Observations on Assistance Dog Training and Use

Raymond Coppinger, Lorna Coppinger, and Ellen Skillings

Hampshire College

Trained service dogs assist and also add pride, self-reliance, and personal satisfaction to an individual’s daily life. However, well-bred, trained dogs are very expensive. To explore decreasing the cost of a service dog by increasing the number of dogs successfully completing training, the authors analyzed tasks that service dogs are expected to perform, measuring some of the inherent physical stresses the dogs encounter and considering training techniques to better prepare the dogs for more successful completion of tasks. Observing working dogs, the authors found that undue stress was placed on many of the dogs while performing tasks; that motivational gestures for performance were not fully extended; and that, many times, handlers did not instruct the dogs properly. The working dogs observed often were required to perform tasks that put them at risk of injury and performance failure. Important future considerations for training and handling working dogs will include proper training of handlers and a better understanding of the complexities of the instinctive and physical capabilities and limitation of dogs.

The most common working dogs in the next century may well be dogs who assist people with tasks that they could not perform by themselves. A recent report (Sandler, 1996) estimated that 10,000 dogs are already doing this work. Some of the working dogs guide people who have sensory disabilities, alerting them to sounds and events or both; others retrieve objects, pull wheelchairs, open doors. A trained service dog can add pride, self-reliance, and personal satisfaction to people’s daily lives (Eddy, Hart, & Boltz, 1988; Hart, Hart, & Bergin, 1987).

Well-bred, trained dogs are expensive. Top working dogs can command prices of up to $10,000 and even as much $20,000 (Allen & Blascovich, 1996). Unfortunately, many of those who need the assistance of a working dog cannot afford to pay this price. The cost of the dog who graduates is directly related to the number of dogs who do not graduate. Published data on this ratio is difficult to find, but professionals continue to seek breeding and training methods to achieve higher success ratios (Goddard & Beilharz, 1982–1983).

Requests for reprints should be sent to Raymond Coppinger, Box CCS, Hampshire College, Amherst, MA 01002.
In 1992, Dr. Bonnie Bergin, president of the Assistance Dog Institute, appointed a committee of canine specialists to study the problems dogs have in completing their training and continuing proper behavior once they go to clients. The suggestion to the committee was to think about how to breed "better" job-specific assistance dogs. The report addressed the experience of Coppinger's group at Hampshire College.

Our approach to the problem was to identify specific tasks that dogs were expected to perform, to measure some of the inherent physical stresses, and to consider training techniques to prepare the dogs for tasks. We analyzed two tasks: (a) pulling a person in a wheelchair and (b) opening a door for a person in a wheelchair. In this report, we present physics measurements involved for the assistance dogs and people. We also discuss other issues affecting the welfare of service dogs during performance, such as training and motivation.

**DOGS PULLING WHEELCHAIRS**

Pulling a wheelchair is often done by a dog in a harness attached to a wheelchair tow strap. The person in the wheelchair holds the tow strap at the side of the wheelchair and continuously commands the dog to pull; it is the person who is being pulled, not the wheelchair. The person has to take an active role in the pulling process by hanging on, not only to the dog, but also to the wheelchair.

Shown in Figure 1 are several major stress points for both dog and user. Note, for example, that the dog's posture is not aligned with his or her motion. The person's arm is hyperextended. The soft breastplate of the dog's harness is pulled sideways. As a result, neither the person nor the dog appears comfortable.

Because the person's arm is the connection between the force of the dog and the person and wheelchair being moved, we studied how much force was applied to the arm on a level pavement (Figure 2). It took about 6.6 lb (29.3 N) of force (see also Figure 3, Column E) to start a person and wheelchair weighing 77 kg moving on level pavement. For comparison, a sled dog, running at racing speed (26 kph) with a 16-dog team and a sled and driver weighing 107 kg may pull 1.25 lb (5.56 N), and the same dog walking, may pull .25 lb (1.11 N; pers. obs.). In one-dog races for six- and seven-year-old drivers, a dog might get close to a 6-lb (26.7 N) pull, but these races are very short, usually only a few hundred meters, which is several times less than the effort needed by a service dog pulling a person in a wheelchair.

