More Than Pets

Understanding How Service Dogs Change Lives

When guide dogs for people with visual impairments were first used over 80 years ago, the relationship between humans and canines took a huge step beyond mere pet and companion. Researchers are now working to discover how that relationship can be intensified even further.

They are called service dogs, and the name is well-chosen, for they provide remarkable kinds of service to people with physical impairments. What the dogs can do for their human partners is nothing less than amazing. They open doors – both metaphorically and literally. Wheelchair service dogs help pull wheelchairs, both powered and manual. If the human can walk but with difficulty, the service dog can provide balance and counterbalance. The dogs can turn lights and appliances off and on. They can push the elevator button for the right floor. They can make sure the remote control for the TV is handy. The most common advantage the dogs provide is the simple act of fetching: one person related getting into the shower but forgetting her towel; when asked, her dog brought it. A service dog can open the refrigerator, take out a can of soda, close the door, deliver the soda, and then deposit the can in the trash when it's empty. Merely having the dog to pick up something you have dropped but cannot reach yourself can be a major benefit.

Some service dogs even receive special training to become "Seizure Response/Alert Dogs." They work with individuals who have epilepsy or other seizure disorders. The dog is trained to perform certain tasks to help the human when a seizure occurs. There are hearing dogs that help individuals with hearing impairments by responding to doorbells, alarm clocks, smoke alarms, and microwaves.

The people who can benefit from service dogs include individuals with spinal cord injuries, spina bifida, multiple sclerosis, and muscular dystrophy. Many have multiple disabilities, such as people who are blind and must use a wheelchair.

The Need for Study

However, while anecdotal evidence indicates the dogs do improve their human partner's quality of life in general terms, deeper questions need to be addressed. For one, in exactly what ways do the service dogs help? How big an impact do they make on their human partners' lives? What kinds of dogs and training work best? What kind of people will realize the greatest benefits if they are partnered with service dogs? How can we do a better job of matching people and dogs?

The information to answer these questions is currently limited. Samples have been small, testing insufficient, and results are often controversial. That's why Dr. Shirley G. Fitzgerald, Assistant Professor, Department of Rehabilitation Science and Technology and Associate Director of Research, Center for Excellence on Wheelchairs and Related Technology, has led a study to address these issues in a scientific manner. Her research becomes especially important when one considers the extent of the current demand for service dogs. Assistance Dogs International, a coalition of people who set quality standards for the service dog industry, says that as many as 6,000 people a year want service dogs. Yet there are less than 600 new dogs available per year. Waiting lists can be five years long. With the funding for dog providers coming exclusively from donations, there is not only a need for more accurate information, but also an increase in overall awareness of the need for service dogs.

Not Your Average Pets

Needless to say, it takes a very special kind of dog to handle these chores. These are working dogs; they're not for play. To become a service dog, the animal must show excellent social behavior skills: No aggression, no inappropriate barking, no biting, no snapping/growling, no inappropriate jumping on strangers, and no begging. They must be very healthy, and be spayed or neutered. And, of course, they must have the right personality, one that meshes well with their human partner's personality.

Shirley Fitzgerald

Some organizations breed service dogs; others obtain them from local breeders; still others get them from shelters. The most common breeds are Labradors, Retrievers, or a mix. Standard Poodles, because of the low dander of their fur, are especially valuable when the human has allergy problems. Dogs used for hearing are frequently mixed breeds. But very few dogs – less than 40 percent – have all the characteristics necessary to become service dogs.

The training of service dogs is an extended, and intense, process. It usually begins with puppies and lasts 18 months or more. The two major suppliers of service dogs – Paws with a Cause and Canine Companions for Independence – differ in their specific training methods, yet both focus on providing a dog that will match its human partner's needs. Often, when the dog and its human partner meet, a field service trainer works with both of them until the two can function as a team. If a change takes place in the living habits or work patterns of the human partner, further training is provided. Interestingly, the service dogs can retire when they become older and less able to work. The human partner can then get another dog.

Research Steps

The research undertaken by Fitzgerald has two levels. In the first, service dog recipients are interviewed before they receive their dog, then three months and nine months later. To determine how much the dog has really changed their lives, they are questioned on several topics. One is community integration: How often do they get out? How much do they interact with people? Another is employment: Have there been improvements in ease of getting to work and on the job? In addition, they are asked about healthcare utilization: Has having the dog made them more likely to attend to their healthcare needs? What exactly is the dog doing for them?

