

TRAINING PROGRAM DESIGN

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INTRODUCTION

Research on training and condition for the canine athlete is not readily available, however there is much to be gained and extrapolated from horse and human research and literature. This paper will attempt to apply the available information on training and conditioning to the Greyhound Racing Dog and the Australian Sled Dog.

ASSUMPTIONS

It shall be assumed that all dogs beginning the training are mature animals (but not aged), in healthy condition, have previously been trained and raced and have been rested for a period of one month. In this period of time, the animals would have a deconditioning affect on their VO₂max and run times but their skeletal muscle fibre area, type and capillarization would not be effected by the one month rest period [12].

GOALS

The physical requirements and physiological adaptations required to perform a sprint race (Greyhound) and endurance race (Sled Dog) are very different.

The Greyhound is required to sprint at speeds up to 45 m.p.h. (72 km/ hr) [9]. The distance can vary from 5/16, 3/8, 7/16, or 9/16 of a mile (500 meters, 600 meters, 700 meters, or 900 meters) [9]. Sprinting is anaerobic in nature.

In the Iditarod, the Sled dog must race for distances up to 1 150 miles (1840 kms), [13] and often will run continuously for 10 to 12 hours between rests at speeds of 10 to 12 mph (16 – 19.2 km/hr) [15]. Shorter races usually see mushers running their dogs for only 6 or 7 hours continuously [13]. The endurance athlete must resist fatigue and injury as well as to have a well conditioned aerobic system.

Cardiorespiratory responses

Several publications have cited the need for increasing VO₂max (maximal amount of energy that can be produce aerobically) in conditioning for any sport [1 - 7]. The training subject should endeavour to maximize its cardiac output, raise the heart's stroke volume, and increase the size of the heart [1, 14], while lowering heart rate at submaximal tasks and lowering the levels of blood lactate as submaximal efforts. Peripheral perfusion must also increase [1]. Plasma and haemoglobin volumes need to increase with training to improve the rate of oxygen debt recovery [14]. Additionally, the sprint athlete should also work towards stimulating anaerobic glycolysis and increasing the lactic acid threshold while reducing the speed of onset of blood lactate accumulation [5, 8].

Musculoskeletal responses

Anaerobic activity (sprinting) relies heavily on Fast Twitch (Type IIb) muscle fibres; so a training goal is to increase the area of these fibres [1]. Fibre area of all types of muscle fibres (slow twitch and fast twitch) can improve with endurance training and endurance athletes require an increase in the ratio of type IIa fibres over type IIb fibres [12]. An increase in the capillarization of muscle and decrease in the diffusional index (area per capillary) should also occur. [12]. The stimulation of growth and contractions of fast twitch muscle cells as well as the synthesis of contractile proteins also benefits the sprinter [5].

Production of lactic acid is one of the performance limiting factors in anaerobic activity [8]. Therefore, to enhance performance for the greyhound, its body must adapt to the presence of lactic acid during training in order to avoid early onset of fatigue. Anaerobically, conditioning these animals should improve the buffering capacity of the fast twitch muscle cells to limit the fall of pH during exercise [5, 1]. Training may additionally enhance the animal's capacity to utilize lactate as a fuel during exercise and increase the concentrations of enzymes that regulate glycolysis (i.e. lactate dehydrogenase) [5] as well as to increase the muscle stores of glycogen [1]. Endurance requires adaptations in skeletal muscle energy utilization. With training, an increase in the volume density of skeletal muscle mitochondria and an increase in the aerobic enzyme activity within the mitochondria occurs [14, 12].

Certainly not to be overlooked is the skeletal structure. Bone density and a thickening of the calcified cartilage layer of articular cartilage can both be increased to strengthen and improve over all load bearing capabilities [10].

Injury Prevention

In sprinting, muscle flexibility should be adequate enough to allow full range of motion required for the activity [1], but not overly flexible which would impede the immediate transference of musculotendinous forces to the bones and potentially reduce the speed of movement [11]. Stretching to gain flexibility would not be necessary for injury prevention in the sled dog as the gait and speed at which an endurance race is run only utilizes the mid ranges of the extremity joints [11].

