

INVESTIGATION OF THE EFFECTS OF SERVICE DOGS
ON INDIVIDUALS WHO USE WHEELCHAIRS

by

Amanda Marie Reinsfelder

BS Vocational Rehabilitation, University of Wisconsin – Stout, 2003

Submitted to the Graduate Faculty of
The School of Health and Rehabilitation Science in partial fulfillment
of the requirements for the degree of
Masters of Science in Rehabilitation Science and Technology

University of Pittsburgh

2006

UNIVERSITY OF PITTSBURGH

THE SCHOOL OF HEALTH AND REHABILITATION SCIENCE

This thesis was presented

by

Amanda Marie Reinsfelder

It was defended on

April 18, 2006

and approved by

Annmarie Kelleher, MS, OTR/L, ATP

Diane Collins, PhD

Shirley G. Fitzgerald, PhD
Thesis Advisor

INVESTIGATION OF THE EFFECTS OF SERVICE DOGS ON INDIVIDUALS WHO USE WHEELCHAIRS

Amanda Marie Reinsfelder, BS

University of Pittsburgh, 2006

With modern medicine and advances in technology, people are living longer and expecting a higher quality of life. Individuals may not be receiving the ideal assistive devices because they are not sure where to obtain the proper equipment, or what is available. An increased flow of informational publications needs to reach the consumers so they are able to make better informed decisions about their quality of life. Addressing the issue of limited resources, this study places a focus on the use of service dogs as a form of assistive technology. The main objective of this study was to collect data from individuals who had wheelchair service dogs and to compare the data to individuals who did not have a wheelchair service dog. Data were collected and analyzed on variables of assistive technology use, disability, human assistance used, depression, pain, fatigue, and activities of daily living. This information was collected as a baseline, after three months and after nine months. Of the 172 individuals who participated from the beginning of this study, 117 successfully completed all three surveys.

For the baseline, there were significant relationships between the dog groups and the individuals who used assistive technology ($p=0.02$); between the dog group and the depression (CES-D) score ($p=0.047$); and between the dog group and the Pain I (Total Pain Rating Index) of

the McGill Pain Questionnaire ($p=0.01$). Individuals in the control group used less assistive technology, and individuals in the service dog and wait list groups used the most assistive technology devices. Individuals on the wait list had significantly higher CESD scores, and individuals who had recently received a service dog had lower scores than those in the pet and control groups.

Overall, depression scores increased for individuals who were on the waiting list to receive a dog, although not to a significant degree. Depression scores increased (insignificantly) at the second visit for service dog owners, but decreased at the third visit. Although not to a significant degree, pain generally decreased for service dog owners. Individuals with service dogs are able to participate in more activities of daily living, although they do still need help.

TABLE OF CONTENTS

ACKNOWLEDGEMENT	x
1.0 INTRODUCTION	1
1.1 Disability in the United States	1
1.2 Human Assistance.....	2
1.3 Technology	2
1.4 History of Service Animals.....	3
1.5 Background on Service Dogs.....	4
1.6 Benefits of Service Dogs	6
1.7 Cost of Service Dogs	7
1.8 Training.....	9
1.9 Matching Process	11
1.10 Significance of the Study	12
1.11 Specific Aims.....	14
2.0 METHODS	16
2.1 Study Design.....	16
2.2 Subjects.....	16
2.3 Study Protocol and Instrumentation.....	18
2.4 Data Management	25
2.5 Methods for Statistical Analysis	27

3.0 RESULTS	31
3.1 Demographics	31
3.2 Hypothesis 1.....	34
3.3 Hypothesis 2.....	38
3.4 Hypothesis 3.....	46
4.0 DISCUSSION.....	52
4.1 Limitations	56
4.2 Future Studies	58
5.0 CONCLUSION.....	59
APPENDIX A.	
Old Version of Questions for Hours of Personal Care (ADL) and Errands (IADL)	60
APPENDIX B.	
New Version of Questions For Hours of Personal Care (ADL) and Errands (IADL).....	62
APPENDIX C. Activities of Daily Living: Questions Asked From the Activity Diary.....	63
APPENDIX D. Number of Assistive Technology Devices Used.....	68
APPENDIX E. Center for Epidemiologic Studies Depression (CES-D)	69
APPENDIX F. Fatigue Severity Scale.....	70
APPENDIX G. McGill Pain Questionnaire – Short Form	71
APPENDIX H. Demographic Distributions	72
APPENDIX I Box Plots.....	77
BIBLIOGRAPHY.....	89

LIST OF TABLES

Table 1 Comparisons of Service Dog Agencies.....	8
Table 2 General Demographics of Subject Population	32
Table 3 Represented Disabilities (Progressive and Non-progressive)	33
Table 4 Relationships at Specific Points in Time (NS = Not Significant).....	34
Table 5 Wheelchair Used Most with Progressive/Non-Progressive Distributions	72
Table 6 Progressive / Non-progressive Distributions Among Dog Groups.....	72
Table 7 Ethnicity Distributions Among Dog Groups.....	73
Table 8 Spinal Cord Injury Distributions Among Dog Groups	74
Table 9 Disability Distributions Among Dog Groups	75
Table 10 Gender Distributions Among Dog Groups	76
Table 11 Age and Years of Disability Means in Dog Groups	76
Table 12 Veteran Status in Dog Groups.....	76

LIST OF FIGURES

Figure 1 Example of Subject Tracking Sheet	26
Figure 2 Hours Used For Personal Care Assistance (Activities of Daily Living)	36
Figure 3 Hours Used For Instrumental Activities of Daily Living (IADL).....	37
Figure 4 Percentage of Activities Completed with Some Human Help	42
Figure 5 Percentage of Activities Completed with Total Human Help	42
Figure 6 Percentage of Activities Completed Independently	43
Figure 7 Percentage of Activities Completed with Assistive Technology	43
Figure 8 Reported Number of Assistive Technology Devices Used	44
Figure 9 Hours of Personal Care Assistance.....	44
Figure 10 Hours of Assistance for Errands (IADL).....	45
Figure 11 Baseline Means of the CESD Scale.....	46
Figure 12 Baseline Means of Pain 1	47
Figure 13 Pain I of the McGill Pain Questionnaire	49
Figure 14 Pain II of the McGill Pain Questionnaire	50
Figure 15 Pain III of the McGill Pain Questionnaire.....	50
Figure 16 CES-D Scores	51
Figure 17 Fatigue Severity Scores	51
Figure 18 Percentage of Activities Done Independently	77

Figure 19 Percentage of Activities Done with AT.....	78
Figure 20 Percentage of Activities Done with Some Human Help	79
Figure 21 Percentage of Activities Done with Total Human Help	80
Figure 22 Reported Number of AT Devices Used.....	81
Figure 23 Hours of Assistance Used for Personal Care.....	82
Figure 24 Hours of Assistance Used for Errands.....	83
Figure 25 Pain I.....	84
Figure 26 Pain II	85
Figure 27 Pain III	86
Figure 28 Fatigue	87
Figure 29 CESD.....	88

ACKNOWLEDGEMENT

I am extremely thankful for the opportunity to learn alongside the very intelligent and helpful staff, faculty, and students that work at the Human Engineering Research Laboratories. I would especially like to thank my advisor, Dr. Shirley Fitzgerald, who patiently answered my endless questions and continuously offered her encouraging guidance throughout my entire education experience. My appreciation also extends to the other members of my thesis committee, Dr. Diane Collins and Annmarie Kelleher, OTR/L, for all of their assistance and patience. In addition, Stephanie Martin, Robert Milan, and Michelle Sporner deserve my gratitude for their support and assistance during my education at the University of Pittsburgh.

I would love to thank my family and friends for all of the kindness and support they have offered me during this process, and especially for listening to my endless strategies for completing this thesis.

1.0 INTRODUCTION

1.1 Disability in the United States

An analysis of our nation's demographics through history shows the increasing need for accommodations (1). The wheelchair user population doubled in ten years (1980-1990).

According to the 2004 Disability Status Report on the United States, the prevalence rate of individuals with disabilities in the United States is 12.1 percent (2). During 2004, 20,268,000 people responded they have a disability of the 167,902,000 people surveyed. For men and women ages 18-64, 14,152,000 out of 179,133,000 (or 7.9%) reported a disability that limits their work.

The definition of disability used for the status report was as follows:

Definition of Disability: The 2003 and 2004 American Community Surveys (ACS) definition is based on three questions: (1) Does this person have any of the following long-lasting conditions: (a) blindness, deafness, or a severe vision or hearing impairment? and (b) a condition that substantially limits one or more basic physical activities such as walking, climbing stairs, reaching, lifting, or carrying? (2) Because of a physical, mental, or emotional condition lasting 6 months or more, does this person have any difficulty in doing any of the following activities: (a) learning, remembering, or concentrating? and (b) dressing, bathing, or getting around inside the home? (3) Because of a physical, mental, or emotional condition lasting 6 months or more, does this person have any difficulty in doing any of the following activities: (a) going outside the home alone to shop or visit a doctor's office? (b) working at a job or business? (2)

1.2 Human Assistance

The amount of human assistance an individual receives depends on a variety of factors (3). “Human Assistance” refers to formal paid help from professional aides and personal care attendants, or informal unpaid help from family members or friends. A person with a disability may need more assistance than they are actually receiving, but the amount of assistance received depends on the resources of the individual as well as the society he or she lives in. Human assistance can be used for Basic Activities of Daily Living (BADL) and Instrumental Activities of Daily Living (IADL) (4). BADLs include eating, bathing, dressing, and transfers. IADLs include other activities such as shopping, cooking, or doing housework.

