per team (five 1-and-1s each.)

FIRST SCORE	SECOND SCORE
FTs	FTs

TEAM BENCHMARKS

By assigning levels of achievement to each test, players have goals to strive for. Also, all-around ability is encouraged.

INDIVIDUAL TESTING

Fitness Level	LEGER (BEEP) TEST Level	20 YRD SHUTTLE RUN Time (s)	300 YRD SHUTTLE RUN Time (s)	SARGEANT JUMP Vertical Height (cm)	'42' (SHOOTING) DRILL Points	WEAK HAND LAY-UPS Time (s)	IRONMAN SHOOTING Time (s)
V	12.5≥	≤4.49	≤54.9	60.0≥	≥35	≤29.9	≤49.9
IV	11.0-12.0	4.50-4.69	55.0-59.9	50.0-59.9	28-34	30.0-34.9	50.0-54.9
III	9.5-10.5	4.70-4.89	60.0-64.9	40.0-49.9	21-27	35.0-39.9	55.0-59.9
II	8.0-9.0	4.90-5.09	65.0-69.9	30.0-39.9	14-20	40.0-44.9	60.0-64.9
I	≤7.5	≥5.1	≥70.0	≤29.9	≤13	≥45.0	≥65.0

PAIRS CHALLENGE

Fitness Level	ELBOW JUMPSHOTS Made FGs	1 DRIBBLE PULL-UPS Made FGs	45 SEC. TRANSITION Made FGs	THREE SPOT SHOOTING Time (s)	TWO MAN SHOOTING Made FGs	LONG PASS DRILL Time (s)	DEFENSIVE RELAY Circuits	PRESSURE FREE THROWS Made FTs
V	≥24	≥12	≥10	≤39.9	≥34	≤15.9	≥12	≥14
IV	20-23	10-11	9	40.0-49.9	29-33	16.0-19.9	11	12-13
III	16-19	8-9	7-8	50.0-59.9	24-28	20.0-23.9	10	10-11
II	12-15	6-7	6	60.0-69.9	19-23	24.0-27.9	9	8-9
I	≤11	≤5	≤5	≥70.0	≤18	≥28.0	≤8	≤7

PERSONAL BESTS

IMPROVEMENT

TOTAL PTS. AVG. PREV. IMPROVE.

TARGETS PARTNER

INDIVIDUAL PAIRS

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Student-Athlete Health

- Introduction, page 1
- **Overtraining and Overreaching**, page 1
- Signs of Fatigue, page 2
- Sleep Factsheet, page 3

INTRODUCTION

Coaches have a great deal of contact with team members. Often, players may trust a coach more than a friend, family member, or another teacher. Teenagers need help to monitor their health effectively and coaches should be available for support. Coaches should watch not only for signs of overtraining but fatigue and other illness that may be a combination of the heavy commitment made by a student-athlete.

Under the supervision of York graduate student Josh Ford, the team follows a strength training program two to three times per week. It is likely true that there is some overtraining in the schedule. Many of the athletes are at-risk because of their background and there is an element of maintaining their academic motivation and keeping them out of trouble by making their participation in a sport that they are passionate about a carrot.

Academics and health must always come first. Coaches should be consistent with their standards and make decisions in the best interest of the student-athlete.

OVERTRAINING AND OVERREACHING

Training performance factors involves a cyclical performance of tearing down and building up. To increase muscle mass, the existing cells must be replaced by newer ones. To increase the capacity of Energy Systems, athletes have to replace the fuel that they used during the workout and allow themselves time to recover. The overload principle asks athletes to reach past prior benchmarks to improve their performance.

Overtraining is characterized by excessive volume or intensity for a prolonged period. Overreaching is defined as a sharp increase of volume or intensity in a short period of time. Both have similar symptoms but overtraining takes place over the course of several weeks, a much longer time than weakness or fatigue due to overreaching. Obviously, athletes will be tired and possibly sore after a high intensity workout but it becomes problematic when the signs persist for multiple days and outside of practice.

In order to increase Aerobic and Anaerobic capacity, exercises have to be performed above the respective intensity thresholds (40-60% of VO₂max and 65-90% respectively). After loading the performance factor early in the season, coaches should lower the level of intensity and focus on maintenance.

It is acceptable to overreach at appropriate times during the year; loading periods are similar to overreaching. There is high volume and intensity for a period of about three weeks. Afterwards, the volume is lowered to permit recovery. Practices need to include periods of active recovery and macrocycles require off days or days of low activity.

Overtraining can be physically and mentally damaging and coaches should be mindful of the warning signs.

SIGNS OF OVERTRAINING

Some signs of overtraining can be measured as part of the season-long assessment program but others are more subjective and can best be seen with experience. The student-athlete will be fatigued in the classroom and the hallways, not just the basketball court so it may take co-operation with staff and administration to observe the symptoms. Not all signs will be present; some will appear over the course of several weeks.

