

SPORTS MEDICINE SYMPOSIUM

Dog Owners and Breeders Symposium

University of Florida

College of Veterinary Medicine

July 29, 2000

Dr. Robert Gillette, DVM, MSE

Director of the Sports Medicine Program

College of Veterinary Medicine

Auburn University, AL

Optimizing Canine Performance: An Introduction¹

Canine performance is dependent upon the expectations of the owner, handler, or trainer. The dog is capable of participating in many various physical activities at many different levels. Pet dogs can serve as workout companions for their owners, they can participate in fun competitions, they can perform a working role, or they can compete at a professional level. How we judge performance is dependent upon the activity in which the dog is performing and at what level. A common mistake is to have performance expectations that are higher than the dog is capable of performing. Therefore it is important to have a good working knowledge of your dog's abilities. The handler should understand the factors that influence their dog's performance. These factors include genetics, anatomy, physiology and psychology influences. Our ultimate goal should be to optimize performance and minimize the stresses of the activity.

Optimum performance is dependent upon the dog's athletic potential, its conditioning level and its methods of training. Athletic potential is dependent upon the performance requirements of the athletic event and the amount of inherited potential with which it was born to perform that event. When the dog is conditioned properly to perform an event, its energy and thoughts are focused towards performing the tasks of the event. Dogs that are not conditioned properly must deal with the affects of fatigue. They are not mentally focused on their tasks, which limits their ability to perform. Also, as the body becomes fatigued it has an increased risk of injury. The dog's body should be properly conditioned for performance. The training program should be designed to acclimate the dog towards the rigors and demands of its performance event. As a dog becomes more accustomed to the performance routine, there is a decrease in the amount of stress placed on the dog in performing the event. Minimizing stress will allow the dog to focus on performance. Optimum performance occurs as a result of excellent breeding, peak conditioning, and the proper training.

¹ The Information provided in this manuscript is taken from: Gillette, R.L. (2000). *Athletic and Working Dogs, A guide to Maximizing Athletic Potential: Part 1 Understanding and Evaluating Performance*. A personal publication by Robert L. Gillette, © 2000.

Genetics play a very big role in the performance of every dog. Proper breeding provides our dogs with the abilities needed to perform their designated activities. If the owner has determined the activity in which they would like to participate, they can either breed for performance potential or they can purchase a dog that has been bred to perform that activity. On the other hand, if an owner already has a dog that they would like to work with, they must determine the activity that best suits athletic potential of that dog. For example, a Rat Terrier was not bred to participate competitively in oval track racing, as was the Greyhound. It would be more competitive in the sport of Earth Dog. Because of genetics, the Greyhound is not anatomically designed to participate in this sport and is better at oval track racing. Genetics also play a role at a more finite level. Certain bloodlines have more athletic potential than other bloodlines. If given the option, always select from the best potential breeding pair, it enhances your performance possibilities.

The anatomy of a dog can affect how the dog performs and its career longevity. In general, the proper conformation can allow the dog to function better and more efficiently than a dog with poor conformation. Poor conformation can predispose a dog to athletic injuries. Certain anatomical structures and body designs are more suited to certain events than other events, as seen in the Rat Terrier/Greyhound example previously mentioned. The anatomy of the functioning systems is just as important as body structure. The body of a Foxhound is better suited for endurance running than the body of a sighthound. The body of an endurance dog is designed to utilize aerobic metabolism more efficiently than the dogs built for sprint or strength activity.

The physiology influences are related to training and conditioning. We cannot change how the body was genetically assembled, but we can train the body systems to function maximally when performing an activity. A body that is trained and conditioned properly for a specific activity will allow for maximum performance and minimal stress. First, the dog should be in good general health. Second, the dog should be immunized and dewormed to prevent any subclinical illnesses from affecting the body's metabolism. Third, the body should be trained to handle the rigors of the work. Lastly, the body should be placed on a conditioning program that maximizes the body's abilities to perform the event.

A frequently forgotten influence on performance is its psychological status. A dog that is a structurally sound, in the best of conditioning, but does not have the desire to perform will continually show poor performances. Sometimes a dog is too excited and this elevated drive creates performance errors. The proper training program should include simulated working conditions or competitive events to prepare the dog for the excitement of the actual event.