1.3 Technology

Within our society, scientific advances have resulted in people living longer after injuries or illness (5). As reported by Platts and Andrews (5), the demand for accommodations is increasing along with quality of life expectations. Technology available to contribute to a better quality of life ranges from splints and reachers to “sip and puff” controllers and other devices for alternative computer access and controlling wheelchairs (6). Voice activation or switches can be used for changing television channels, operating video players, controlling electronic beds, opening doors, and controlling lights and temperatures in an individual’s home (7). Cell phones

are now available with features to allow individuals to use an earpiece with automatic answering and voice dialing (8).

The purpose of technology is to increase independence and improve the quality of life. However, it is equally important not to impose equipment on individuals who would prefer not to use it (5). Three possible reasons why technology has still not reached the majority of individuals who could use them include: a lack of knowledge of what is available; a lack of knowledge of how to obtain what is desired; or a lack of funds for expensive equipment (5).

1.4 History of Service Animals

History has shown evidence that dogs and humans have worked together for 30,000 years (9). It is believed that this is when dogs were first domesticated by Native Americans. The connection of dogs and humans in legislation traces back to 1874. Laws protected animals from abuse, but laws to protect children were not yet enacted (10). Henry Bergh, who was key in the development of The Society for the Prevention and Cruelty to Animals in 1874, helped to defend a little girl who was being severely abused by her step-mother. The case caused the development of the Society for the Prevention of Cruelty to Children in 1875. In 1876, these two merged to form the American Humane Society.

Dogs and other animals have also been used in therapy. “Animal Assisted Therapy” was used in the 1700’s as horses were used to assist individuals with confidence and balance (11). In 1962, Boris Levinson, M.D. found the use of dogs successful in therapy sessions with children he was treating for mental health. Some situations where dogs were useful included

schizophrenia, autism, and obsessive-compulsion (11). Time with dolphins has also helped children with mental disabilities as response rates increased during interaction (11).

1.5 Background on Service Dogs

It is believed dogs are good assistance animals for people because of a naturally strong “human-animal bond” (9,11,12). Pets are believed to reduce tension in families, and some pet owners admitted being as close (or closer) to the pet as to any other member of the family (11). Pets have even been shown to reduce blood pressure and stress in a comparison of women who had pets and women without pets (11). A reduction in stress is physically beneficial as excessive stress can cause cardiovascular disease and disorders in the gastrointestinal, respiratory, and musculoskeletal systems (13). As stress increases blood pressure, relaxation reduces blood pressure. Some relaxation techniques include meditation, hypnosis, progressive muscle relaxation, or activities that also include an element of repetitive mental focus (10). The human-animal bond and the act of petting an animal is an effective relaxation technique (10,13,14).

A general term to describe all the services that dogs perform for individuals is *assistance dogs*. This term refers to dogs that guide individuals who are blind, alert individuals who are deaf to important sounds, warn individuals about to have seizures and help protect them during seizures, and dogs trained to assist individuals with physical disabilities, etc. (15).

Dogs trained to assist individuals who use wheelchairs are sometimes referred to as “wheelchair service dogs”. Because the idea of service dogs is still fairly new in the medical field, there is a lack of consistency in the vocabulary (8).

Definitions compiled from The Delta Society, Assistance Dogs of the West, and

Assistance Dogs International are as follows:

Guide dogs: Enhance community mobility by helping people compensate for visual impairments by alerting them to obstacles and retrieving items.

Hearing dogs: Respond and alert the person to sounds such as doorbells, phones, crying infants, smoke detectors, and alarm clocks.

Medical alert dogs: Protect people by detecting and alerting them to physiological changes (e.g., before a seizure) or by locating help during medical emergencies.

Service dogs: Assist people with comprised physical abilities by retrieving objects, aiding with transfers, opening doors, operating lights, or door-opening devices, pulling a wheelchair, assisting with undressing and similar tasks.

Canine therapy/facility team: Consists of a handler and dog who meet appropriate standards and provide canine-supported activities.

(Above selection taken directly from Winkle, 2003 (16))

Wheelchair Service Dogs help individuals with a variety of tasks including (but not limited to) retrieving dropped items, retrieving and carrying newspapers, letters, and cordless phones, pulling an individual in a manual wheelchair, opening and closing doors, open drawers, turning lights on and off, operating switches and alarms, helping weak individuals sit up, helping with transfers, and helping individuals to maintain balance (1,17,18).

Since animals besides dogs are used for services, the United States Department of Justice defines service animals as “any guide dog, signal dog, or other animal individually trained to provide assistance to an individual with a disability.” (19) Service animals need to be admitted to places where pets are not allowed because a service animal is not considered a pet.

The Americans with Disabilities Act provides some protection of the rights of individuals with service dogs (15). As individuals enter public places with a service dog, people responsible for the facility are only permitted to ask if the dog is a service dog (15). No questions about disability or services rendered by the dog are permitted to be asked. Reasonable accommodations must be made, but the dog may be removed if a threat is present or if the dog is disturbing others in the proximity. Since proof of training is not necessary to gain access,

individuals who train their own service dogs are protected under the ADA and should be allowed to enter public facilities. Although there is no current certification for dogs, Assistance Dogs International does have a test dogs can pass to determine their level of skill and temperament.

1.6 Benefits of Service Dogs

The presence of a dog also helps individuals with Alzheimer's with socialization (11). Depression was reduced in adult-home residents along with an increase in competence, social interaction, psychological well-being, and life satisfaction (9). Pets can help with "providing companionship and pleasurable activity, facilitating exercise, play and laughter, being something to care for and a source of consistency, allowing feelings of security, being a comfort to touch and pleasurable to watch" (9). Dogs also give individuals a sense of worth as the animal is something to care for as well as a companion. Pet owners benefit from exercise as studies show an increase in walks taken daily and a decrease in minor health problems (9). It has also been observed that feelings of loneliness decrease with the presence of an animal. Individuals with disabilities tend to have more social interaction with other people when using a service dog rather than a piece of technology (9). For example, the use of a guide dog rather than a cane would encourage more conversations.

Individuals with physical disabilities may also be affected by low self-esteem, anxiety, depression, and helplessness (1). A social support system is vital in the mental wellness of individuals and it has been shown that service dogs do facilitate in improving social interaction among individuals with physical disabilities (1). To individuals partnered with service dogs, it seems as though people are not afraid to start a conversation when the dog is present (28).

Blood pressure, anxiety and cholesterol levels decrease in individuals when interacting with animals (20). Dogs can be therapeutic both mentally and physically (21). At the Rehabilitation Institute of Chicago, Illinois, individuals who throw a ball for a dog are exercising necessary muscles in the hand and arm while having fun! The presence of animals has shown an increase in attention, orientation, and mobility with an improvement in cognitive, physical, psychosocial and spiritual aspects (10).

1.7 Cost of Service Dogs

The cost of service dogs varies among service dog agencies across the nation because of different sponsorships. The costs differ among three agencies (22-24). The dogs from Assistance Dogs Institute (ADI) have a total cost of \$2,500 (23). The two week training camp is paid for by \$500 of the \$2,500. The remaining \$2,000 is for the individuals to obtain ownership of the dog. Service dogs from Susquehanna Service Dogs (SSD) have a total cost of \$19,000, but the individual is only responsible for \$5,000 for fees. Scholarships are available for \$4,500 of the \$5,000 for fees. Sponsors assume all costs for the dogs from Canine Assistants and there is no charge for individuals receiving a service dog. Below is a table (Table 1) showing comparisons of data from three agencies.

Table 1 Comparisons of Service Dog Agencies

	ADI	SSD	Canine Assistants
Costs	\$2,500.	\$19,000.	No charge to individuals
Time Involved	1.5-2 years	1 year	1-5 years
How to Apply	Online	Online instructions	7 page application; 3 page medical history
Eligibility	Need help with physical mobility	Individuals looking for more independence	People with disabilities
Matching Process	First come – first served	First come – first served	Needs based
Team Formation	Medical team observation and interviews	An hour and a half with 5 or 6 dogs	The second day of the two week training.
Team Training	2 week “boot camp”	2.5 weeks together	2 weeks of training
Dog Taken Home:	Thursday of the first week	The 4 th night of team training.	After graduation on the Friday of the second week.
Main Breed Used	Golden Retrievers and Yellow Labs	Labs	Golden Retrievers and Yellow Labs

1.8 Training

The life of a service dog starts with a foster family (15). Since service dog agencies may differ, the following information is based on the concepts for Canine Companions for Independence (CCI). A foster family socializes a puppy from the time it is 8 weeks old until the puppy is 14-16 months old. During this time, the puppy is housebroken, taught basic obedience, and taken into public to become accustomed to new environments and large numbers of people. Dogs are put through a complete screening process. If it appears a dog does not have the appropriate traits at any time during training, the dog will be removed from the program.

Currently, in the United States, service dogs are trained by individuals or dog agencies (17). For the purposes of research, dogs trained through a respected service dog agency are preferred. As an example, one individual who had Muscular Dystrophy, a subject trained a dog herself to assist her while she waited three years for a dog to become available through a dog agency.

For an example of how service dogs are treated in other countries, dogs are trained and paired with individuals in the United Kingdom who are then closely monitored to ensure the proper treatment of the dogs (18). As dogs are subject to stress just as humans are, some training organizations maintain ownership of the dog under a “leasing arrangement”. This allows the organization to be able to take the dog back if it shows signs of mistreatment, high stress, or the inability to continue working. Other organizations require the dogs to have a veterinary visit twice a year (18).