SIGNS OF OVERTRAINING

PHYSIOLOGICAL

- chronic muscle soreness
- loss of body mass *
- increased resting heart rate *
- increased (core) temperature *
- increased susceptibility to colds and infections
- swollen lymph nodes
- chronic sore throat
- recurrent headaches
- minor skin infections
- constipation or diarrhea
- increased white blood cell count *
- decreased haemoglobin (men < 13g / women < 12g) and/or haemocrit *
- decreased iron stores (serum ferritin) *
- increased serum enzymes (LDH, CPK) *
- increased urinary urea *
- increased blood lactate for a specific submaximal workout *
- decreased performance of a standard set *
- delayed recovery from a training session
- decreased ability to generate adequate contractile force *

PSYCHOLOGICAL

- nervous or anxious
- irritable
- overly aggressive
- poor attitude
- desire to quit or skip training sessions
- lack of care or enthusiasm
- decreased academic performance
- depressed
- lethargic
- exhausted
- altered perception of effort
- inability to relax
- inability to sleep
- inability to eat or lack of appetite

* Objective Measures of Overtraining

ADOLESCENT SLEEP FACTS

High school students do not get enough sleep. Coaches should inform players about the importance of getting enough sleep. Otherwise, fatigue due to lack of sleep could impede training and contribute to poor performance during competitions.

SLEEP REQUIREMENTS

- Adolescents require 8.5 to 9.25 hours of sleep per night
- Only fifteen percent of adolescents get the required amount of sleep during the week; most sleep seven hours
- Deep sleep is critical to cognitive or motor skills, problem solving, and maintaining the immune system

DAYTIME SLEEPINESS

- Daytime sleepiness increases during puberty and can cause accidents/injuries and reduce attention spans

EFFECTS OF A SLEEP DEFICIT

- A 30-36 hour deficit reduces cardiovascular performance by 11%
- Mental performance and information processing decreases twice as quickly as physical performance
- Minimal sleep deficits can result in fatigue or depression

SLEEP AND EXTRA-CURRICULAR ACTIVITIES

- Teens who are extensively involved in school or community activities or work part time are at a greater risk of the effects of sleepiness than those who are less involved or work fewer hours

TIPS TO COMBAT A SLEEP DEFICIT

- Establish a sleeping environment that is dark, quiet, cool, and comfortable
 - Stick to a consistent bedtime
 - Restrict adjustments in bedtime to thirty minutes daily
- Two consecutive nights can alter circadian rhythms
- Reduce caffeine consumption in the afternoon and evening
- Adolescents should not consume melatonin

SLEEP AND STUDYING

- It is important to get enough sleep before (to be alert) and after (to consolidate memory) learning
- All-nighters create a severe sleep deficit for several days

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Conclusion

- **Three Major Energy Systems**, page 1
- **How My Philosophy Changed**, page 2
- **List of Resources**, page 4

THE THREE MAJOR ENERGY SYSTEMS

CHARACTERISTICS	Anaerobic Alactic	Anaerobic Lactic	Aerobic
Other Designation	Phospagen ATP/PC	Lactic glycolytic	Oxidative
Fuel Source(s)	Stored ATP CP	Stored glycogen Blood glucose	Multiple enzyme systems
Enzyme System Used in Breakdown	Single enzyme system	Single enzyme system	Multiple enzyme systems
Muscle Fibre Type(s) Recruited	I • IIa • IIb	I • IIa	Depends on the level of effort
Power Output Requirement	High	High	Low
Metabolic Byproducts	ADP • P _i • C	Lactic acid	CO ₂ • H ₂ O
Maximum Rate of ATP Production (moles/min)	3.6	1.6	1.0
Maintenance Time for Maximal ATP Production	1 sec.	5-10 sec.	2-3 min.
Time to Exhaustion of System	6-10 sec.	20-30 sec.	5-6 min.
ATP Production Capacity (moles)	0.6	1.2	Theoretically unlimited
Relative (%) ATP Contribution:			
• 10 sec	• 50%	• 35%	• 15%
• 30 sec	• 15%	• 65%	• 20%
• 2 min	• 4%	• 46%	• 50%
• 10 min	• 1%	• 9%	• 90%
Time for Total Recovery	3 min.	1-2 hr.	30-60 min.
Time for ½ Recovery	20-30 sec.	15-20 min.	5-10 min.
Ultimate Limiting Factor(s)	Depletion of ATP/PC stores	Decreased pH due to H ⁺ accumulation greater than buffering capacity	Depletion of CHO stores Inability to supply sufficient O ₂ Heat accumulation

