SLEDGE HOCKEY

NATIONAL TEAM FITNESS TESTING GUIDELINES

ABOUT THIS RESOURCE

This manual is designed to serve as a guideline for sledge hockey players and coaches who are striving to take their game to the next level. It will provide an outline of the fitness testing regimes which are in place for athletes on Canada's National Sledge Hockey Team as well as some of the standards which are maintained by both national team athletes and developing athletes who are on the path to becoming national team athletes in the future.

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SLEDGE HOCKEY – GENERAL INFORMATION

Sledge hockey is the Paralympic version of ice hockey. It made its Paralympic debut at the 1994 Paralympic Winter Games in Lillehammer, Norway and is currently one of the most popular spectator sports at the Paralympics.

The game itself is very similar to able-bodied hockey. At the international level, IIHF rules and regulations are followed with a few minor exceptions. A standard playing lineup includes 15 players, with six players (including a goaltender) on the ice, the same as able-bodied hockey.

Players sit in sleds on the ice which rest on two standard-size hockey skate blades. Each player uses two sticks which are used for puck control and shooting, and also for propulsion, as there are picks at the top end of the sticks. Goaltenders use a standard blocker and trapper, and picks are attached to the trapper and the heel of the goaltender stick since the goaltender is only able to carry one stick.

The game is extremely fast and physical, and body contact is allowed and encouraged. Some of the top sledge hockey players in the world are able to shoot up to 75 miles per hour with one hand.

Sledge hockey is an intermittent sprint sport featuring shifts of 30-90 seconds with 120-360 seconds between shifts, depending on the number of lines. During a shift approximately 10% of the time is spent doing hard maximum-effort skating sprints. The average sprint is 2.8 seconds and is repeated 4-6 times per shift. The majority of the time, 39%, is spent doing light skating or fast gliding. Resting and slow gliding accounts for 25% of a shift and moderate skating accounts for 26% of the average shift. These proportions can vary depending on game plan and level of play.

This type of data clearly shows that the majority of a hockey game is spent in rest and recovery and that the ability to accelerate in a very short period of time and recover quickly is key to hockey success.

Traditionally training in hockey has been based around the duration of a shift. It is not uncommon to see players doing 30-second to 60-second sprint intervals. While this makes sense on a superficial basis, it does not represent the nature of the game and inevitably results in the development of energy systems that are not used in hockey.

TRAINING FOR HOCKEY

As an intermittent sprint, collision sport hockey players need a good overall level of fitness encompassing strength, flexibility, anaerobic fitness, aerobic fitness, speed, balance and agility.

Strength is the most important part of a hockey-conditioning program and is the backbone on which all other fitness is built. A high level of balanced strength will help prevent both non-contact injuries like groin and low abdominal pulls as well as contact injuries that occur during collisions with other players. Over the past 25 years, as the size and speed of players has increased, the frequency of injury due to contact has as well, and this has also made an early injury-prevention phase of a strength training program crucial for hockey players of all levels.

Strength is also the primary ingredient in speed and acceleration. A simple physics lesson illustrates this point:

Force = Mass x Acceleration (F=MA)
Acceleration = Force/Mass (A=F/M)

When you have to accelerate your body weight, as you do in hockey, your acceleration is going to be the force you can produce with the lower body muscles divided by your body weight. In other words your acceleration is going to be related to your strength-to-body-weight ratio.

Flexibility

Flexibility is the amount of movement of a joint. Every sport requires a certain amount of flexibility - for hockey players adequate flexibility will allow them to perform the skills of the game more effective and resist injury during contact and collisions. While an adequate level of flexibility is necessary, some players take things too far - too much flexibility can make a joint unstable and lead to injury, particularly in the shoulders and wrists. Younger players who have not fully matured are sometimes at risk of developing contact injuries because of excessively mobile joints.

Anaerobic Fitness

The human body produces energy through three systems: the anaerobic alactic system, the anaerobic lactic system and the aerobic system. The anaerobic alactic system is the primary source of energy for the high speed/high power sprinting done on the ice. Your ability to maintain your speed during a long sprint will depend on the capacity of this energy system. If the capacity of this energy system is not large enough, your body will switch over to using the anaerobic lactic energy system. When you switch over to this system your body produces hydrogen ions (H+). Hydrogen ions play a role in the development of fatigue. As H+ level rises, your speed drops, your skills decrease and your ability to make good decisions is impaired. Anaerobic training increases the capacity of the alactic system, decreasing your reliance on the lactic system, helping you maintain speed and skill late in the game.