Team training begins when the dogs have completed about six months of advanced training (15). Each person is able to work with more than one dog before one is specifically

chosen. As the dogs continue to learn more commands, the humans learn how to work with dogs. The people in training are able to take a dog home after the first week of team training. Since the dog is learning to obey and assist its partner, it is imperative that the person who is receiving the services of the dog is the only one to walk, feed, and bathe the dog (15,17). This ensures the dog is not confused who is the boss. An average career for a service dog tends to last 6-8 years (15).

In the collection of information from three agencies, Assistance Dogs Institute (ADI) in California, Susquehanna Service Dogs (SSD) in Pennsylvania and Canine Assistants in Georgia, some trends are evident. Each of the service dog agencies requires about a two-week training camp for the individuals to complete the process with their service dogs (22-24). This training camp generally starts with learning basic commands in the first week, such as sit. During the second week, more difficult commands are taught and the team is given training out in public to learn how to work together. Some commands that are learned during this entire process are: sit, stand, down, come, pivot, heel, place, under, up, back, let's go, alert, find, push, retrieve, touch and open door. Some service dogs are also taught how to help people off of the floor.

The new individuals are able to take their service dogs home with them at different times, depending which agency they are using. ADI allows individuals to take their service dog home with them on the Thursday of the first week for "umbilical cord" training. This is when only the person who is giving the commands feeds the dog, walks the dog, and spends all day and all night with the dog. SSD also allows individuals to take their dogs home the fourth night in the first week of training. However, Canine Assistants allows the participants to take the service dogs home with them only after graduation on the Friday of the second week of training.

1.9 Matching Process

Individuals paired with service dogs tend to have a variety of disabilities including: Autism, Cerebral Palsy, Down Syndrome, Multiple Sclerosis, Muscular Dystrophy, Spina Bifida, and Spinal Cord Injuries (15). As dogs are screened before being placed on a team, inquiring individuals need to attend a series of interviews. There are not enough dogs for people who are interested in obtaining a service dog, and those asking to be placed on a waiting list may wait up to three years before hearing a response from a dog agency (15,17).

To facilitate an efficient matching of a service animal to the individual needing services, Susan Zapf developed the Service Animal Adaptive Intervention Assessment (SAAIA) (25). According to the SAAIA, the three main aspects of the partnership are the environment, the person, and the service animal. This assessment tool takes one to two hours to evaluate the functional needs and goals of the individual, the individual's experience level with animals, the skills and characteristics of the individual and the needs of the service animal in respect to what the individual is able to provide. These are evaluated in three sections: Section A – The Client's Functional Needs Assessment which assesses the individual's functional levels and specifically develops goals toward independence; Section B – The Service Animal Predisposition Match ensures that the individual is motivated and willing to work with the animal; and Section C – The Treatment Care Plan turns goals into training tasks for the animal.

Susan Zapf also uses the Matching Person and Technology (MPT) assessment which has five parts: Survey of Technology Use; Assistive Technology Device Predisposition Assessment; Educational Technology Predisposition Assessment; Workplace Technology Assessment; and Health Care Technology Predisposition Assessment. The MPT can be a useful tool when

choosing technology for individuals (26). Both the assistive technology professional and the consumer complete versions of forms for each of the five sections. From these forms, limitations are matched with goals and interventions as well as predispositions the individual has for certain types of technology. If an individual has too many negative perspectives on a certain device, it would not be beneficial to recommend that specific device. The Matching Assistive Technology and Child (MATCH) has similar concepts but the focus is on a consumer who is a child (26).

1.10 Significance of the Study

A cross sectional analysis was examined to show differences in individuals with mobility impairments who had service dogs, and individuals with mobility impairments who did not have service dogs. Frost et al. (1) reported psychosocial benefits are related to the ownership of a service dog. Individuals with a strong support system tend to be healthier overall, both physically and psychologically. This pilot study included 20 individuals with mobility impairments who had a service dog, and 29 individuals with mobility impairments but did not have a service dog.

A previously mentioned study conducted by Lane et. al. has shown differences in individuals with wheelchair service dogs (18). Four areas were focused on in a questionnaire-based study: social facilitation, beneficial companionship, emotional support, and physical health. When asked, 70 percent of the subjects responded the main reason for applying for a service dog was to gain more independence (27-29).

Some controversies exist in the field of service dogs. Allen and Blascovich (30) reported results from a randomized clinical trial that found individuals with service dogs improved

psychologically with increased self-esteem after six months of receiving a service dog.

According to this study, individuals also became more socially involved with the community and experienced an increase in employment rates. Individuals with service dogs also needed less paid or unpaid human assistance.

Questions were raised by other researchers regarding these high success rates reported by Allen and Blascovich (31). One concern was the small sample size of 48 individuals with service dogs, out of the 500 individuals who allegedly applied to participate in the study. Eames and Eames challenged the matching of each group for statistical analysis (31). For example, each group had exactly 12 men and 12 women. Other issues questioned included the funding sources and the dog agencies recruited from, which were unable to be traced by Eames and Eames. Because a good research study needs to be easily reproduced and the overall success rate of service dogs was 100 percent, Allen and Blascovich's study raised questions on the reliability and validity for their research.

More studies with a focus on service dogs in the general public and in the workplace would be beneficial to the rehabilitation field. Researchers and professionals in the rehabilitation field understand the need for more studies regarding wheelchair service dogs (15). Therefore it was proposed to examine this topic of wheelchair service dogs to enhance the limited available data. If data shows strong correlations between wheelchair service dogs and the improved overall health of individuals, presented cases regarding the use of service dogs would be stronger with the evidence to back it up. With dogs assisting the human race for 30,000 years (9), it is time to present data that supports the collaboration between dogs and individuals with mobility limitations.

1.11 Specific Aims

The purpose of this study was to show relationships between disabilities and the use of assistive technology. This study explores the effects service dogs have (as assistive technology) on individuals who use wheelchairs, especially in the areas of depression, fatigue, pain, amount of assistive technology used, and amount of human assistance used. Some examples of assistive technology devices that may be replaced by service dogs are reachers, dressing sticks, remote controls or environmental control units. The following hypotheses were examined:

Hypothesis 1.A.

The use of assistive technology relates to the severity of an individual's disability and the amount of assistance available at the baseline.

Hypothesis 1.B.

The use of assistive technology relates to the severity of an individual's disability and the amount of assistance available over a nine-month period of time.

Hypothesis 2.A.

Individuals using the most assistive technology, without the assistance of service dogs, will rely on more human help at the baseline.

Hypothesis 2.B.

Service dogs will reduce the need for other assistance (human and mechanical) over time.

Hypothesis 3.A.

Service dogs used as assistive technology will reduce scores reflecting feelings of depression, pain and fatigue at the baseline.

Hypothesis 3.B.

Service dogs used as assistive technology will reduce scores reflecting feelings of depression, pain and fatigue over a nine-month period of time.

2.0 METHODS

2.1 Study Design

This was a nine-month longitudinal study investigating the use of mechanical assistive technology compared to the use of service dogs. Individuals were given a questionnaire about demographics, disability, assistive technologies and human assistance used. A questionnaire was given as a baseline, as well as at the three-months and the nine-months after the baseline. The information collected from the questionnaires allowed for the comparison of scores among individuals with varying disabilities, duration and severity of disabilities, and types of assistance used. Institutional Review Board (IRB) approval was obtained from the Department of Veterans Affairs prior to any data collection. All subjects signed an informed consent document before participating.

2.2 Subjects

Participants were categorized into one of the following four groups: 1.) individuals who have received a service dog trained by a certified organization within four weeks of completing the initial questionnaire; 2.) individuals who are on a waiting list to receive a service dog from a qualified organization; 3.) individuals who have a cat or dog as a pet; and 4.) individuals in the control group who did not have service dogs or pets and were not on a waiting list to receive a service dog. In order to be eligible to participate, the participants needed to be 18 years of age or older and to use a wheelchair for 75% of the time for mobility.

Participants were recruited through brochures explaining the study sent to individuals already in the Human Engineering Research Laboratories Wheelchair Users Registry. This registry is a database for the lab's reference only. Individuals registered in this registry have given the lab permission to contact them if a study comes up for which they may be eligible. Personal information in the Wheelchair Users Registry is treated as confidential, as only the principal investigators and clinical coordinators have access to this database. For researchers to determine who may be eligible for a particular study, the clinical coordinators are given the eligibility requirements and search through the Wheelchair Users Registry. Registry investigators or coordinators contact individuals who fit the eligibility criteria to participate in a particular study.

Dog agencies were contacted asking if the organizations would assist the study by distributing brochures approved by the Institutional Review Board (IRB). Agencies were found through contacts with Paws with a Cause, Canine Companions for Independence, and from online directories such as Assistance Dogs International Inc. (32), and International Association of Assistance Dog Partners (33). Researchers associated with this study spoke with the appropriate individuals over the phone to ask permission for us to send brochures if there were any upcoming graduations of services dogs. The service dog agencies were also asked to target individuals on waiting lists.

Once individuals contacted the investigators, the researchers were able to answer any questions that may have arisen. Then, the researchers would gather an IRB approved packet which included: a cover letter explaining the contents of the packet, a baseline questionnaire, an activity diary, a consent form, a pay sheet, and a self-addressed stamped envelope. Both the brochures and the cover letters also contained multiple means of contacting the research team

should any additional concerns have arisen with the potential participants. Upon the receipt of the returned, signed consent form, data was collected. Individuals who were unable to complete the packet through the mail were able to complete the information in a telephone interview. Participants were considered to be enrolled once informed consent was completed and the subject met inclusion/exclusion criteria.