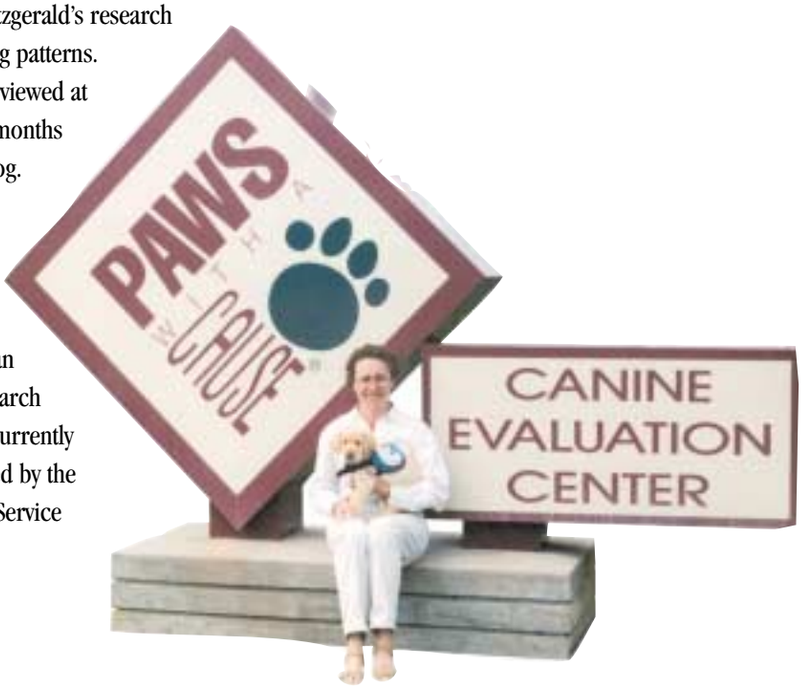
Along with the questions on daily living are psychosocial questions on self-esteem, social support, and quality of life. Fitzgerald points out that one of the clearest results of the study is that service dogs improve their human partners' quality of life.

Because daily needs are more likely to change than those that are psychosocial in nature, a second phase of Fitzgerald's research focuses on daily living patterns. Participants are interviewed at two, five, and seven months after obtaining the dog.

The question of who can best be helped by service dogs is the focus of an epidemiological research program Fitzgerald currently has underway. Funded by the Veteran's Integrated Service Network (VISN), Competitive Pilot Project Fund, it is studying a larger group of people, with the objective of determining what kinds of people have service dogs. There has been no scientific analysis of this information – for example, 80 percent of service dog owners are women – and it is central to the entire concept of connecting service dogs to help those who need them most.

Fitzgerald says, "The data we've generated has gone a long way toward clarifying the real advantages of service dogs. However, there's much more to be done. Much of what happens between the dog and its human partner is very individual, so the potential success of the relationship is difficult to quantify."

For more information, e-mail Shirley Fitzgerald at **sgf9@pitt.edu.**



No Butts About It

Putting the Pressure on Wheelchair Seat Cushions

For the estimated 1.5 million people in the United States who rely on wheelchairs for mobility, there is an insidious risk of developing dangerous pressure ulcers from the simple act of sitting in their chairs. This is particularly true for people with spinal cord injuries, and the elderly who lack mobility and the sensation that represents the first alert to a developing pressure ulcer.

David Brienza

Enter the Department of Rehabilitation Science and Technology. Through a variety of research and technical initiatives, faculty and researchers are advancing the science of preventing pressure ulcers. Chief among them is the use of the right wheelchair seat cushion.

Unfortunately, the importance of the proper wheelchair seat cushion is often overlooked. But, according to Dr. David M. Brienza, Associate Professor and Director of the Soft Tissue Mechanics Laboratory, "The seat cushion is fundamental to the use of a wheelchair. It's the interface between a person and their mobility device. In a way, it's the base of operation. Among other things, the cushion needs to protect your skin."

Significant Research Underway

Brienza, who also serves as Co-Director of the Rehabilitation Engineering Research Center (RERC), states, "We are looking at the physiological responses to pressure and the effects of pressure on the soft tissue. What researchers have discovered is that pressure doesn't affect everyone the same way. The natural or healthy response to pressure on the skin is a dilatation of the blood vessels and an increase in blood flow to compensate for that pressure."

However, Brienza points out that a certain portion of the population, including many people with spinal cord injuries, does not appear to exhibit this natural response, putting them at even a greater risk of developing pressure ulcers. Researchers are trying to identify differences in responses – the level of risk – and how that relates to the development of pressure ulcers.

Brienza and his colleagues have developed a tissue characterization technique based on quasi-linear visco elastic modeling. In the past, similar characterizations have been used to study elastic properties of tendons and other types of connective tissue and muscle. Here, it was a dapted to evaluate the characteristics of skin, fat, and muscle in compression.