Factors That Affect Performance

Every time the dog completes an event factors affect how the dog performed that event. Dogs are affected by internal factors and external factors. The internal factors include anatomical make-up, physiological function, and psychological influence. The external factors include: environmental climate and location, dog interaction, handling, functional demands and event factors. Understanding the factors involved in performance helps us to develop the knowledge we need to determine the best way to train and manage the canine athlete. These factors affect

the dog in various ways, both positively and negatively. Some dogs are able to handle certain factors better than other dogs.

External Factors

We usually do not have any control over the environmental factors. Weather factors can include heat, cold, humidity, rain or snow if the dog is working outdoors. If the dog is working indoors, we might have some control over the temperature and the humidity. The terrain can also influence a dog's performance. Rocky, mountainous, sloped terrain will be different to work on than a sandy terrain. Indoors, a hard surface may accentuate paw lameness more than a padded surface. Many different environmental factors can influence how a dog performs.

Dog interaction can influence how a dog performs. In a dog race or a coursing race, one dog can influence the dog next to it by accidentally bumping it. Dogs can also affect other dogs psychologically and emotionally. This occurs in both multiple dog workouts and single dog events. A male pointing dog's performance is usually affected when put together with a female pointer for the first time. If two dogs are kenneled together the night before a single event competition, and one is a "barker" it can keep the other dog from getting a good rest. This can affect how both dogs perform the next day. Also, health factors can be a problem when two dogs come into contact. Some dogs are affected by the presence of other dogs and in some it doesn't make a difference.

In work or competitions where the dog is worked by a handler, the handler plays a very big role in how he performs its tasks. This is both physically and psychologically. If a handler is worried or tense, the dog will feed off this. In the work where the dog performs by the handler's command, their performance can be bad because of poor handler control. This is a non-factor in the sports and work where the dogs perform alone, without the handler.

In certain sports the functional demands of the competition change. For example, in coursing and agility events the course design and setup will change between one competition and the next. The slopes of the terrain may be different or an obstacle may be added. A dog may be able to handle one setup better than another. This can then become a factor, and must be taken into consideration when evaluating its performance on the two courses.

The designs and boundaries of a course may change. In field trial dogs the time of competition can be different, for example a thirty-minute trial, a sixty-minute trial and a one hundred eighty minute trial. Certain dogs can perform better in a thirty-minute trial, and will not perform as well in a sixty-minute trial. In racing Greyhounds the length of the race can vary, for example, a 5/16-mile race versus a 3/8-mile race. If a Greyhound is changed from a shorter race to a longer race and performs better, it could be because the Greyhound prefers longer distances, or it could be the Greyhound just had a cleaner race. The design and boundaries of an event should be taken into consideration when evaluating and comparing a dog's individual performances.

Internal Factors

The internal factors that affect performance are the dog's anatomical structure, its physiological status and its psychological state. Any one of the three factors is no less important than the other ones. A dog that is a structurally sound dog, in the best of conditioning, but does not have the desire to perform will continually show poor performances. On the other hand a dog that is very driven to execute, but is not sound or is in poor health will also have poor performances. Our canine athletes must be in top physical and psychological condition to attain optimal performance.

There are three basic conditions that negatively affect performance. These conditions are pain, fatigue, and psychological alterations. The most common performance inhibitor is pain or musculoskeletal lameness. A grading system has been created by the author to help veterinarians determine the relevance of a problem to the function and performance of their patient. The five grades of musculoskeletal or physiological abnormalities in relation to performance are defined by the degree that the abnormality affects performance.

- I. Asymptomatic
- II. Symptomatic but performance unaffected
- III. Symptomatic and performance affected
- IV. Performance inhibiting
- V. Career ending

The injuries that can have the most deleterious affects on a single performance or a career are Grade I, II or III injuries. They often go unnoticed by the handler or trainer or are dismissed as not important by the veterinarian. These injuries alter the dog's movement just enough to affect performance or create secondary and tertiary problems that lead to Grade IV or V injuries.