TRANSITIONS	Rest	PHASE 1	Aerobic Threshold	PHASE 2	Anaerobic Threshold	PHASE 3
Type of Metabolism		Aerobic	Becoming		Increasingly Anerobic	
Primary Fuel		Fat Carbohydrate	→	→	→	Carbohydrate Fat
Predominant Fibre Type		I	→	I + IIa	→	I + IIa + IIb
Relative Intensity (VO ₂ max)			40-60%	→	65-90%	
Heart Rate (per min)			130-150	→	160-180	
Blood Lactate (mmol/L)			2.0	→	4.0	

Source: Pyley

HOW MY PHILOSOPHY CHANGED

In the arduous (☺) five years since I first undertook the National Coaching Institute program and the completion of this task, there have been no quantum shifts in my coaching. I have continually learned new information and applied it on the court. This conclusion comprises the basic information that I believe a basketball coach should know about Energy Systems.

COMBINE DIFFERENT ENERGY SYSTEMS IN PRACTICE

If athletes perform over a thousand discrete movements of varying intensity throughout the game and each action has an average duration of about two seconds, coaches should incorporate sport-specific movements in each workout or practice. Athletes must not only develop their energy systems but their ability to switch movements quickly.

Kobe Bryant's former personal trainer Joe Carbone talks about the idea of "chaotic speed", the ability to change direction quickly and cover the entire court. Istvan Balyi believes that the brain must also be trained, in addition to the body. For example, training the brain to get up to full speed (or in the case of basketball make changes in movement) as quickly as possible is an important part of practices.

Coaches should be cognizant that workouts need to include all three energy systems: explosive sport-specific movements and sprinting to develop the ATP-PC system, part-method or skill development drills lasting thirty seconds to five minutes for the Anaerobic Lactic system, and work to increase the aerobic base of each athlete.

EXPLOSIVENESS STILL MATTERS

Although coaches should focus on the Anaerobic Lactic system, it is valuable to devote time to explosiveness training (which uses the ATP-PC system) because of the great affect that athleticism can have on the game. The total live time devoted to high intensity movements is only sixteen percent but players who can perform sport-specific movements with great speed and power often dominate slower, more technical skilled players. Skill development and strategic changes have increased the speed of the game dramatically in the last twenty years.

COACH DIFFERENT POSITIONS DIFFERENTLY

Guards perform more high-intensity activities than forwards or centres. They change movements more and devote more time to high intensity and moderate intensity activities. The nature of play around the perimeter is quicker and requires more running and cutting. Inside, there is more physical play, such as "semi-stationary" fighting for position. Guards and forwards have better VO₂max readings than centres.

First of all, during pre-season assessment, guards must meet higher standards than the requirements for larger players. In practice, the players must be taught different sport-specific movements. Skill development drills for guards should be conducted at a higher intensity than drills for forwards and centres. Also, coaches should be prepared to give centres more time on the bench during games, although this will be dictated by the specific fitness levels of each player.

HOWEVER: YOUTH COACHES SHOULD TEACH ALL SKILLS TO ALL PLAYERS

One problem with the custom of assigning positions based on size appears in youth basketball. Players with early growth spurts are often slotted in the Centre position and do not learn key basketball skills. Other shorter players may not be selected to the team at all. At the youngest level, players born early in the year have the best chance of athletic success: players born in the first three months of the year comprise forty percent of teams and players born in the last quarter only ten.

When players have reached the level of elite high school competition, it is appropriate to differentiate between positions in order to maximize performance. At the younger levels (Junior Varsity and younger) coaches should help develop the skills of all team members. This includes pushing bigger players to their limits by making them practice as much high-intensity activity as smaller counterparts.

USE OTHER SPORTS TO TRAIN FOR BASKETBALL

Variety in terms of workouts (duration, intensity, type of exercises, and order of exercises) is important to prevent overtraining. A coach can also create variety by pulling a sport out of the blue to mix things up. Even for just fifteen minutes, everyone is on the same level playing field as they try to learn soccer or volleyball so it can become a team building activity.

SPORTS WITH A SIMILAR ENERGY SYSTEMS BREAKDOWN TO BASKETBALL

Sport	ATP-CP and LA	LA-O2	O2
Basketball	60	20	20
Gymnastics	80	15	5
Floor Hockey	50	20	30
Soccer	50	20	30
Volleyball	80	5	15

Source: Fox et al.

MANAGE THE MENTAL CAUSES OF ELEVATED HEART RATE

High competitive anxiety could also cause one player to experience a higher heart rate than a peer who plays the same number of minutes at the same intensity. No correlations were reported between heart rate and time spent in high intensity activity. All three types

of positions reported the similar heart rates throughout the match. On hypothesis could be that as physical intensity decreases as the match progresses, mental intensity rises because of the competitive anxiety.