Aerobic Fitness

Even though the work periods in hockey are done using the anaerobic energy systems, hockey players still need a well developed aerobic system. The aerobic system is used to replenish the anaerobic alactic system when the players are gliding on the ice or sitting on the bench and to burn up the lactic acid that might be produced during longer sprints. Hockey players don't need the same type of aerobic fitness as a cyclist or distance runner, rather they need to develop an aerobic system that will aid them in recovery between shifts and between periods.

Speed, Balance, and Agility

Speed, balance and agility are all related abilities. The development of one will improve the others.

The term speed is misused in hockey. Speed is not very important for a hockey player; acceleration is the key. As mentioned in the analysis of the game section earlier in this chapter, the average period of hard skating during a shift is less than four seconds, not enough time to reach full speed, and when you consider the fact that you cannot achieve full speed when you have to change direction to avoid other players or make a move on the ice it becomes clear that the ability to change direction and accelerate quickly are much more important than flat-out speed. Speed and acceleration have to be developed separately from anaerobic fitness. Training for anaerobic fitness is designed to develop fatigue, which decreases speed and acceleration, preventing you from improving those abilities. Speed and acceleration are built through shorter sprint and plyometric activities while anaerobic fitness is built through longer fatiguing sprints.

Agility is related to acceleration as it is the ability to quickly change direction while maintaining body position and balance. Of course agility training can only be effective if the player has enough strength to accelerate and decelerate their body weight.

ASSESSING SLEDGE HOCKEY FITNESS

Overview

Fitness assessments have become a routine part of an athlete's preparation and development. In the Canadian National Sledge Hockey Program, fitness testing has several purposes:

- Identifying areas of strength and weakness for each player
- Monitoring the effectiveness of training cycles and training programs
- Ranking and tracking players
- Identifying up and coming athletes with the potential to make the team
- Providing motivation for the athletes
- Providing accountability for the athletes

Test Frequency

Testing is conducted three times per year during major training camps and at select times throughout the year during practice sessions. With younger, developmental athletes, testing every 6-8 weeks allows coaches to modify programs more frequently and ensures that the athletes are progressing towards the fitness level that they will need to achieve for higher levels of play.

Administering Tests

In order for a national system of fitness testing to be established and for the testing data to be useful, standard protocol must be followed whenever the testing is done. Please be sure the distances described below for each test are carefully measured and marked on the ice with cones or other markers. This is very important since ice surfaces differ in size and face-off dots, blue lines, goal lines and centre lines are often in slightly different positions at different arenas.

THE TESTS

There are six tests commonly used by Hockey Canada with the sledge team. Each of these tests has been chosen because they measure essential fitness components of sledge hockey and require minimal equipment, making them accessible to most teams and individuals.

1. Pull-ups

This is an upper body pulling strength measure and seems to be highly related to skating speed. An overhand grip is used with hands placed comfortably outside the shoulders. The player pulls themselves up until their chin is equal with the bar and lowers themselves until their arms are completely straight. Perform as many reps as possible. It may be necessary for one or more coaches to assist in lifting some athletes so that they can reach the pull up bar and help them return safely to their chairs.

2. Bench Press Reps with Body Weight

The bench press test is a measure of upper body pushing strength and provides a measure of how well upper body strength is balanced between push and pull muscles. This is important for shoulder injury prevention. Athletes are weighed on a standard scale and the equivalent of their body weight is loaded onto the bar. Lying on a standard bench-press bench the athlete lifts and lowers the weight until it touches their chest as many times as possible. A coach should be positioned at the end of the bench to act as a spotter and aid with the initial lift off. Some athletes will need help balancing on the bench and can have other athletes or coaches stabilize their hips and trunk as long as there is no interference with the bar during lifting. This test should not be attempted unless the athlete has done some bench press during training and is familiar with proper technique.

3. 9 ¼ Laps

This test is a measure of maximal aerobic fitness and skating endurance. Set up cones in a 135’ x 45’ rectangle. The run-up for the first ¼ lap is 86’. This means that the starting point for each lap may not coincide with centre ice if a smaller ice surface is being used. The athletes are required to skate 9¼laps of the course as fast as possible, staying outside the cones on all corners. Record the time to the nearest second.

