Kinetics of Weight Loss
Caroline Adamson, MSPT, CCRP

KINETICS OF WEIGHT LOSS

With the growing interest and excitement in veterinary rehabilitation, it becomes difficult to pick a single topic in which to present. These next two hours will cover a mish-mosh variety of subjects related to veterinary physical therapy: from obesity and the kinetics of weight loss, to practical applications of neurological physical therapy techniques to one of the newest fields of veterinary rehabilitation, orthotics and prosthetics.

Obesity is a common, growing problem in our animal patients. Obesity has been well-documented to contribute to or exacerbate certain diseases processes including metabolic alterations, endocrinopathies and other functional disorders such as degenerative joint disease, dyspnea, exercise intolerance and cardiovascular disease.[1] This portion of the lecture will cover the preliminary results of an ongoing kinetic study that will measure the change in forces in the forelimbs and hindlimbs due to weight loss alone.

It was purported that a positive change in gait associated with weight loss will show less force on the limbs once targeted weight loss is achieved. To ensure that results would not be skewed by underlying orthopedic conditions, study animals had their hips and stifles radiographed to rule out orthopedic disease. Each animal underwent a full nutritional evaluation and trialed through our gait laboratory at Alameda East Veterinary Hospital prior to and again after target weight loss was achieved.

For each animal, an exercise program was designed aimed at conditioning an otherwise healthy dog through the use of swimming, underwater treadmill activity, land treadmill activity, and interaction in a daycares setting with other dogs boarding at Animal Lodge at Alameda East Veterinary Hospital. In addition, obesity could be accurately assessed through the use of Dual-Energy X-Ray Absorptiometry (DEXA) and a nutritional program could be designed and implemented.

Protocol

Gait analysis was performed in the Clare and Eugene Thaw Biomechanics Laboratory and included the use of 2 force platforms and a motion analysis system. All dogs were trotted across the force plates guided by a handler while on a leash. Walking trials were accepted when the walking velocity is between 1.0 and 1.3m/s without any significant acceleration or deceleration (+/- 0.5m/s2); while trotting trials were accepted when the velocity was between 1.7 and 2.0m/s with the same acceleration constraints. At the same time, the paws of the dogs must hit the force plates cleanly, the dogs should not move their heads excessively and they should walk in a straight path. The best 5 trials were selected for each velocity condition for each dog for further analysis.

Two OR-6-6 force plates (AMTI, Watertown, MA) are mounted longitudinally, in a row and flush with the floor in the center of the Biomechanics Laboratory. Three-dimensional

ground reaction forces and moments are recorded using Acquire 7.3 (Sharon Software Inc) and stored on disk for further analysis.

Data analysis
The Acquire 7.3 software will be used to extract the following parameters from the force plate data: peak vertical force (PVF); vertical impulse (VI); peak breaking force (PBF); breaking impulse (BI); peak propulsion force (PPF); and propulsion impulse (PI). All variables will be normalized to bodyweight.

When target weight loss is achieved, animals are dogs are again trialed through the gait laboratory and sedated for a second DEXA scan to reassess body. This study continues to evaluate a larger number of dogs before any definitive conclusions can be drawn. In addition, further research may result in information that could help in the formulation of exercise programs that would maximize fat loss while preserving lean muscle mass. Information generated may be useful in determining the caloric requirements for weight loss that would maintain a maximum of lean muscle mass.

References

1. Hand, Thatcher, Remillard, Roudebush. *Small Animal Clinical Nutrition.* 4th Ed. Mark Morris Institute:2000.