Overtraining and over-reaching should be avoided [5]. Overtraining is described as the loss of performance despite the maintenance of or an increase in training effort [5]. Essentially, an animal should be allowed adequate rest and recovery periods between exercise bouts to avoid this phenomenon and trainers should be instructed to monitor appetite, body weight, recovery of body weight after racing, behavioural changes, reluctance to exercise, muscle soreness, reduction in performance and slow recuperation following exercise [5]. Over-reaching is the phenomenon when the athlete experiences a sudden increase in the speeds or distances before the musculoskeletal system has fully accommodated. This can result in a sudden increase in stress on the bone, tendons or other structures [5]. Training should allow for a gradual increase

in intensity so as not to overstress the cardiovascular or musculoskeletal systems, with attention to time frames for these adaptations to occur [2, 12].

Resisting fatigue and preventing injury can be accomplished by raising VO₂max, building strength and improving oxygen metabolism mechanisms in skeletal muscles [1]. Bony and cartilaginous strengthening may also aid in preventing injury [10].

Warming up the animal prior to racing or exercise is of great importance to achieve superior performance and prevent injuries [7, 16]. A warm-up of 5 to 10 minutes is more beneficial for improving oxygen kinetics than a shorter warm up period [7]. There are conflicting finds however, as to whether warming-up has any effect on performance in speed activities [1]. Some literature also sites that endurance athletes perform better with five minutes of vigorous high intensity warm ups that include some sprinting [1]. Essentially, heating of muscle tissues can improve musculotendinous extensibility and may thereby reduce its susceptibility to strain injury [17]. The cool down should be at least 20 minutes of walking after an especially strenuous session [5].

Attention to skill training, training on different surfaces or in adverse conditions can aid in avoiding injuries on 'race day' [5]. Appropriate racing paces for the sled dogs should be trialed to resist fatigue in both normal conditions and adverse weather (i.e. excessive heat) [5, 13, 15].

PROPOSED EXERCISE REGIMES

All dogs participating in the conditioning program should first have a veterinary medical evaluation to determine health of the animal and a physiotherapy evaluation to evaluate soft tissue, spine and extremity joint functioning. The two programs have been divided into three parts; preparation phase, specific training phase and competition phase [18]. Incremental progressions have been incorporated into each week's program, ensuring that no more than one or two components of the program are progressed at a time [1]. The preparation (base training) phase is 6 weeks long to allow for cardiorespiratory responses (VO₂max, capillarization and muscle fibre area) [12]. Further muscle adaptations, skeletal bone responses and muscle mitochondrial oxidative capacity will improve over the next 5 weeks of specific training [5, 10, 12, 24]. A longer competition phase would be advantageous to train for more strenuous or longer races and allow for longer bouts of submaximal intensity training, which have been found to correlate with endurance performance at high intensities [18].

Animals should be evaluated for resting heart rate (HR), maximum heart rates and lactate levels at week 3 (ensure that maximal heart rate testing on the animal is not completed too early in the training session) [5, 14], and again at the end of each training stage. This is most easily / practically accomplished by having the animal exert a maximal effort on the treadmill (until signs of fatigue) while monitoring heart rate. Following the exercise session, a blood sample taken 3 – 5 minutes after exercise should be tested for blood lactate concentrations. Strenuous training should result in blood lactate levels of 4 – 8 mmol/L [5]. The maximum heart rate for this

session should be noted using a wireless heart rate monitor. Utilizing this data, VO₂max can be determined. The formula for percentage of VO₂max is as follows:

$$(\text{Exercise HR} - \text{Resting HR}) \div (\text{Maximal HR} - \text{Resting HR}) [1].$$

This information will allow the trainer to utilize heart rate to determine the VO₂max or percentage of VO₂max when training the animal during endurance sessions (preparation stage and specific training stage).

Additionally, the animal should be regularly tested for signs of overtraining (in the specific training and competition phases) using a blood test to determine levels of aspartate aminotransferase (AST) in the blood plasma [5]. The blood sample needs to be taken at the same time of the day and week for accuracy [5]. The trainer will be instructed to monitor for signs of overtraining, and a monthly physiotherapy evaluation should be conducted to monitor the musculoskeletal well being of the dogs in training; treating symptoms as needed.

The Racing Greyhound

The sprint racing athlete should engage first in a base training (preparation phase) regime to increase cardiovascular and respiratory responses. This can be accomplished with 3 days a week of endurance training with duration of 20 – 30 minutes [1, 2, 3, 5]. To increase the effects of the base training, the training days per week can be increased to six [2, 5, 12]. Base training should not be incorporated with sprint training [5]. (See table 1)

Table 1: A preparation stage and base training program for racing Greyhounds using a land treadmill (10% incline).