As in any longitudinal study, retainment was an issue with participants through the nine-month period. Individuals were sent birthday cards and holiday greetings at the appropriate times to build professional rapport and to help individuals feel comfortable working with us. To prevent drop outs, logs were kept in Microsoft Excel and were closely monitored. The participants who may have been coming close to the target date were called and reminded of the due packet. During these phone calls, answers were provided to any questions or concerns individuals would present to the researcher. The participants would either state the packet was in the mail, or a phone interview was scheduled. Individuals were reimbursed \$20.00 for each questionnaire that was completed.

2.3 Study Protocol and Instrumentation

Once subjects signed the informed consent forms, data were collected. Data collected consisted of Dog Status; Disability Prognosis (progressive or non-progressive); Number of Assistive Technology devices used; Hours of Human Help Used; Activities of Daily Living; Depression; Pain; and Fatigue. The following are the variables listed with descriptions of how these were measured. Throughout this study, “assistance available” and “human help” are used interchangeably.

Dog Status

Dog status was achieved by placing the subjects in one of four study categories. These were individuals who had received service dogs within 4 weeks of completing the questionnaire, individuals on a waiting-list to receive a service dog, individuals who had a pet, and individuals who did not have a pet and were not on a waiting-list. To determine the status of the subjects, individuals were asked, “Do you have a service dog?” Here, individuals are also asked, “Are you on a waiting list?”, and “Do you own a pet?”

Disability Prognosis

Specifically, the type of disability was determined by the answers individuals gave to the question: “What is your injury or diagnosis?” The date of onset, injury, or diagnosis was recorded following the question asking about the type of disability. For the purposes of this study, prognosis of the disability describes whether or not the disability is progressive or non-progressive.

Questions taken from the questionnaire to determine disability:

We are interested in the relationship of disability and assistive technology to other factors in your life. The following questions deal with these factors.

1. What is your injury or diagnosis? _____

Date of onset, injury, or diagnosis: ____/____/____

Hours of Human Help Used

Individuals need different amounts of assistance for daily activities. As some individuals need more assistance than is available to them, the amount of human assistance used was measured. Subjects were asked: “How many hours in a typical 24-hour day do you have someone with you to assist with personal care activities?” (This question was referred to as

“hours assistance for personal care” in this study), and “How many hours in a typical week do you have someone with you to assist you with grocery shopping, housekeeping, or running errands?” (This question was referred to as “hours of assistance for errands” in this study.)

Two versions of the questionnaires used. The subjects who enrolled in the study before the newer version of the questionnaire was implemented were asked to divide the number of hours given for personal care assistance per week into which individuals completed specific tasks for them, if the helpers were paid, and if the helpers had to take time off from work to help. To standardize the two questionnaires, the answers from the newer questionnaire (hours per *day* of assistance) were multiplied by seven to equal hours of assistance per *week* (to equate with the answers from the older version).

Activities of Daily Living

Responses to the hours of human help were combined with information gathered from the Activity Diary. In the Activity Diary, subjects were asked to indicate whether or not they were able to complete daily tasks (activities of daily living) independently, with an assistive device, with some human help, or with total human help. A scoring technique was used to determine the extent an individual was able to complete a task independently, with an assistive device, with some human help, and with total human help. Using Excel, the researchers developed a formula to combine the percentages from each activity to calculate the total percentages for all activities.

Information regarding the use of assistive devices was also determined by the Activity Diary. Percentages were obtained from the Activity Diary where individuals were asked if they needed assistance with an activity of daily living. Subjects responded that they completed elements of the task: independently; with an assistive device; with some human help; or with

total human help. If an individual used a service dog to complete a task, the service dog was considered an assistive technology device. All of the percentages for each activity of daily living were combined for overall total percentages.

Number of Assistive Technology Devices Used

The number of assistive technology devices used was determined by asking, “In the past 6 months, have you used any assistive devices to assist you in the use of your hands or arms – for example a reacher or a dressing stick? If yes, please list the device(s) used.” The answers were then recorded.

Depression

Depression was determined using the Center for Epidemiologic Studies for Depression (CES-D) Scale. This scale asked the subjects to respond to twenty statements and to indicate to what extent they have felt that way during the past seven days (34). It was developed by the Center for Epidemiologic Studies which is a department of the United States National Institute of Mental Health. This scale is intended for individuals 18 years of age and older. Four to eleven percent of the general population is affected by depression, but the percentage does go up in specified populations such as individuals with chronic illnesses. The responses were: rarely or none of the time (Less than 1 day); some or a little of the time (1-2 days); occasionally (3-4 days); or all of the time (5-7 days). With the exception of four statements that reversed the scoring, the previous responses were scored as zero to three, respectively and all scores were added for a total score of depression.

The CES-D measures depression through questions. Schroevers et al. tested the reliability and the validity for both sections with individuals who had been diagnosed with cancer 15 months previous to the survey and individuals who had not (35). This study has shown that the questions reflecting a negative mood were both reliable and valid, while questions showing an overall positive personality were simply reliable. However, a study completed among older individuals proved the CES-D was valid, with 88% specificity (36).

The CES-D can be used with any population and is appropriate with differences in age, gender and socioeconomic status (34). Devins and Orme (1985), reported results from a study done by Radloff in 1977 which showed reliability coefficients of .51 after one week, .59 after eight weeks, .48 after three months, and .49 for twelve months when looking at consistency of the test score. However, when looking at internal consistency, Cronbach's coefficient alpha Radloff reported coefficient alphas of .84, .85, and .90 which show there is reliability (34).

When the CES-D scale was compared with other tests to check validity, it correlated with two other tests used to determine depressive symptoms. The CES-D correlated with the Hamilton rating scale ($r^2 = .50s$ to $.80s$ in different populations) and the Raskin scale ($r^2 = .30s$ to $.80s$ in different populations (34).

When 538 community residents completed the CES-D and 16 was the determining score if an individual showed signs of depressive symptoms, there were about 40.5 % false negatives reported. With the score raised to 23, there were 60 % false negatives reported. However, the false positives were 14.1% and 7% respectively (34). For this study, 22 was used as the cut off score for determining depressive symptoms because of the lower false positive rate.

Pain Levels

The pain levels an individual felt were measured by the McGill Pain Questionnaire (Short Form). This questionnaire divides the score into three sections: Total Pain Rating Index (Pain I), The Present Pain Intensity – Visual Analog Scale (Pain II), and the Evaluative Overall intensity of Total Pain Experience (Pain III). Pain I includes the combination of a Sensory Pain Rating Index and an Affective Pain Rating Index. Here the subject was given a series of adjectives describing different types of pain and the subject was instructed to indicate to what extent he or she has experienced that type of pain. These choices were given numerical values and recorded as: None (0), Mild (1), Moderate (2), or Severe (3). Questions 1 through 11 measure afferent pain, and questions 12 through 15 measure sensory pain. The scores from all fifteen pain adjectives were added up for the Total Pain Rating Index. For the Visual Analog Scale, the subject was instructed to indicate the present level of pain from “No Pain” to “Worst Possible Pain”. The mark the individual made was then measured to come up with a percentage that was recorded as the score for Pain II. Pain III was obtained by asking the individual to describe his or her present level of pain (which also had numeric values) as: No Pain (0); Mild (1); Discomforting (2); Distressing (3); Horrible (4); or Excruciating (5). These were then added for the score of Pain III.

The original McGill Pain Questionnaire had conflicting findings on its validity (37, 38). The McGill Pain Questionnaire (Short Form) was later designed in hopes of improving validity. The McGill Pain Questionnaire (Short Form) was also found to be very reliable (37,38). The scores from the McGill Pain Questionnaire (the long form) and the McGill Pain Questionnaire (Short Form) are highly correlated (39). The p-values were all less than .01 in different populations dealing with pain (post surgical pain, labor pain, and musculoskeletal pain).

When researching the validity and comparing the long form of the McGill Pain Questionnaire to other tests measuring pain, correlations were found ranging from .11 to .65 (40). A consideration for this large range in correlations could depend on the variety of psychometrics of the populations being tested. The reliability was consistent in 70 – 75% of all the cases tested over a 3-7 day trial period by Melzack in 1975 (40).

Fatigue Levels

Each subject was asked to complete the Fatigue Severity Scale which determined his or her level of fatigue. The Fatigue Severity Scale asked each individual to rate each of the nine statements asked on a scale of 1 to 7, where 1 equaled “statement not appropriate” and 7 equaled “strongly agree”. The total score for fatigue was calculated by taking the average of all of the numbers given by the subject.

The Fatigue Severity Scale has been shown to have high reliability (41). However, the validity has been questioned (42). Stouten claimed that as of 2005, the existing articles generally stated that the tests were reliable and valid, but no solid numbers were given. However, Kleinman et al. (43) did find a reliability of .94 and a validity value of .82 for the total score.

Severity of Disability

When referring to severity of disability, the prognosis of the disability was considered. Prognosis is referring to whether the disability is progressive or non-progressive. The type of wheelchair an individual used was also taken into consideration (manual, power, or scooter). The results of the statistics produced a comparison between the types of wheelchair that was used and prognosis, and the dog status and prognosis. These tables are in the Appendix H and Appendix I.

2.4 Data Management

As completed packets were received, the information was reviewed to ensure that the consent was properly completed and there was no missing information in the questionnaire. In the best interest of the individuals participating in the study, if the score on the Center for Epidemiologic Studies for Depression (CES-D) was higher than twenty-two, the subject was called and notified of the high score. Individuals were also called if scores were under twenty-two, only if missing data needed to be obtained or if there was a question regarding a response to an item in the questionnaire. For the initial baseline, each packet was given an ID number which correlated to the order in which it was received. These numbers were given according to the existing excel database (Figure 1). The follow-up packets for months three and nine were added to the baseline, keeping the same ID number as the baseline packet. All records were tracked in detail throughout the data collection process. These records included the date the packet was received, the date of entry into the computer database, and the date of reimbursement.