The effort the assistance dog puts into the performance also depends on how fast, how far, how long, and over what surface the object is being moved. For a short time, 6.6 lb (29.3 N) is significant, but not astronomical. But, as the slope increases, or the angle of pull moves away from a centered direction, either horizontally or vertically, the force required to move the wheelchair must increase in proportion to the slope or angle and this is when the person in the wheelchair needs the most help.
Also shown in Figure 1 is an ill-fitted, over-padded harness. Harnesses for working dogs should be designed to fit over nonmoving parts of the dog’s anatomy, so as not to restrict motion. Figure 1 depicts how the service dog must move his or her shoulders and forelegs into the breast strap with each stride. The difficulty the dog would have with this harness is similar to a person trying to hike with a backpack strapped loosely to his or her lap. The pressure from the dog’s tow strap tugs the harness from side to side each time the dog reaches a leg forward. In addition, because the ill-fitted harness slips to the sides, it cuts into the dog’s shoulders with each step.

Note that in Figure 1, the person’s arm is not only hyperextended to the side, but is also pulled down and the person must use extra force. Holding the dog at this
FIGURE 2 Details of some of the forces operating in the system. This illustration is from a student's laboratory notebook, with the following note: Total weight of wheelchair and person was 77 kg. Total weight of pull was 12 lb (53.4 N). If a dog who weighed 23 kg was pulling the wheelchair in our experiment (77 kg), then that would be comparable, using the same weight ratio, to a person who weighed 77 kg pulling a wheelchair that would weigh 262 kg.
angle is inefficient because the force the dog has to put into the system is greater than if the dog were directly in front of the wheelchair. Pulling from the side of the wheelchair requires additional energy from the dog because one side is being pulled harder than the other and the wheelchair rotates away from the direction of the pull. Both dog and person strain to counter this rotation, which the dog does, in part, by leaning away from it. This forces the dog to exert extra pressure on the sides of his or her feet and strains his or her joints and back, which can result in chronic debilitation.

The problems created for the person’s arms and hands are almost too much to measure because there is an oscillation as the wheelchair is directed toward the dog that rotates in the opposite direction. Both dog and person receive varying, and by no means modest, stress from the continuous pull and erratic tugs. These pressures are not beneficial for the person or the assistance dog and contrast with the task of a sled dog, in which the dog pulls straight ahead and the tension on the back strap is reasonably uniform.

The many variables in these measurements (including weight, speed, length of tow straps, size of dog, surface quality, incline, wheelchair design, starting, stop-
ping, and turning) make an exact delineation of the contribution of each force difficult. The problem is not that the forces are large; it is that so many forces pull in so many directions. Shown in Figure 1 are both dog and person twisted in uncomfortable positions, giving ample evidence of their efforts to counteract conflicting and diverging forces.

Body temperature, ambient temperature, and body weight are also primary factors in a working dog’s comfort. Running dogs often achieve high body temperatures because (unlike humans), dogs are poor at radiating heat. In many running animals, including humans, heat load is a limiting performance factor (Phillips, Coppinger, & Schimel, 1981). A cumbersome, over-padded harness and an additional backpack do not help matters. Heat stress often motivates sled dogs or herding dogs (pers. obs.) to misbehave. Sled dog drivers tend not to train their dogs if the ambient temperature is over 16°C. Overweight dogs risk heat prostration and, at a sled dog race, a judge can disqualify overweight or poorly conditioned dogs. Yet, we watched overweight service dogs asked to perform in the heat of the day.

DOGS OPENING DOORS

Shown in Figure 4 is a dog pulling a shopping mall door open with a hook and rag placed over the door handle. By pulling on the rag, the dog opens the door for the person in the wheelchair to pass through. It is not immediately obvious just how hard this job is.

If the dog’s mouth were at the same height as the door handle, pulling would be the easiest. However, most door handles are higher than most dogs. The shorter the dog, the greater the angle from the horizontal plane of the door handle, thus, more force needs to be applied to open the door (Figure 5). Increasing the rag’s length decreases this angle and makes the dog’s task easier.