PREPARATION STAGE: (BASE TRAINING)

<u>WEEK</u>	<u>ACTIVITY & INTENSITY</u>	<u>FREQUENCY</u>	<u>DURATION</u>
1	Light trot on treadmill (60% VO ₂ max)	3 days a week	20 minutes
2	Light trot on treadmill (60% VO ₂ max)	3 days a week	30 minutes
3	Light trot on treadmill (60% VO ₂ max) Fast canter on treadmill (80% VO ₂ max)	3 days a week 1 day a week	30 minutes 20 minutes
4	Light trot on treadmill (60% VO ₂ max) Fast canter on treadmill (80% VO ₂ max)	2 days a week 2 days a week	30 minutes 20 minutes
5	Light trot on treadmill (60% VO ₂ max) Slow Gallop on treadmill (>80% VO ₂ max)	2 days a week 2 days a week	30 minutes 20 minutes
6	Light trot on treadmill (60% VO ₂ max)	2 days a week	30 minutes

	Slow gallop on treadmill (>80% VO₂max)	4 days a week	20 minutes
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The second stage of training is more specific to the type of competition in which dog competes. The animal must be allowed adequate rest and recovery times between sprinting session in order to avoid fatiguing the animal [5, 12, 19]. Between the 100 meter sprint bouts (see Table 2), the animal should be given 45 second rests, and between the longer sprinting distances, the animal should receive 12 or more minutes of rest between sprints [19]. Studies have found that performance in speed and acceleration are only correlated to training for these components [20, 21]. Additionally, adding weights or towing weights tends to disrupt the normal acceleration kinematics which could have deleterious effects on performance [22, 23]. Sprint training and skill training should not be performed on a treadmill, but rather, in the environment where the task will be performed in competition [5].

Table 2: A specific training stage program for racing Greyhounds using a combination of a land treadmill(10% incline) and track training.

SPECIFIC TRAINING STAGE

<u>WEEK</u>	<u>ACTIVITY & INTENSITY</u>	<u>FREQUENCY</u>	<u>DURATION</u>
7	Light trot on treadmill (60% VO₂max) 3 sprint bouts of 100 meters and 3 sprints of 300 meters (track)	3 days a week 3 days a week	20 minutes N/A
8	Light trot on treadmill (60% VO₂max) 4 sprint bouts of 100 meters and 4 sprints of 300 meters (track)	3 days a week 3 days a week	20 minutes N/A
9	Light trot on treadmill (50% VO₂max) 5 sprint bouts of 100 meters and 5 sprints of 400 meters (track)	3 days a week 3 days a week	20 minutes N/A
10	Light trot on treadmill (50% VO₂max) 6 sprint bouts of 100 meters and 6 sprints of 400 meters (track)	3 days a week 3 days a week	20 minutes N/A
11	Light trot on treadmill (40% VO₂max) 7 sprint bouts of 100 meters and 7 sprints of 400 meters (track)	3 days a week 3 days a week	20 minutes N/A

In the competition phase of training, avoiding fatigue is most important. The rest days and recovery periods should be strictly adhered to (see above), only allowing enough activity to 'keep the animal happy' [19, 5]. The sprint training days should be divided into two sessions.

The time between these two sessions should be three times the duration (time) of the first training session [5]. (See table 3)

Table 3: A competition stage program for racing Greyhounds using a combination of track training and leash walking.

COMPETITION STAGE

<u>WEEK</u>	<u>ACTIVITY & INTENSITY</u>	<u>FREQUENCY</u>	<u>DURATION</u>
12	Walk on lead (30% VO _{2max})	3 days a week	20 – 30 minutes
	2 sprint bouts of 100 meters and	3 days a week	N/A
	3 sprints of 500 meters (track)	(2 sessions / day)	
13	Walk on lead (30% VO _{2max})	3 days a week	20 – 30 minutes
	2 sprint bouts of 100 meters,	3 days a week	N/A
	2 sprints of 500 meters and	(2 sessions / day)	
	1 sprint of 600 meters (track)		
14	Walk on lead (30% VO _{2max})	3 days a week	20 – 30 minutes
	2 sprint bouts of 100 meters	3 days a week	N/A
	1 sprint of 500 meters,	(2 sessions / day)	
	1 sprint of 600 meters,		
	1 sprint of 700 meters and		
	1 sprint of 900 meters (track)		
15	Walk on lead (30% VO _{2max})	3 days a week	20 – 30 minutes
	2 sprint bouts of 100 meters	3 days a week	N/A
	1 sprint of 500 meters,	(2 sessions / day)	
	1 sprint of 600 meters,		