Fatigue is a major factor in the canine athlete, especially those dogs that participate in endurance activities. The best way to prevent fatigue is to provide a proper nutrition and conditioning program that prepares the physiological systems to handle the stresses of performance. There are some medical reasons for a dog to show early signs of fatigue. These problems can usually be determined by having the veterinarian perform a hematological test, blood chemistries, thyroid blood levels, urinalysis, and a fecal on your dog. Most physiological performance problems can be detected from this data.

Psychological problems can occur as a result of lameness or a metabolic problem. For this reason, a good performance evaluation should be performed by an experienced sports medicine veterinarian before changing the training program. Too often, a trainer will assume a performance problem is a result of a training mistake or another handling problem when actually the problem is physical. Once the physical reasons are ruled out, training and behavioral problems can be addressed.

We must provide all the ingredients for our dog to perform optimally and at the same time minimize any damage that could occur as a result of that performance. Cellular or systemic injury occurs to some degree during each workout, which in turn can affect subsequent workouts.

Realizing this, it is up to the owners or trainers to address this element in their training and conditioning programs. To attain peak performance and career longevity, the training and conditioning regimen must address the extremes of competition.

Canine Conditioning Methodology²

Our canine athletes must be in top condition to attain optimal performance. Realizing this, it is up to the owners or trainers to address this element in their training and conditioning programs. To attain peak performance and career longevity the training, conditioning and nutritional regimen must address the extremes of competition and prepare the body metabolism to meet these demands.

Understanding what happens to our dogs in competition helps us to determine the care of our athletic companions. The body systems involved in performance are the muscular, skeletal, nervous, cardiovascular, respiratory, gastrointestinal, renal, hormonal and skin. Every athletic event includes some form of movement. Movement is a result of the muscles moving bones according to neuronal stimulation. The other systems work together to provide or maintain all the components needed to allow this function to occur. Muscles are used in propulsion and navigation of the body. The skeleton provides support and structure to the body. The nervous system provides stimulation, balance and direction. The cardiovascular system provides energy to the cells and removes the energy by-products. The respiratory system provides gaseous exchange and thermoregulation. The gastrointestinal tract produces energy and removes waste. The renal system provides fluid balance and waste removal. The hormones act to maintain balanced metabolism. The skin provides a protective covering from the environment, an outer membrane to the internal organs, and is responsible for optimal hair coat. Peak performance of the body as a whole is a result of the optimal, balanced output of these systems.

Since movement and body condition are factors that are common to all athletic competitions, an understanding of muscle physiology and the activity of the body during movement can help to determine how you manage your athletic or working dog. Skeletal muscles in general connect one bone to another bone. Each muscle, itself, is made up of thousands of individual muscle cells. Inside these cells are filaments composed of protein. Actin and myosin are the two types of protein chains. They interact as a result of enzyme and chemical reactions to produce muscle cell contraction. Enzymes are protein molecules that specifically interact with the actin and myosin substrates to allow the chemical reactions to occur. Calcium and phosphate, in the form of adenosine triphosphate (ATP), are the chemical components of contraction. ATP is located at the end of the myosin leverage arm. A calcium ion opens a receptor site on the actin protein chain. Energy is created when ATP releases a phosphate (P) ion producing adenosine diphosphate (ADP). The resultant energy allows the ADP to create a bond between the open actin receptor site and the myosin leverage arm. This bond changes the myosin structure providing a leverage action to produce a muscle contraction between the two fibers. The ADP is released and the lever arm is freed to reattach. Energy is then required to add a P to the ADP recreating ATP, which is then used for further contractions.

² The information for this manuscript was taken from: Gillette, R.L. (1998). Maximizing Performance of the Canine Athlete. Proceedings of the Australian Greyhound Veterinary Association Conference (pp 7-8). Sydney, Australia