Another angle to be considered is the one generated by the arc that follows the swing of the door. If the dog pulls in only one direction, the angle of rag to door increases, and the force required to get the door open (to a 90°, right-angle position from closed) also increases. The dog must be permitted to back up in an arc, anticipating the arc followed by the handle of the opening door. In Figure 4, the leash is being held tightly and the dog is being pulled toward the wheelchair and away from the left-hand opening door. The dog is pulling straight back and needs to generate twice the normal force just to get the door two thirds (60°) of the way open (Figure 6).

The equation for vertical angles is the same as for horizontal angles. If both angles are increasing, then the totals are multiplied together, resulting in rapidly escalating difficulties for the dog (Figure 7).

There is yet another problem. To pull a heavy object backwards, a dog crouches to get more traction and leverage from his or her feet and legs (Figure 5). However, dropping down increases the angle on the rag and, thus, the force required for the task. As the dog pulls, the rag pulls him or her upwards, thus reducing the dog’s
ability to pull. The dog is then compelled to drop farther down, moving backwards with a series of yanks. The pressure on his or her teeth oscillates from perhaps 8 to 14 lb (36–63 N) of force. It is this constant increase and decrease of pressure on a dog’s mouth that creates discomfort.

MOTIVATION FOR PERFORMANCE

Many tasks required of assistance dogs fall outside of the normal canine repertoire of internally motivated behaviors. Dogs opening doors or pulling wheelchairs are probably not cognizant of what they are doing, of the functional outcome, or when it has been achieved. These tasks have goals and immediate rewards for a person, but not for a dog. The dog does not realize that the object of the task and, thus, the reward, is to allow the person to go through the opening or to get somewhere in the wheelchair. It is unclear whether a dog understands that moving a toggle on the wall turns a light on in the room or that pushing an elevator button brings the elevator ½ min later. Because of this, the dogs have to be continually verbally commanded and rewarded to perform an action that is perhaps physically unpleasant. Once this encouragement stops, the dog stops the performance. The signal that the dog can stop is the cessation of the verbal command and reward, “good dog,” for instance.
FIGURE 5 Measured forces required to pull at different angles. Not only does the force required increase as the angle increases, but the dog must crouch to gain increased traction and leverage, thus, further increasing the angle.
FIGURE 6 Force required of a dog to open a door at different angles. A dog must exert increasing force in a horizontal and a vertical direction as the horizontal and vertical angles between his or her mouth, the height of the door handle, and the arc of the door’s swing vary.

Constant commanding should not be not necessary for working dogs. In fact, at many field trials, over-commanding dogs during performance is a fault. Most commands to sled dogs, sheep dogs, or retrievers are guidance for direction only. Praise, if given at all, is reserved for the completion of a job. One does not have to give the sled dogs the command to run; most of the time, releasing the brake suffices.

With many working dogs, the motivation to perform is internally generated. Sled dogs do not understand that there is a race to be won. Border collies do not have an appreciation of why the sheep need to be penned. The border collie has built-in motor patterns that it shows innately; one of these is called eye (Willis, 1992). Eye is internally motivated. The performance of eye is its own reward. The handler simply provides the object for the dog to eye, be it sheep, ducks, or a stick, and then guides the dog’s relation to the object. There can be no performance using eye if the animal does not naturally possess eye.

Similarly, a sled dog does not think it is running a race. A sled dog runs because other dogs are running. Running is innate and socially facilitated. Picking dogs that
can run fast and are conditioned to do so is the driver's job. The driver is the strategist. The dogs are just together. That's their reward.

Because the behaviors that these dogs demonstrate are instinctive, they need no external reward to perform. Circus animals, however, receive external rewards for performance. Training circus animals requires instrumental conditioning (if you move left, you get a peanut [appetitive conditioning]) or if you move to the right, you get a shock [aversive conditioning]) because they are asked to perform tasks that are not instinctive or inherently rewarding. There is no benefit for an elephant to dance unless the trainer provides one. Without external reinforcement, the performance of a "trained" behavior rapidly fades. In fact, a "trained" behavior that deviates from an instinctive behavior can fade even with constant reinforcement (Breland & Breland, 1961).