16	2 sprints of 700 meters and 1 sprint of 900 meters (track)	3 days a week	20 – 30 minutes
	Walk on lead (30% VO _{2max}) 2 sprints of 100 meters 1 sprints of 500 meters, 1 sprints of 600 meters, 1 sprint of 700 meters and 2 sprint of 900 meters (track)	3 days a week (2 sessions / day)	N/A

The Sled Dog

Practicalities in training a sled dog team vary from training an individual dog. The program below is intended to be done with animals attached to a light weight sled and being conditioned as a group. Individual animal training for a dog sled team would be time prohibitive and ‘man-power’ intensive when working with upwards of 16 dogs. Additional differences in the training programs of the Greyhound and Sled dog reflect the competition need. The Sled dog will rarely break out of a trotting gait in a race situation; their base training program endeavors to increase distance / duration of the training session as compared to gait speeds. Additionally, a recent study reported that successful human endurance runners traditionally train 71% of the time at light intensity, 21% of the time at moderate intensity and only 8% of the time at high intensity [18].

Table 4: A preparation phase and base training program for sled dogs using land training while hooked to a light weight sled.

PREPARATION STAGE (BASE TRAINING):

<u>WEEK</u>	<u>ACTIVITY / INTENSITY</u>	<u>FREQUENCY</u>	<u>DURATION</u>
1	Slow trotting (flat land or track training) (60% VO _{2max})	3 days a week	20 minutes
2	Slow trotting (flat land or track training) (60% VO _{2max})	3 days a week	30 minutes

3	Slow trotting (flat land or track training) (60% VO₂max)	3 days a week	30 minutes
	Faster trotting (flat land or track training) (80%VO₂max)	1 day a week	30 minutes
4	Slow trotting (flat land or track training) (60% VO₂max)	2 days a week	40 minutes
	Faster trotting (flat land or track training) (80%VO₂max)	2 days a week	30 minutes
5	Slow trotting (flat land or track training) (60% VO₂max)	3 days a week	40 minutes
	Faster trotting (flat land or track training) (80%VO₂max)	3 days a week	30 minutes
6	Slow trotting (flat land or track training) (60% VO₂max)	3 days a week	40 minutes
	Faster trotting (flat land or track training) (80%VO₂max)	3 days a week	40 minutes

The goal of the specific training stage is to increase endurance and strength of the sled dog. The sessions are gradually increased in duration and weight training is added as a strengthening component on 'day 6' so as to allow a full day of rest following the heavy intensity [19]. The sled dog is not likely to be as motivated to sprint as a Greyhound and for practicality reasons; sprint training has been replaced by using packs with weights and/or hill work. The moderate and light intensity days are to be alternated. When two training sessions are completed within the

same day, a recovery period of 3x the amount of the morning exercise session should be allowed before commencing in the afternoon / evening session.

Table 5: A specific training stage program for sled dogs using land training while hooked to a weighted sled with all or a portion of the team.

SPECIFIC TRAINING STAGE:

<u>WEEK</u>	<u>ACTIVITY & INTENSITY</u>	<u>FREQUENCY</u>	<u>DURATION</u>
7	Moderate intensity (flat land or track training) (80% VO _{2max})	2 days a week, Once a day	40 minutes
	Light intensity (flat land or track training) (60% VO _{2max})	2 days a week, Twice a day	30 minutes
	Hill work with weighted sled – 3kg per dog (outdoor hilly terrain) (>80% VO _{2max})	1 day a week (day 6)	20 minutes
8	Moderate intensity (flat land or track training) (80% VO _{2max})	2 days a week, Once a day	50 minutes
	Light intensity (flat land or track training) (60% VO _{2max})	2 days a week, Twice a day	
	Hill work with a weighted sled – 4 kg per dog (outdoor hilly terrain) (>80% VO _{2max})	1 day a week (day 6)	40 minutes
	Moderate intensity (flat land or track training) (80% VO _{2max})		20 minutes
9	Light intensity (flat land or track training) (60% VO _{2max})	2 days a week, Once a day	60 minutes
	Hill work with a weighted sled – 5 kg per dog (outdoor hilly terrain) (>80% VO _{2max})	2 days a week, Twice a day	
	Moderate intensity (flat land or track training) (80% VO _{2max})	1 day a week (day 6)	50 minutes
	Light intensity (flat land or track training) (60% VO _{2max})	2 days a week,	