The image shows a Microsoft Excel spreadsheet titled "sample data tracking sheet". The spreadsheet is organized into several sections:

- Section 1 (Rows 1-11):** Contains personal and contact information with columns: title, fname, lname, id, dogstat, initials, address1, address2, city, dphone, nphone, email, bdaymo, best time, Crecd, InfCons, Ccopied, Cmaild.
- Section 2 (Rows 12-22):** Contains tracking data with columns: bsent, Brecd, Bpaid, Benterd, Bverify, snt3, send3, target3, recd3, paid3, entrd3, verify3, snt9, send9, target9, recd9, paid9, entrd9, verify9.
- Section 3 (Rows 23-31):** Contains tracking data with columns: sdthxs, disq, calls, Sent Thank You's, Where learned about our study.

The spreadsheet interface includes the Microsoft Excel menu bar, a toolbar with various icons, and a status bar at the bottom showing "Ready" and the current time as 11:38 AM.

Figure 1 Example of Subject Tracking Sheet

2.5 Methods for Statistical Analysis

Data from each packet were manually entered into and organized in Microsoft Access. Once the information for the packets was entered into the Access program, SPSS was used to analyze the data. SPSS is a software program specifically for statistical analysis (44). SPSS Version 11.5 was used for this study. Frequencies were run to check distributions for all variables.

Nine individuals were crossovers. This indicates that nine individuals who were on the waiting list received a service dog while they were active participants in the study. Only the questionnaires completed after the receipt of the service dog were included in the analysis of this study. For all analyses, alpha was set a priori at 0.05. A post hoc analysis using an LSD (Bonferroni) was done for variables with significant values after a repeated measures analysis was completed.

Hypothesis 1.A.

The use of assistive technology relates to the severity of an individual's disability and the amount of assistance available at the baseline.

Prognosis, years with disability, total number of assistive technology devices used, primary wheelchair used (manual, power, or scooter), gender, and age were all normally distributed among the 172 subjects. T-tests were used to examine the relationship between categorical variables (use of assistive technology; prognosis) and continuous variables (years with disability, hours of assistance received, and number of assistive technology). Chi-square statistics were used for categorical variables (use of assistive technology, primary wheelchair used, and prognosis) and correlations were computed for continuous variables. An analysis of variance (ANOVA) was run to find significance between continuous variables and categorical variables with more than two levels (the number of assistive devices used and the primary wheelchair used; hours of assistance received for personal care and the primary wheelchair used, and the hours of assistance received for errands (IADL) and the primary wheelchair used).

Hypothesis 1.B.

The use of assistive technology relates to the severity of an individual's disability and the amount of assistance available over a nine month period of time.

A within-subjects repeated-measures analysis was run to examine relationships over the nine-month period of time within the number of assistive technology used and the hours of assistance used as the repeated variable. The data was also examined visually on plotted graphs of means for these variables.

Hypothesis 2.A.

Individuals using the most assistive technology, without the assistance of service dogs, will rely on more human help at the baseline.

With all 172 subjects, an ANOVA was used to obtain the level of significance of the dog group (service dog, wait list, pet, and control) with the normally distributed variables (number of assistive technology; percent of activities of daily living completed independently). A Kruskal Wallis test was used to analyze the dog group with the hours of human assistance used for personal care (Activities of Daily Living - ADLS) and errands (Instrumental Activities of Daily Living - IADLS); percent of assistive technology used for activities of daily living; and percentages of human assistance used for activities of daily living (based on categories of “some human help” or “total human help”).

Hypothesis 2.B.

Service dogs will reduce the need for other assistance (human and mechanical) over time.

A repeated measures analysis was run to show relationships over the 9-month period of time for each individual within each variable as the service dog variable affected them: the number of assistive technology devices used; the hours of human assistance used for personal care or errands; and the percentages of activities of daily living completed independently, with an assistive device, some human help, or total human help. The data was also examined visually on plotted graphs of means for these variables.

Hypothesis 3.A.

Service dogs used as assistive technology will reduce scores reflecting feelings of depression, pain and fatigue at the baseline.

The service dog group was analyzed using an ANOVA with the normally distributed variables from the McGill Pain Questionnaire (I and II), the Fatigue Severity Scale, and the CES-D scores. A chi-square was used to analyze the dog group with variable III of the McGill Pain Questionnaire.

Hypothesis 3.B.

Service dogs used as assistive technology will reduce scores reflecting feelings of depression, pain and fatigue over a nine month period of time.

A repeated measures analysis was run to show relationships over a 9-month period of time for each individual within each variable as the service dog variable affected him or her: CES-D (total score); McGill Pain Questionnaire (variables I, II, and III); and the Fatigue Severity Scale (total score). The data was also examined visually on plotted graphs of means for these variables.

3.0 RESULTS

3.1 Demographics

In this study, 172 eligible individuals enrolled to participate in the 9-month study and completed the baseline questionnaire. Of these 172, thirty-nine individuals (22.7%) were on the waiting list to receive a service dog, eighteen (10.5%) had received a service dog within four weeks of completing the baseline questionnaire, sixty (39.4%) individuals had a pet cat or dog, and fifty-five (32.0%) individuals did not have a service dog, did not own a pet, and were not on a waiting list. At the time of data analysis, 117 individuals completed all nine-months: 147 individuals completed the three-month questionnaire and 121 individuals completed the nine-month questionnaire. Individuals did not complete all three packets because of problems with time constraints, address changes, or disconnected phone numbers.

At the baseline, the average age was 46.01 (± 12.37) and the average years an individual had a disability was 25.46 (± 15.57). The study consisted of male and female subjects, with 38.4% (n=66) male and 61.6% (n=106) female. Fifty six percent (n=97) of individuals who participated in this study had non-progressive disabilities and the remaining (43.6%, n=75) had progressive disabilities. Table 3 shows the different disabilities that were represented. The majority of individuals who responded to this study were Caucasian (84.9%, n=146), but other ethnicities were represented: 4.1% (n=7) African American; 1.2% (n=2) American Indian; 1.2% (n=2) Asian American; 1.7% (n=3) Hispanic; 7.0% (n=12) responded as “other”.

Every subject in this study used a wheelchair as their primary means of mobility (75% of the time he or she is up and moving around). Forty-eight percent (n=82) of individuals used a power wheelchair; forty-two percent (n=73) used a manual wheelchair, and ten percent (n=17)

used a scooter. Although two individuals decided not to indicate whether or not they were a veteran, 84.3% (n=145) indicated they were not veterans and 14.7% (n=25) indicated that they were veterans. There was no significance between each demographic variable and the dog groups. See Table 2 for the general demographics of the surveyed population. Distributions of demographics are detailed in tables found in Appendix H.

Table 2 General Demographics of Subject Population

Ethnicity %	Service Dog Group %	Wheelchair Most Used %	Veteran Status* %	Prognosis %	Gender %	Age in Years	Years with disability
4.1 African American	23 Wait List	42.4 Manual	84.3 Not Veterans	44 Progressive	38.4 Male	46.01 (± 12.37)	25.46 (± 15.57)
1.2 American Indian	11 Service Dog	47.7 Power	14.7 Veterans	56 Non – Progressive	61.6 Female		
1.2 Asian American	34 Pet	9.9 Scooter					
84.9 Caucasian	32 Control						
1.7 Hispanic							
7.0 Other							

*Missing 2 data pts

Table 3 Represented Disabilities (Progressive and Non-progressive)

Progressive	Non-progressive
Muscular dystrophy	Spina bifida
Multiple Sclerosis	Cerebral Palsy
Spinal Muscular Atrophy	Traumatic Brain Injury
Rheumatoid Osteoarthritis – Degenerative Joint Disease	Cerebalvascular Accident (CVA)
Reflex Symathetic Dystrophy (RSD)	Amputations
Cardiovascular disease	Spinal cord injuries
Arthrogyriposis	Osteogenesis imperfecta
SLE or Lupus	Fibromyalgia
Post-Polio Syndrome	Transverse myelitis
ALS	
Fredrich’s Ataxia	
Myotonic dystrophy	
Osteoarthritis	
Spinal Stenosis	
Engelmann disease	
Charcot Marie Tooth Disorder	
Brainstem encephalitis	
Primary lateral sclerosis	
Tay Sachs	
Guillain Barre Syndrome	

3.2 Hypothesis 1

Hypothesis 1.A.

The use of assistive technology relates to the severity of an individual's disability and the amount of assistance available at the baseline.

At the initial data collection point (baseline), there was a borderline significant relationship between prognosis and the number of assistive technology used ($p=0.05$).

Individuals who had progressive disabilities used more assistive technology devices. There was also a significant relationship between the primary wheelchair used and the hours of assistance received for personal care activities ($p=0.00$) and the hours of assistance received for instrumental activities of daily living (IADL) such as help with errands and grocery shopping ($p=0.01$). Individuals who used a power wheelchair needed more human assistance. Individuals with progressive disabilities used significantly more hours of assistance for instrumental activities of daily living ($p=.02$). Table 4 shows correlations with significance.

Table 4 Relationships at Specific Points in Time (NS = Not Significant)

Baseline				
	Use AT (yes/no)	# AT	Hours personal care	Hours care for IADL
Years with disability	NS	NS	NS	NS
Primary wheelchair	NS	NS	$p = 0.000$	$p = 0.010$
Prognosis	NS	$p = 0.050$	NS	NS
3 month				
	Use AT (yes/no)	# AT	Hours personal care	Hours care for IADL
Years with disability	NS	NS	NS	NS
Primary wheelchair	NS	NS	$p = 0.010$	$p = 0.025$
Prognosis	NS	NS	NS	NS
9 month				
	Use AT (yes/no)	# AT	Hours personal care	Hours care for IADL
Years with disability	NS	NS	NS	NS
Primary wheelchair	NS	NS	$p = 0.005$	$p = 0.043$
Prognosis	NS	NS	NS	$p = 0.016$

Hypothesis 1.B.