The body needs energy to maintain homeostasis, and additional energy during physical activity. The body utilizes three systems to provide this energy. The type of activity defines which of the systems will be used. The immediate energy source is from the one enzyme system. It provides energy for the first five seconds up to twenty seconds. This system uses intracellular ATP, creatine phosphate (CP), and the ADP/myokinase reaction to provide energy for the increased body activity. The glycolytic pathway provides energy from five to twenty seconds up to two minutes. Energy comes from the anaerobic breakdown of glucose and is a more complicated form of energy production involving multiple steps and enzymes. The third energy source is from oxidative metabolism. It starts approximately two to four minutes after the start of the physical exercise. It is the most complicated energy system. It can use various substrates and is the most efficient system. When the body performs at a level greater than its normal daily routine, there is a greater demand for energy. The systems as a whole must work together to provide energy to the areas of need and at the same time maintain homeostasis. Therefore, the fuel resources must be at a level to meet this demand and accessible to be used as an energy source. Workout repetition compels the body to adapt itself to meet these demands. It begins by pooling energy sources at the location of greatest need, i.e. intracellular ATP, CP and glucose. Then it increases the production of the specific enzymes required for the most utilized energy systems. Workout repetition conditions the body to the stresses of competition and minimizes the chance of systemic or cellular injury.

Muscle cell types are differentiated by their energy source, contractile strength, fatigability and their energy system. Genetics play a role in cell type composition of each individual's muscle make-up. The two types of muscle fibers in the dog are the slow-twitch (type I) and the fast-twitch (type II) fibers. The slow twitch muscle fibers uses mostly aerobic energy via the oxidative energy pathway. It has a low contractile force, but is highly resistant to fatigue. Fast twitch muscle fibers utilize the glycolytic energy pathway and the one enzyme energy sources. They have a strong contractile force, but have a low resistance to fatigue. Most of the dog's type II fibers can utilize both anaerobic and aerobic energy. Nutritional, training, and conditioning programs are based on the special requirements of the different muscle types.

Once we have determined the components of competition, we can then organize our management program accordingly. Genetically we should breed for performance. Many of the essential anatomical and physiological parameters are determined genetically. The husbandry and training protocols should be defined by the factors of competition. All aspects of the body must be prepared for competition. The enzymes, proteins and chemicals must be available for proper cellular function. The transport systems must be trained and conditioned to meet the demands of competition. The everyday workout routine and feeding schedule must prepare the body for the competitive schedule that lies ahead. Once the body is trained for maximal output, we must keep the body conditioned for the rigors of competition. The ideal conditioning program maintains this level and prepares the body for optimal output when needed during competition. At the same time, this conditioning program works to minimize the damage that occurs during an athletic performance. A poorly conditioned dog is very susceptible to tissue injury and cellular damage. The goal should be for a winning career not just a winning performance.

Nutritional needs change throughout the life of an athlete. When the dog is growing the attention is towards proper, healthy structural growth. Once training begins structure is still important, but the additional ingredients should be added for the increased physical activity. As the athlete prepares for competition, feeding times become important. The basic feeding program should provide for the basic nutritional needs of the competitive season. The content of protein, carbohydrate, and fat in the feeding program is determined by the type of competition the dog will be performing. For example, dogs that perform in events that are less than two minutes will need a lower percentage of fat in their diets than those that perform in endurance events. Dogs that compete in events that are longer than two minutes require more components of the oxidative cycle. In addition, dogs that compete in events that require low energy needs should be fed a diet with a lower calorie content than those that compete in events that require higher energy levels. When defining the dietary needs of a particular athlete, first determine the physiology that is involved with the particular event.

Supplemental feeding should be timed to benefit and not hinder performance. Pre-competition snacking should be done at least two hours prior to the start of the event. This is dependent upon the ingredients of the snack, i.e. complex carbohydrates should be given at least four hours prior to competition or they can actually hinder performance. The purpose of this supplement is to round off any energy pools that may not quite be maximally filled. Simple carbohydrates would be appropriate along with vitamins E and B-complex. The most important feeding time is the post-competition snack. This is the optimum time to replenish the nutrients that have been depleted during the athletic event. Immediately after the competition and for the next one-half hour to an hour, all of the systems of the body are devoted to replenishing the deficits of the energy systems. Feeding the snack during this period promotes the uptake and optimizes replenishment of the deficient nutrients at the proper locations. This snack should be made up of simple carbohydrates, a meat protein source, calcium, phosphorus, and the hematological supplements.

Individuals that work with the canine athlete must understand the physiology of competition and work performance. The handler that has an understanding of the events that their dog performs is better able to adapt the training, conditioning and nutritional program to the schedule of their canine athlete or working dog.