10	Hill work with a weighted sled – 6 kg per dog (outdoor hilly terrain) (>80% VO _{2max})	Once a day	20 minutes
		2 days a week, Twice a day	
	Moderate intensity (flat land or track training) (80% VO _{2max})	1 day a week (day 6)	70 minutes
	Light intensity (flat land or track training) (60% VO _{2max})		70 minutes
11	Hill work with a weighted sled – 7 kg per dog (outdoor hilly terrain) (>80% VO _{2max})	2 days a week, Once a day	70 minutes
		2 days a week, Twice a day	20 minutes
		1 day a week (day 6)	
			80 minutes
			90 minutes
		20 minutes	

The goal of the competition phase of training is to increase time and distance of running and introduce competition day paces and environmental factors. The once a day sessions can be longer and progresses weekly. The twice a day sessions need to be limited to two hours to allow for a 6 hour rest between sessions. The once a day sessions can be increased weekly to reflect the distances / time required in competition.

Table 6: A competition training stage program for sled dogs using land training while hooked to a light weight sled with all or a portion of the team.

COMPETITION STAGE PROGRAM:

<u>WEEK</u>	<u>ACTIVITY & INTENSITY</u>	<u>FREQUENCY</u>	<u>DURATION</u>

12	<p>Light intensity (flat land or track training) (60% VO_{2max})</p> <p>Moderate intensity (flat land or track training) (80% VO_{2max})</p> <p>Hill work or muddy terrain (>80% VO_{2max}) on same day as a light intensity work out (60% VO_{2max})</p>	<p>2 days a week Twice a day</p> <p>2 days a week Once a day</p> <p>1 day a week Once a day each (day 6)</p>	<p>90 minutes</p> <p>80 minutes</p> <p>40 minutes and 90 minutes respectively</p>
13	<p>Light intensity (flat land or track training) (60% VO_{2max})</p> <p>Light to moderate intensity (on typical racing terrain) (60 - 80% VO_{2max})</p> <p>Interval training 10 minutes of light intensity followed by 15 seconds of high intensity / speed (repeated) (>80% VO_{2max})</p>	<p>4 days a week Twice a day</p> <p>2 days a week Once a day</p> <p>1 day a week Once a day (day 6)</p>	<p>120 minutes</p> <p>180 minutes</p> <p>90 minutes of total work</p>
14	<p>Light intensity (flat land or track training) (60% VO_{2max})</p> <p>Light to Moderate intensity (on typical racing terrain) (60 - 80% VO_{2max})</p>	<p>4 days a week Twice a day</p> <p>2 days a week Once a day</p>	<p>120 minutes</p> <p>240 minutes</p>
15	<p>Hill work or muddy terrain (>80% VO_{2max}) on same day as a light intensity work out (60% VO_{2max})</p> <p>Light to Moderate intensity (on typical racing terrain) (60 - 80% VO_{2max})</p> <p>Light to Moderate intensity (flat land or track training) (60 - 80% VO_{2max})</p>	<p>2 days a week Twice a day</p> <p>2 days a week Once a day each</p>	<p>90 minutes and 150 minutes respectively</p>

16	Light to Moderate intensity (on typical racing terrain) (60 - 80% VO ₂ max)	2 days a week	300 minutes
		Once a day	
		3 days a week	240 minutes
		Once a day	
		3 days a week	360 minutes
		Once a day	

OUTCOME MEASURES

After the preparation stage, assessment of performance can be evaluated. For the Greyhound, timing the sprint speed for each given distance will serve as an outcome measure from week to week. The Sled dog may utilize distance markers and time elapsed to reach each marker while on a track or trail. Comparing marker times from week to week, bearing in mind the desired intensity of the training session, will give objective measurements of performance. Heart rates can be taken using a wireless heart rate monitor during training sessions or manually after a session to determine work load of the animal. Muscle biopsies, lab tests or fitness tests could be performed at the trainers request to determine physiological effects of training. The author feels that these training programs have the potential to produce superior performance results based on research findings for non-canine species.

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