The use of assistive technology relates to the severity of an individual's disability and the amount of assistance available over a nine month period of time.

A repeated measures analysis was run to determine the significance of changes over time. The average hours of assistance used increased, but the use of assistive technology remained constant throughout all the visits. Individuals who had progressive disabilities used significantly more hours of assistance for IADL ($p=0.021$). Although not significant, hours used for personal care activities tended to increase over time as well. Longitudinally, people who used a power wheelchair needed significantly more human assistance for both IADL ($p=0.005$) and personal care ($p=0.000$). (See Figures 2 and 3)

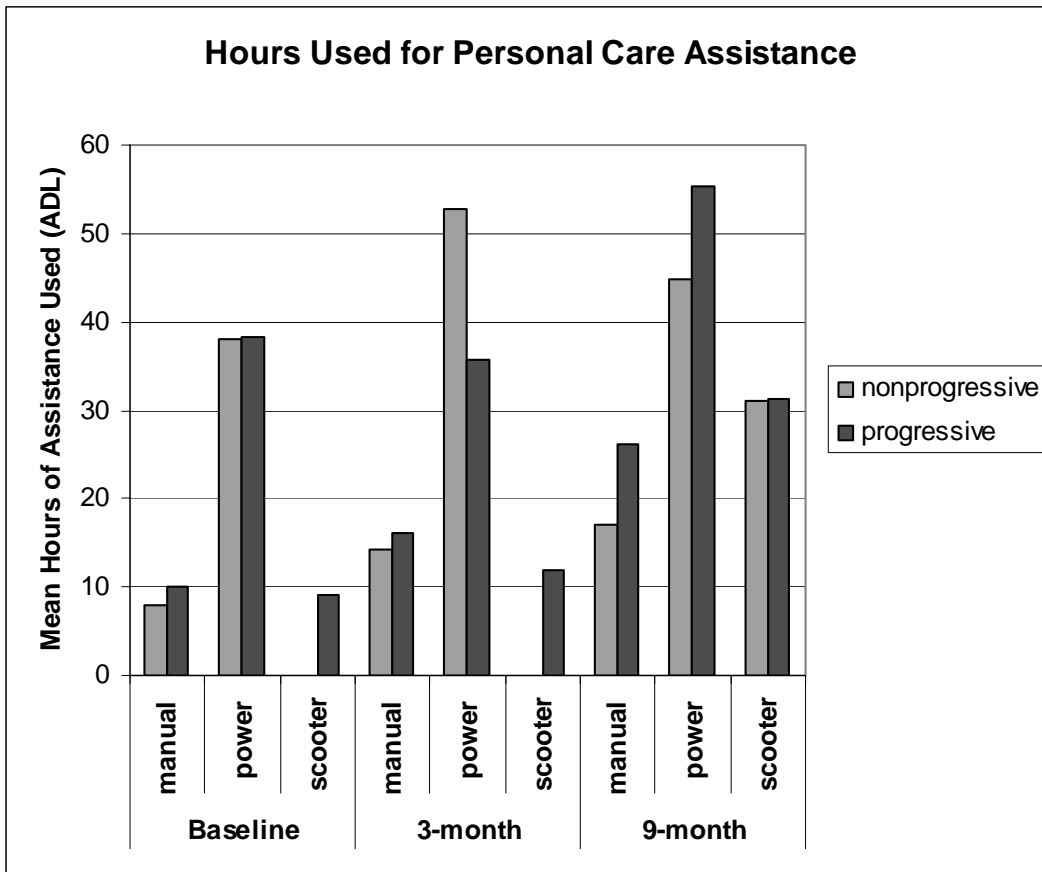


Figure 2 Hours Used For Personal Care Assistance (Activities of Daily Living)

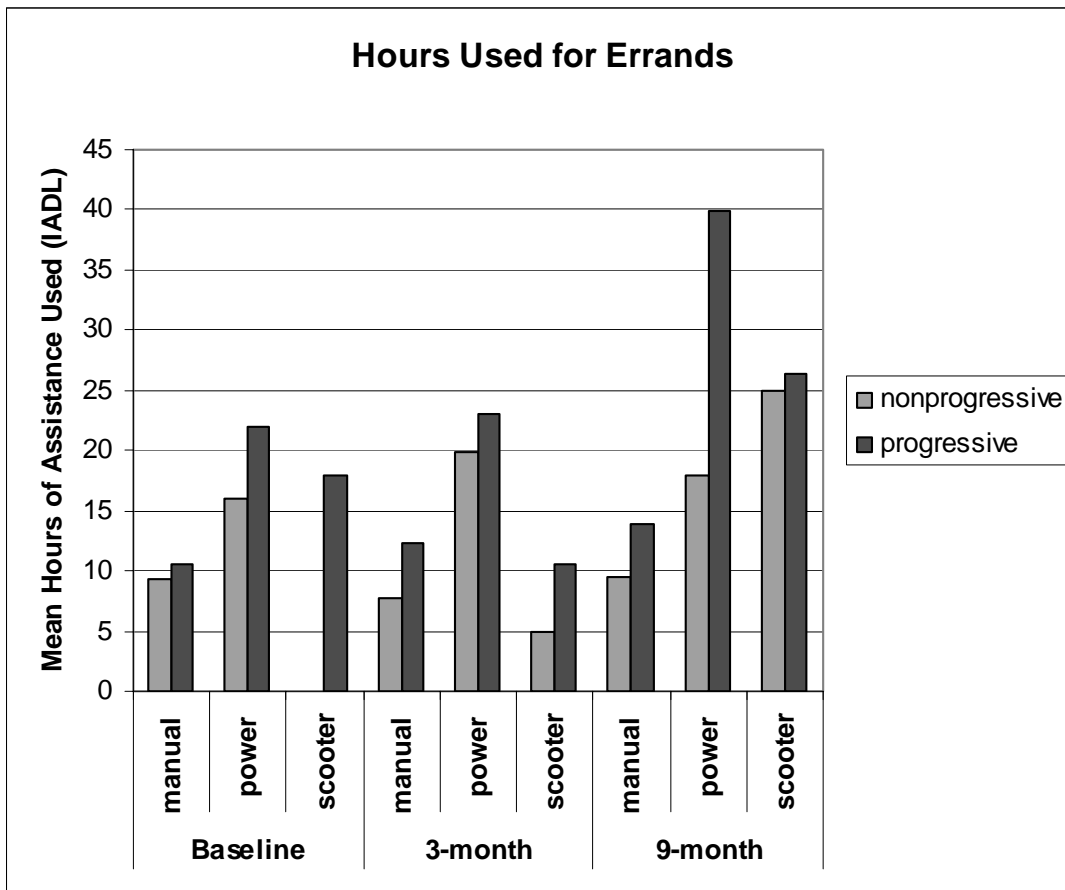


Figure 3 Hours Used For Instrumental Activities of Daily Living (IADL)

3.3 Hypothesis 2

Hypothesis 2.A.

Individuals using the most assistive technology, without the assistance of service dogs, will rely on more human help at the baseline.

At the baseline data collection, there was a significant relationship between the dog groups (wait list, service dog, pet, and control) and the number of assistive technology devices used ($p=0.01$); the service dog group and hours of human assistance used for errands ($p=.001$); the service dog group and the raw percentage of assistive technology used for activities of daily living ($p=0.001$); and the service dog group and the raw percentage of some human help used for activities of daily living ($p=0.00$). Of the individuals who used assistive technology, there was a significant difference between dog groups ($p=0.02$). Individuals partnered with service dogs used the least amount of assistive technology devices. Figures 2 – 7 show these differences between dog groups.

To limit the data and only observe individuals who use assistive technology, some human help, or total human help, these variables were looked at without the people who indicated they needed zero help with the respectable categories. The raw data includes all data points from all individuals, while where it is stated “of the individuals who use...” refers to the exclusion of the subjects indicating no help in that specific category (assistive device, some human help, or total human help).

Hypothesis 2.B.

Service dogs will reduce the need for other assistance (human and mechanical) over time.

A repeated measures analysis was run to determine significant changes over time within service dog groups and the categories for Hypothesis 2A (Number of assistive technology devices used, hours of assistance for personal care assistance (ADLs) and for errands (IADLs), and the percentages of activities performed independently, with assistive technology, with some human help and with total human help). According to initial analysis, there were no significant increases over time in any of these groups in relation to the dog groups that individuals were in.

Over time within subjects, individuals who do use service dogs increased the activities for which they needed some human help ($p=0.005$). A post hoc analysis showed that significant differences existed between the baseline and the nine month visit ($p=0.02$), increasing 9.2% to 11.4% respectively. There was also a significant increase from the third month to the ninth month ($p=0.004$), from 8.7% to 11.4% respectively. During these intervals, the percentages of some human help used for activities increased insignificantly. There was a significant increase in the percentage the controls used some human help from the baseline visit to the third month ($p=0.03$), as shown in Figure 4.

Upon further investigation, individuals with progressive disabilities had significant changes between the baseline and the third visit ($p=0.047$), and between the second and third visits ($p=0.04$), as the mean percentages of some human help increased. However, there was a significant increase from the second visit to the third visit ($p=0.02$) for the individuals with non-progressive disabilities.