Due to the negative correlation between mental anxiety and performance, coaches should assess players using the Sport Competitive Anxiety Test or the Competitive State Anxiety Test II and instruct techniques such as breathing exercises, visualization, and mental rehearsal if necessary.

ACTIVE RECOVERY

Active recovery removes lactic acid twice as quickly as rest recovery. The minimum recovery time drops from one hour to thirty minutes and the time for full recovery from two hours to sixty minutes. Coaches should ensure that players understand the concept for their own personal workouts and include periods of active recovery in practice (*which can be highlighted in blue text on the practice plan*). Basketball active recovery tasks include foul shooting, shooting focused on technique, and ballhandling dexterity drills.

INCORPORATE ENERGY SYSTEMS ON EACH PRACTICE PLAN

To remind the coaching staff to maintain the proper intensity level of each practice and to communicate the importance to developing physical performance factors to players, the energy systems (AA, AL, AE) should be included on each posted practice plan. The plan can also include the Work:Pause ratio.

DRILL		WP • PF	MIN
K	3:55-4:10	CALL TO ORDER	4:10-4:12
seout the Key		1:1	AE 5
otic Speed			AL 5
Drive and Kick			AG 5
uence Drill			SP 5
e Screen and Roll		1:1	8
• 2 on 2			AA
			AE
			BA
			SP
ion Work		1:1	AA
ooting	<u>Ballhandling</u>		AE
ots	Inbound/Attack		BA 8
'2	Stationary 2 Balls		SP 2
ssure FT		1:1	3
• Make: Def DB, Miss: Def 30			
ion Work: Potato		1:1	10

FATIGUE HAS MULTIPLE CAUSES

Student-athletes can experience fatigue because of academic, athletic, or personal reasons. Irrespective of the cause, the symptoms will be similar: irritability, depression, tension, anxiety, aggression, lethargy, and poor sleep quality. Furthermore most high school students do not get enough sleep.

Watch for the signs of fatigue and work co-operatively with the player, teachers, administration, and family to improve the situation. It may be overtraining, stress from school, or another issue, such as work or sibling supervision issues at home. Schedule practices with the sleep patterns of adolescents in mind and address the importance of proper sleep with players in preparation for an evaluation or competition.

RESOURCES

- Abdelkrim, N.B., S. El Fazaa, and J. El Ati (2007). "Time-motion analysis and physiological data of elite under-19-year-old basketball players during competition." British Journal of Sports Medicine. 46.2: 69-75.
- Anderson, S. and D. Manche (2009). "Basketball Fact Sheet." Sports Dietitians Australia. Downloaded 15 April 2009 from www.sportsdietitians.com.au/asset/1/upload/Basketball2.pdf.
- Balyi, I. (2009). "Changing Coach Paradigms." *Ontario Coaches Conference*. Delivered 20 February 2009 in Richmond Hill, Ontario.
- Chan, D. (2009). "Fitness Testing Assignment: Basketball." Exercise Physiology Educational Resources 1999. Downloaded 15 April 2009 from <http://physiotherapy.curtin.edu.au/resources/educational-resources/expphys/99/basketball.cfm>.
- Coyle, E.F. and J. González-Alonso (2001). "Cardiovascular Drift During Prolonged Activity." Exercise & Sport Science Review. 29.2: 88-92.
- Fox, E. L., Bowers, R. W., & Foss, M. L. (1993). The Physiological Basis for Exercise and Sport (5th ed.). Dubuque: W.C. Brown.
- Gladwell, M. (2008). Outliers. Little, Brown and Company: New York.
- Infedi, F. (2005). "Sport Participation in Canada, 2005." Culture, Tourism and the Centre for Education Statistics. Downloaded 22 April 2009 from http://dsp-psd.pwgsc.gc.ca/collection_2008/statcan/81-595-M/81-595-MIE2008060.pdf.
- McInnes, S.E., J.S. Carlson, C.J. Jones, and M.J. McKenna (1995). "The Physiological load imposed on basketball players during competition." Journal of Sports Sciences. 13: 387-97.
- National Sleep Foundation (n.d.). Teens and Sleep. Download 28 May 2005 from <http://www.sleepfoundation.org/hottopics/index.php?secid=18>.
- Plyley, M. (2004). "Task 1: Energy Systems." *National Coaching Institute*. Delivered October 2004 in Toronto, Ontario.
- Seiler, S. (1996). "Principles of Training - Revisited." Masters Athlete Physiology and Performance. Downloaded 3 May 2009 from <http://home.hia.no/~stephens/traprin.htm>.
- SPARQ Marketing and Media (n.d.). SPARQ Training. Downloaded 1 April 2009 from <http://www.sparqtraining.com>.

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*“When two teams are evenly
matched, the better
conditioned team will usually
execute better when fatigue
sets in, and will probably win.”*

- John Wooden