"It's a mathematical model that we fit to data that we collect," says Brienza. "Based on the parameters of the model, we make assumptions about the condition of the tissue."

The group also uses finite element modeling in their research. "Once we can characterize the elastic properties of tissue, we can use those properties to form a three-dimensional model of a structure – a buttock, perhaps – so we can simulate different kinds of loading conditions on that model to try and predict how the tissue will react," he states.

Brienza notes that once the buttock model is developed, it could be used to help design new or evaluate existing seat cushions. "Through computer simulation, the model can be applied to different cushions to determine if they met the specific needs of an individual."

Dr. Mary Jo Geyer, a former student researcher and now faculty in the Soft Tissue Mechanics Laboratory, believes that the same biomechanical tissue characterization used in evaluating the risk of pressure ulcers could be used to characterize the soft tissue in people with lipodermatosclerosis (LDS), other venous diseases, and diabetes that result in ulcers, primarily on the lower extremities.

Currently, expensive CT Scans are used to evaluate LDS and fibrosis. Geyer's research has shown that a similar analysis and evaluation can be accomplished using the much simpler biomechanical system.

"We're very excited about this development," states Brienza. "It represents a whole new area of research for us." Presently, there are two research projects underway in the laboratory to evaluate this technique with LDS and diabetic ulcers.

Testing in Real World Conditions

In order to test theories developed in the laboratory, Brienza and his team fielded a pilot study, "A Randomized Control Trial to Evaluate Pressure Reducing Seat Cushions for Elderly Wheelchair Users." Conducted in 1999 and recently published, the study evaluated the differences in the risk of developing pressure ulcers using standard foam cushions versus specially-designed,

pressure-reducing cushions. In this pilot study, consenting nursing home residents were recruited as subjects.

The research was sponsored by grants from the National Institute on Disability and Rehabilitation Research, ETAC USA, Crown Therapeutics, and Sunrise Medical.

The preliminary findings confirm that there is a high rate of pressure ulcer incidence among older, sedentary people and shows a trend toward significantly lowering rates of pressure ulcers among those subjects who were given specially-designed, pressure-reducing cushions, rather than the standard foam cushions.

The researchers are currently seeking funding from the National Institute of Health to conduct a definitive, randomized control, multi-center study to further validate the findings of the pilot project. They estimate this study would take four or five years and involve 300 to 400 participants.

Research and Technology Cross Disciplines

Soft Tissue Mechanics Laboratory researchers are taking lessons from other disciplines. Forensic experts use ultraviolet and infrared-imaging techniques to detect biological markers that provide an indication of the condition of the skin, in particular wounds not visible on the surface of the skin. These techniques have been successfully used in cases such as investigating suspected child abuse.

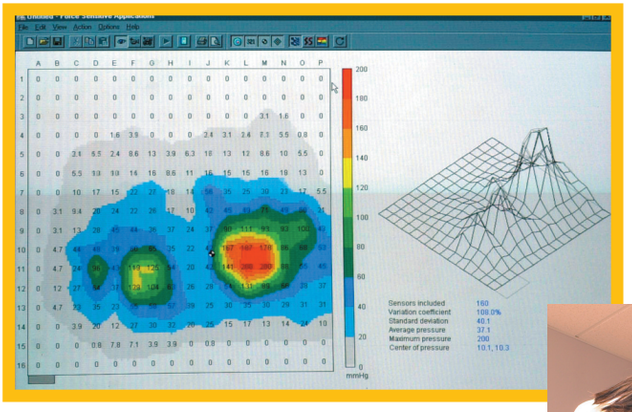
Brienza notes that these techniques are so precise they make it possible to match an invisible imprint in a person's hand left by the handle of a knife that was used in a crime.

"If you could detect those kinds of subtle injuries, we believed there was the potential to detect pressure damage before it becomes more serious," he points out. This is particularly important for people who have darkly pigmented skin on whom a telltale red mark of a developing pressure ulcer may not be visible and, therefore, are at greater risk of developing pressure ulcers. Research is ongoing to evaluate the potential of this promising technique.

Seat Cushions Go High Tech

Brienza's team is also examining a relatively new powered seat cushion technology that includes air chambers – typically in rows – that alternately inflate and deflate, varying the pressure. "The technology is used in bed surfaces," notes Brienza, "but its effects on tissue viability have not been proven and are not well understood. We suspect that the alternating pressure either compensates for the defective active vaso dilatation or stimulates vaso dilatation."

Funded by the Veteran's Administration, the researchers are studying, among other things, how the variations in the thickness of the air cells and the frequency with which pressure is alternated may impact the tissue response and, ultimately, the impact on reducing pressure ulcers.