There were no significant changes in the percent of total human assistance overall or within each group. Individuals with service dogs had the least percentage of activities of daily living completed with total human help ($6.2 \pm 2\%$ at the baseline and $8 \pm 3\%$ at nine months). The control group had the largest percentage of activities completed with total human assistance ($13 \pm 4\%$ at the baseline and $13 \pm 3\%$ at nine months). This information is detailed in Figure 5.

Individuals who were on the waiting list had a significant decrease ($p=0.04$) in the percent of activities completed independently from $74.3 \pm 5\%$ at three months to $69.4 \pm 5\%$ at nine months. Although there were no significant changes, service dog owners also decreased in the percentage of activities completed from $77.6 \pm 5\%$ at the baseline to $70.7 \pm 6\%$ at nine months. Pet owners remained the same at about 75% for all three months, and the controls remained at about 77% for all three months, as shown in Figure 6. To control for changes in climate and seasons, subjects were recruited continuously throughout the year and were recruited from various locations across the country.

Individuals who owned service dogs had an overall higher percentage for use of assistive technology – but this percentage decreased during the nine months (from $6.8 \pm 2\%$ at the baseline to $4.6 \pm 1.7\%$ at 9-months). The individuals on the waiting list remained constant (at about 4.5%) for the percentage of activities of daily living completed with assistive technology. There were also no significant changes within the pet group or the control group, as shown in Figure 7.

There were no significant changes in the use of assistive technology over the nine months overall, or within the groups. Individuals who were controls used the least amount of assistive technology with an average of 1.08 ± 0.18 at the baseline and 0.96 ± 0.18 at three months. The subjects who were pet owners used the next to least amount of assistive technology

(remembering that service dogs were counted as a form of AT), with an average of 0.97 ± 0.13 devices at the baseline and 1.07 ± 0.16 at nine months. Service dog owners used the most assistive technology reporting an average of 1.46 ± 0.41 at the baseline and 1.92 ± 0.38 at three months. There were no significant changes in individuals who were on the waiting list for service dogs. This information is detailed in Figure 8.

A post hoc analysis did show a significant increase in hours for personal care among all of the individuals from the baseline to the nine month visit ($p=0.001$) and from the three month visit to the nine month visit ($p=0.046$). Although there were increases in hours of personal care (24.11 ± 4.03 hours of assistance at baseline to 38.93 ± 5.43 hours of assistance at nine months), the post hoc analysis showed no significant increases in hours used for personal care within the dog groups.

Although there was not a significant change between groups over time shown in the repeated measures analysis, the individuals owning service dogs had an increase in the mean of hours of personal care assistance from 37.00 ± 19.22 hours for personal care assistance at the baseline to 61.46 ± 17.91 hours for personal care assistance at the nine month data collection period. Individuals in the control group also had an increase from 17.59 ± 4.51 at the baseline to 28.87 ± 7.93 at nine-months for hours of personal care assistance. Individuals in the pet group only increased from 22.91 ± 6.32 hours of personal care assistance at the baseline to 32.24 ± 8.37 at the nine-month data collection period, as shown in Figure 9.

Although not significant, there were noticeable changes in hours of assistance used for errands (IADLs) by individuals who use service dogs (from 12.61 ± 3.39 hours at baseline to 28.77 ± 12.66 at nine-months), individuals who own pets (from 13.86 ± 4.01 at baseline to 23.88 ± 6.59 hours at 9-months), and individuals who are controls (13.56 ± 2.76 hours at baseline to

18.54 ± 4.66 hours at 9-months). There was an increase for hours of assistance for errands for all dog groups as the average for all four increased from 14.76 ± 2.12 hours of assistance to 21.07 ± 3.65 hours. Figure 10 shows this information in detail.