4. 16.78m SPRINTS

a. STATIC
b. FLYING

This is a measure of skating speed and acceleration. You will need a set of electronic timing lights for this test. There are two versions of the test – in the flying 16.78m test the player starts at the goal line and skates as fast as possible between the cones marking the course; cones should be set up on or near the blue lines to give the athlete enough acceleration space to hit full speed. The timing is started as soon as the player crosses the first blue line and stopped as soon as they cross the second line. The player should be at top speed when they hit the first blue line.

In the static test the player starts at one blue line and skates as fast as possible to the other blue line. Timing is started as started as soon as the player moves.

5. 34.78m Static Sprint

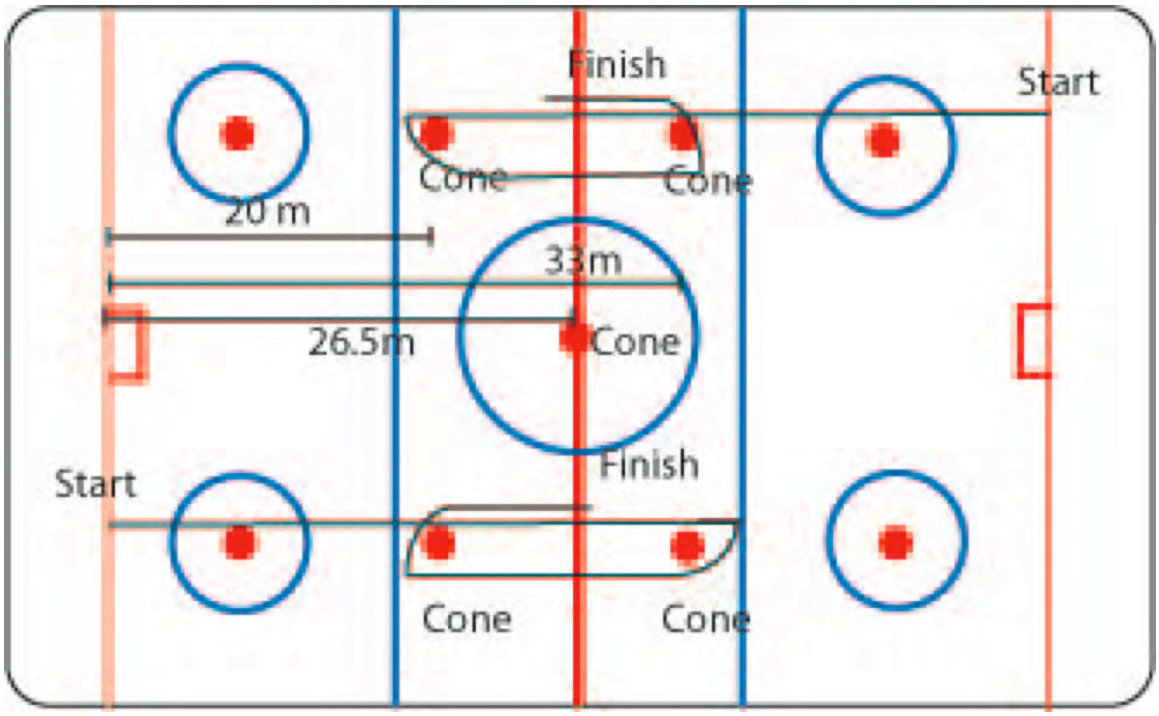
Like the previous test this is a test of speed and acceleration. The players start at the goal line and sprint 34.78m as fast as possible, which is approximately to the far blue line. Timing is started as soon as the player moves.

6. RHIET TEST (see diagram below)

The RHIET (Repeat High Intensity Endurance Test) measures anaerobic fitness and recovery. You will need an ice surface, two or more stop watches, and cones to perform this test. Measure out a distance of 20m from the goal line on the ice surface and place a cone, then measure a distance of 33m from the goal line and place a cone - the two cones should be in line with each other. On an international ice surface the cones should be close to the neutral zone face-off dots. The diagram shows the setup of the cones on the ice surface. It is very important to measure accurately. Do not assume that the line markings are the same at every arena, inaccurate measurements will make it difficult to compare yourself to the norms below.