Which Cushion is Right?

But with the potential all of this research holds for the future, currently there is no easy answer to the question of how to select the wheelchair seat cushion that's right for an individual. Along with the fundamental components of the ability to feel sensation and the degree of mobility, many other risk factors such as nutrition and exposure to moisture must be assessed.

Once risk factors have been evaluated, how a person intends to use their chair must also be considered. For example: For a person who plays wheelchair basketball, an air cushion might not be the best choice because it's less stable than a custom, contoured foam cushion. On the other hand, foam may force the build-up of heat and moisture, two of the risk factors for developing pressure ulcers.

The weight of the cushion may factor into the equation if the person moves frequently from chair to car, moving the cushion as well. In this case, a dense fluid cushion may not be the right choice.

Each of these priorities must be balanced and a cushion selected that is the best compromise for the individual.

The short answer, according to Brienza, is "There is no one cushion that works best. There are a variety of good cushions on the market today – air, gel, viscous fluids, foam – each of which has a place in the marketplace."

Developing Standards

Adding to the dilemma, currently there are no standards by which to evaluate and compare seat cushions or bed surfaces. Pitt researchers are collaborating with researchers around the world to develop and validate test methods that quantify clinically relevant characteristics of cushions and bed surfaces. Following three years of work, the ISO group has recently completed the first draft of standards for seat cushions.

A similar effort to develop bed surface standards has just begun.

"Our goal is to empower consumers and give them information they need to know to be able to compare products," states Brienza. Currently, information consumers have comes from the manufacturers. While that does not invalidate the information, he points out, it's not necessarily comparable. There is no standard way for a manufacturer to report pressure distribution, for example.

"If standard test methods and reporting standards were used, it would enable consumers to make comparisons among the products and, ultimately, select the one that best fits their needs," Brienza concludes.

For more information, e-mail David Brienza at **dbrienza@pitt.edu.**

The Rehabilitation Engineering Research Center on Wheeled Mobility

The Rehabilitation Engineering Research Center (RERC) at the University of Pittsburgh is one of more than a dozen similar programs across the country. RERCs typically focus on specific issues related to assistive technology. Pitt focuses on wheeled mobility and seating.

Supported by the National Institute on Disability and Rehabilitation Research, RERC is an outgrowth of the Rehabilitation Act of 1973, which authorized sweeping changes in how the U.S. tackles the issues faced by people with disabilities.

Co-Directors of the RERC are Dr. Clifford Brubaker, Dean of the School of Health and Rehabilitation Sciences, and Dr. David Brienza, Associate Professo, Department of Rehabilitation Science and Technology.

RERC was established at Pitt in 1993, and two years ago, re-energized itself with a renewed mandate of research, design, and development of new assisted technologies and guidelines, training and education, and information dissemination related to wheelchair mobility. The RERC also acts as a source for technical assistance to the public. Within each area, tasks have been identified to help achieve the overall goal of improving wheeled mobility.

Research

The lion's share of the research currently underway involves wheelchair seating (see article on page 44). This includes developing new options for dynamic seating,, studying pressure ulcer prevention, and optimization of cushion design.

Researchers are also developing international standards for seat cushions and quantifying and developing outcome measurement tools to assist physicians and others who prescribe wheelchairs in selecting the proper seat cushion.

Guidelines and Product Development

Developing guidelines for preventing injury to users of wheelchairs is just one of the initiatives being undertaken, including safely transporting people in wheelchairs in cars or vans.

In addition, this group is developing a standard interface for the integration of computers and other electronic devices with wheelchair controllers and working to enhance controls for powered wheelchairs, among other initiatives.

Industry representatives also consult the RERC when they have ideas for new or improved products. RERC personnel can advise if a product currently exists, has been previously tried, or if it seems promising and should be pursued.

Training and Education

It goes without saying that a training component is critical to the RERC. Graduate and post-graduate students, along with practicing professionals, have the opportunity to further their expertise in wheelchair mobility through hands-on experience and graduate research and education.

Information

All of this research and development is not done in a vacuum – nor does it collect dust in a library. Researchers, faculty, caregivers, and people who use wheelchairs are targeted through this information dissemination and exchange initiative.

Among the highlights: RERC hosts a bi-annual International Seating Conference that brings together 600 to 800 experts in the field. Regular workshops and forums are also held.

A compendium of information, including research papers, symposia lectures, and other reference materials is located at **www.wheelchairnet.org**.

The RERC fields questions from the public through the Web site, among other avenues. Those questions most often relate to identifying existing technology to solve specific problems.