Guide dogs are not taught to solve problems, but to avoid them (pers. obs.). They can attend to people walking (social facilitation), but must learn through experience to avoid obstacles. The trainer reprimands a dog when it leads a user into an obstacle. Mistakes are immediately corrected simply by aversive disruption of the routine: a verbal correction, a loud noise, a tug on the harness.
For behaviors such as opening doors and pulling wheelchairs, assists are not generally properly employed. What does a dog get for pulling a door open? A person can go through. What does a dog get for pulling a wheelchair? Pull some more, for an undefined time. In both cases, the reinforcement does not have appetitive characteristics. And, in both cases, continued performance can be physically distressing—the performance itself is aversive.

**ADDITIONAL WELFARE CONSIDERATIONS**

In many of our observations, people did not instruct their assistance dogs properly. People are, for the most part, novices with dogs; most people in our society have little or no real experience with highly trained working dogs. Sometimes, a person’s physical or vocal characteristics make maintenance of the dog’s performance difficult. When border collie handlers obtain a trained dog, recorded commands are often provided, helping the new owner to precisely mimic instructions to his new dog so that the dog will understand the new owner’s performance commands. Dogs are reasonably good at discriminating between fricatives such as “zit” and “sit.” So, if the user’s vocalizations are not precise, the dog may not recognize a command.

For instrumental conditioning, timing and signaling must be precise. It is important that recipients of service dogs acquire the training and experience needed to understand the complexity of the situation. In one case we observed, an assistance dog was given a command to sit. The user thought the dog was not responding quickly enough and said, “No!” to the dog, who, at the time, was showing an intention to sit. The dog was confused, but obeyed the “No!” command, did not sit, and was accused of disobedience. Similarly, we observed that one owner, in an effort to help a dog with a difficult task, actually made the task harder by pulling on the dog’s neck and forcing her out of alignment with a door she was trying to open.

**CONCLUSIONS**

Based on our many years of training working sled dogs, retrievers, and sheep dogs and on the measurements made specifically for this report, we thought that the service dogs we observed were being asked to perform tasks that put the dogs at risk of injury and failure. We suggest that some failures of service dogs are less a problem of inadequate dogs than of the difficulty of the tasks they must perform, the inadequacy of much of the equipment they are required to perform with, and the instinctive behavior of dogs themselves. We feel that progress could be made in each of these areas by industry-wide attention.

In our research, we kept encountering a dichotomy between the academic world’s theoretical publications on animal behavior and cognition and the dog training world’s practical reports. There is a wealth of information available in the academic literature that could be used to great advantage by service dog trainers (Delta Society Working Group, 1995). The service dog industry, in contrast,
publishes very little data, and much of the existing data lack peer review or validation by other researchers (Duncan, 1996).

Service dogs, with their unique sensory abilities and their trainability, could well play an increasingly important role as partners for people with special needs. Their history of achievements constantly reminds us how valuable they are. Now, it is our turn to apply the full range of what we know and connect future theoretical and practical investigations to ensure that the dogs' welfare is at least equal to our own.

ACKNOWLEDGMENTS

These studies were done with students at Hampshire College, Amherst Massachusetts, with the support of the Lemelson National Program in Invention, Innovation, and Creativity. Funding in support of research was provided by Hampshire College and by the Lemelson Center for Assistive Technology Development at Hampshire College.

These findings are also presented in a booklet published at Hampshire College that contains data presented in this article plus a few model technical specifications for the redesign of harnesses, wheelchairs, and attachment devices (Wheelchair Assistance Dogs; copies can be obtained by contacting the Delta Society, Order Department, P.O. Box 1080, Renton, WA 98057–9906.).

Credits for illustrations: Genia Bonyun, Thayer Brainard, Lee Spector, Robert Greevy, Jr., Christine Gora, Micah Jessup, and Scott Zissell. Photographs in Figures 1 and 4 by Raymond Coppinger.

REFERENCES