After a warm up, two players will go simultaneously, one starting at each goal line, skate as fast as possible around the far cone, come back and round the first cone and finish by crossing the mid-line cone. Time starts when the timer yells go and is taken for the full lap. The sprint is repeated six times starting every 30 seconds. If it takes 15 seconds to do the sprint there is a 15-seconds\ rest, if it takes 25 seconds to do the sprint there is a five-second rest. The easiest way to keep track of the work and rest times is to keep one stop watch running constantly and take split times rather than stopping the watch with every trial.

RHIET Diagram



CALCULATING THE RESULTS

There are several numbers that need to be calculated once all the data has been collected. This can be done immediately following the test or later once all the athletes in the group have been tested. The calculated results represent the fitness measures.

Drop Off and Percentage Drop

Drop off and percentage drop are measures of anaerobic fitness. Low scores for both measures are ideal and show that the anaerobic alactic energy system is in good shape and capable of recovering quickly between points. High scores indicate a need for more anaerobic sprint training or poor change of direction ability, suggesting a need for more anaerobic work.

The drop off is the difference between the best score and the worst score. For example, if the athlete's best time was 12 seconds and their worst score was 14.4 seconds, the drop off would be 2.4 seconds. The percentage drop is the drop off score divided by the best score, giving you a measure of what percentage of their speed was lost. In our example the predentage drop would be 2.4s/12.0s, which equals a 0.2 or a 20% drop in speed.

The drop off should be less than 2.5 seconds and the percentage drop less than 18%. If the training program is working properly the times for test will be improving and the drop off and percentage drop will be getting smaller.

Timing

While electronic timing is the most accurate way of timing the sprints it is expensive and often not available to regional and local sledge programs. Although it seems like a simple thing, operating a stop watch introduces an element of human error into a testing session. The average error of measurement using a stopwatch is 0.2s. To help reduce this error the following procedure is recommended:

- Have two coaches take the time for each sprint and average the scores
- Start the watch when the athlete moves not on the "GO" command
- Do three repeats of each of the 16.78m and 34.78m test and average the three trials

Warm Up

Warm up prior to the test is individualized. A minimum of 10 minutes of ice time should be available prior to the start of the testing. Athletes should be encouraged to do a couple of minutes of easy skating followed by 3-4 progressively harder sprints.

Equipment

As mentioned these tests have been chosen because they require minimal equipment, you will need:

- 30m measuring tape
- Two or more stop watches or an electronic timing system
- 6-8 cones
- Pen and paper

HOCKEY CANADA NORMS AND STANDARDS

Below are tables of norms and standards for many of the tests described above. As more data is collected theses tables will be updated. The key element of these tables is the goal that has been established for each test. These goals have been picked to represent the level of fitness that will allow the team to use any style of play a coach desires and to play at an extremely high game tempo that will make it very difficult for other nations to keep up.

The labels development 1 and development 2 refer to playing level of people trying to make the national team. Development 1 athletes are those that have been invited to a national team tryout camp. Development 2 athletes are those that are playing competitive sledge hockey but have not yet reached a performance level that gets them an invitation to national team tryouts. For some of the tests there are no norms for development 2 since there have not yet been enough tests conducted on this level athlete to create accurate norms.

As can be seen the biggest differences between those athletes currently on the team and those trying to move up is skating ability, particularly speed and acceleration. Dedicated training and practice time that focuses on developing skating skills is an often overlooked part of sledge hockey but needs to become a major focus for younger developmental players.

Table 1: Sprint Tests

	9 ¼ LAPS	16.78m STATIC	16.78m FLYING	34.78m
Goal	< 3:30s	< 3.70s	< 2.60s	< 6.95s
National Team Average	3:39s	3.82s	2.67s	6.99s
Developmental 1	4:05s	4.20s	3.00s	8.20s
Developmental 2	4:25s	4.45s	3.25s	8.50s

Table 2: Strength Tests

	BODY WEIGHT	BENCH PRESS REPS w/BODY WEIGHT	PULL UPS
Goal	-------	15	15
National Team Average	176	9.2	11
Developmental 1	153	6	9
Developmental 2		4	6

Table 3: RHIET

	BEST TIME	WORST TIME	DROP OFF	% DROP OFF
Goal	< 13.00s	< 15.00s	< 15.00s	< 18%
National Team Average	12.94	14.76	13.96	14.2%
Developmental 1	15.69	19.10	17.30	21.83%
Developmental 2				