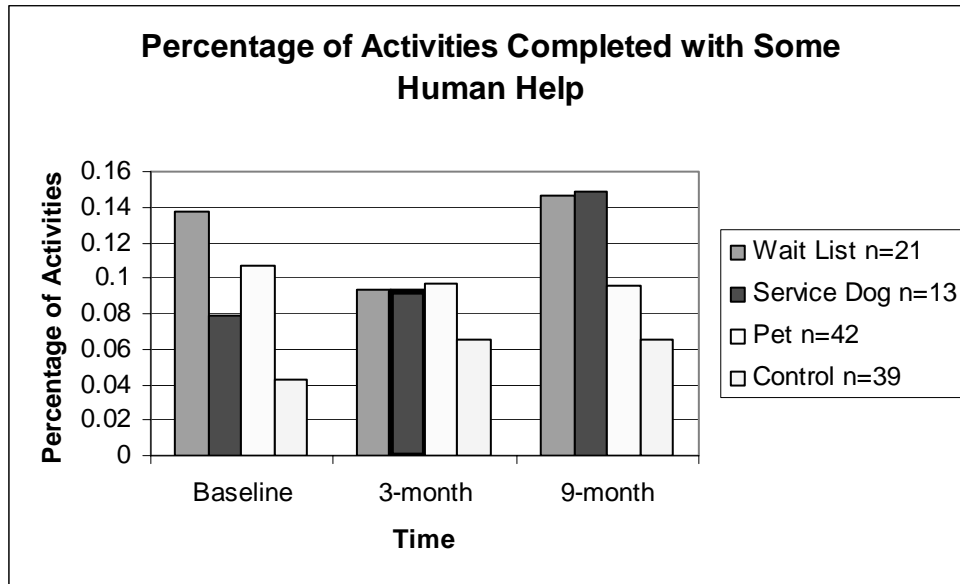


Figure 4 Percentage of Activities Completed with Some Human Help

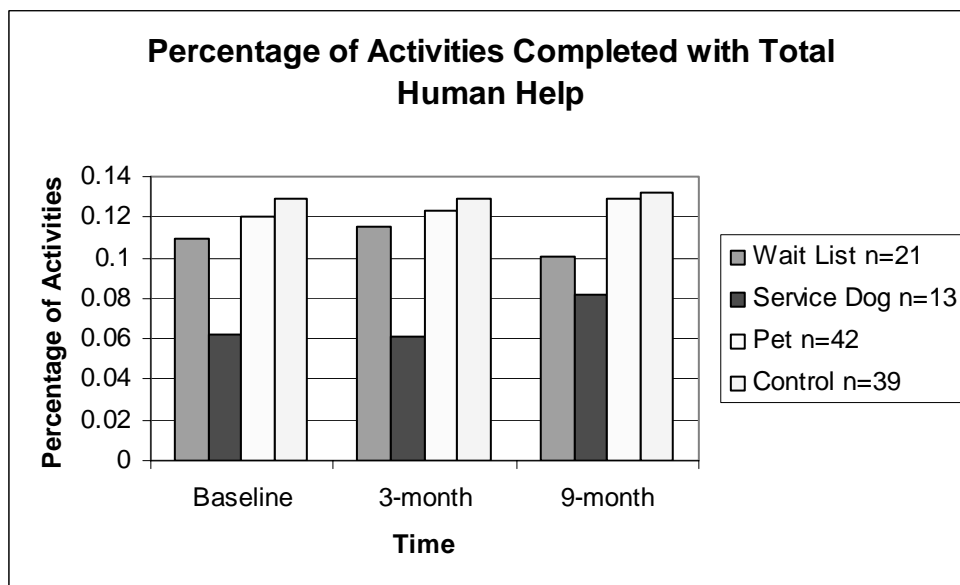


Figure 5 Percentage of Activities Completed with Total Human Help

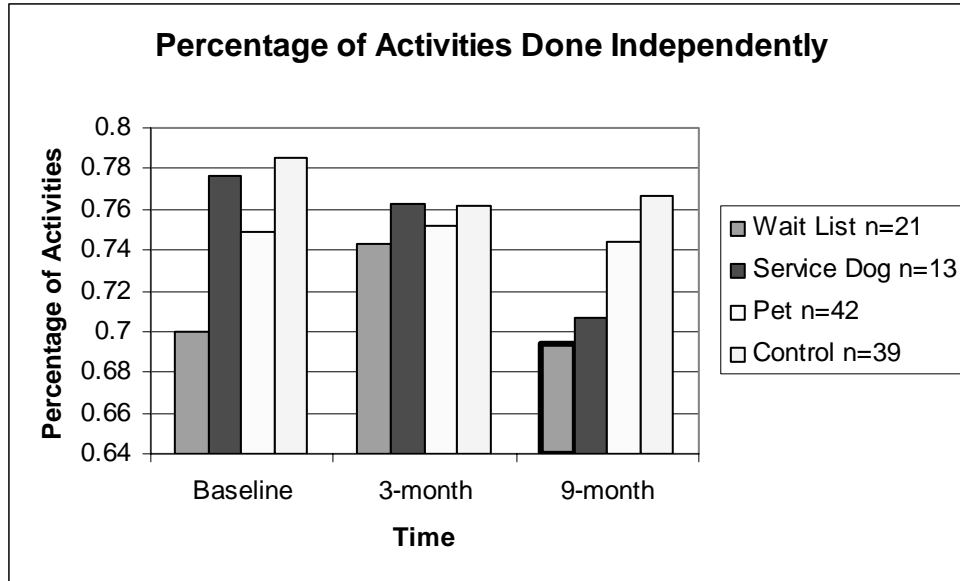


Figure 6 Percentage of Activities Completed Independently

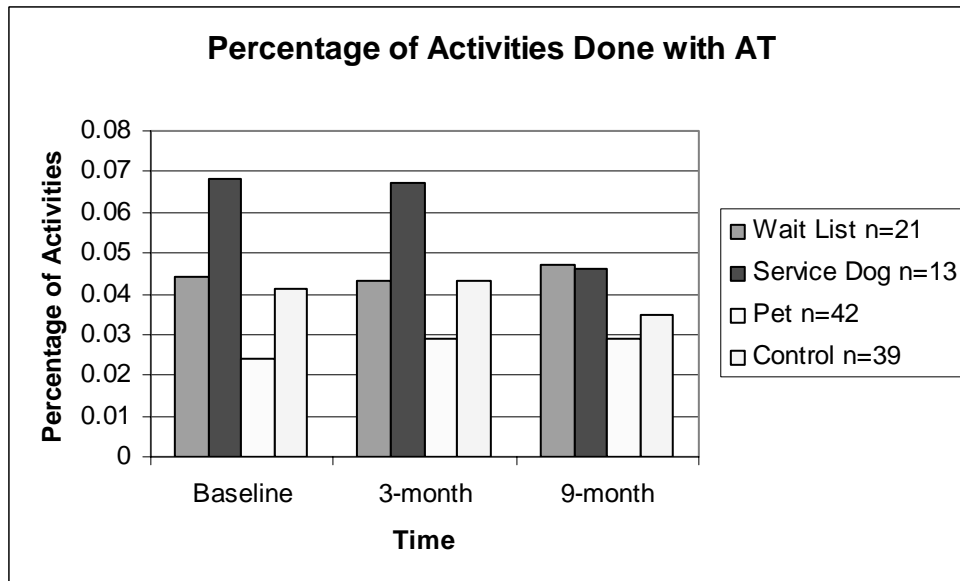


Figure 7 Percentage of Activities Completed with Assistive Technology

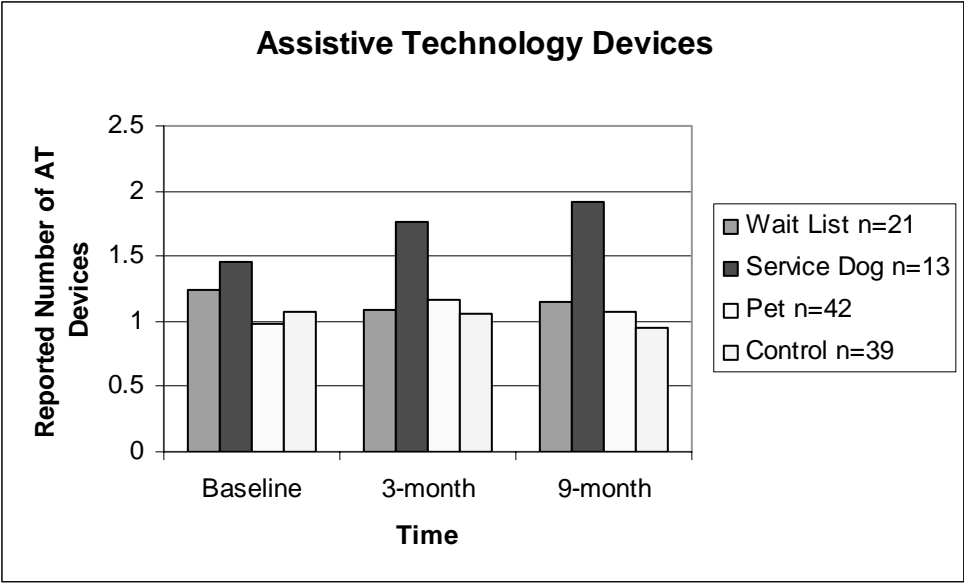


Figure 8 Reported Number of Assistive Technology Devices Used

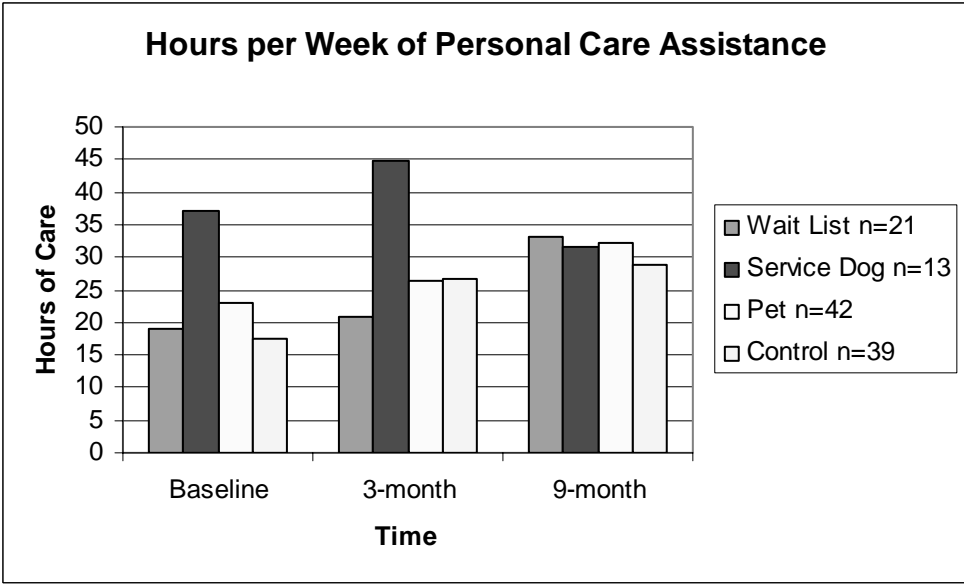


Figure 9 Hours of Personal Care Assistance

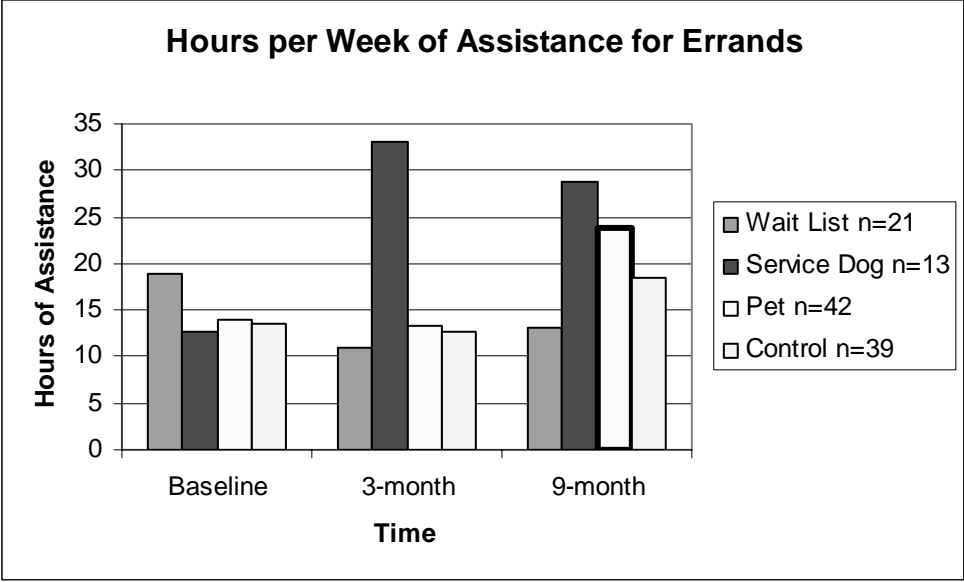


Figure 10 Hours of Assistance for Errands (IADL)

3.4 Hypothesis 3

Hypothesis 3.A

Service dogs used as assistive technology will reduce scores reflecting feelings of depression, pain and fatigue at the baseline.

At the initial data collection point, the distribution of the CES-D scores for depression was barely skewed at 1.06. Using a Kruskal-Wallis test to compare the CES-D scores across the dog groups, there was not a significant relationship ($p=.08$). After truncating the data to control for the outliers, there was a significant relationship between dog group (wait-list, service dog, pet group, control) and the CES-D score ($p=0.047$). See Figure 11 for a visual comparison. There was also a significant relationship between the dog group and the Pain I (Total Pain Rating Index) of the McGill Pain Questionnaire ($p=0.01$). See Figure 12 for a visual comparison.

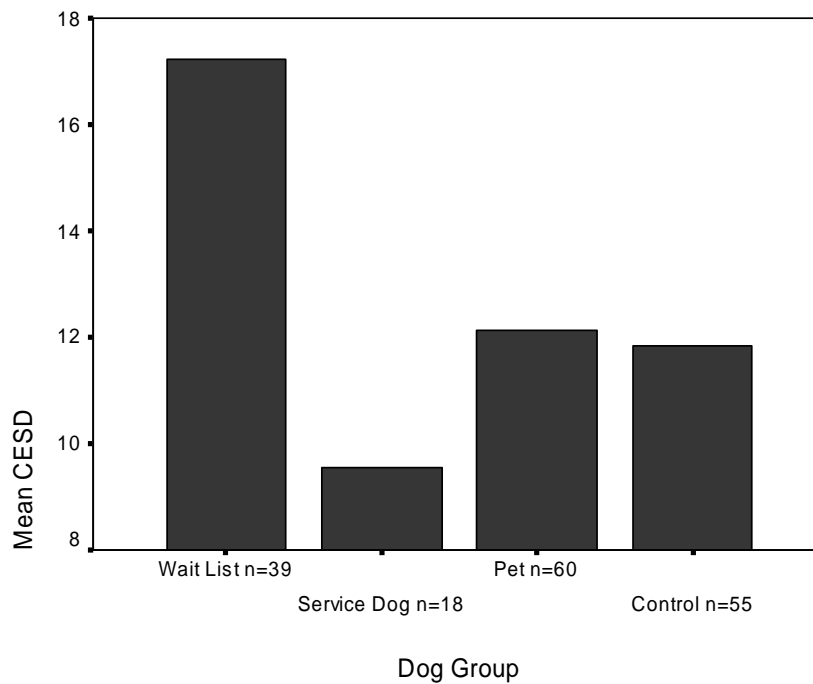


Figure 11 Baseline Means of the CESD Scale

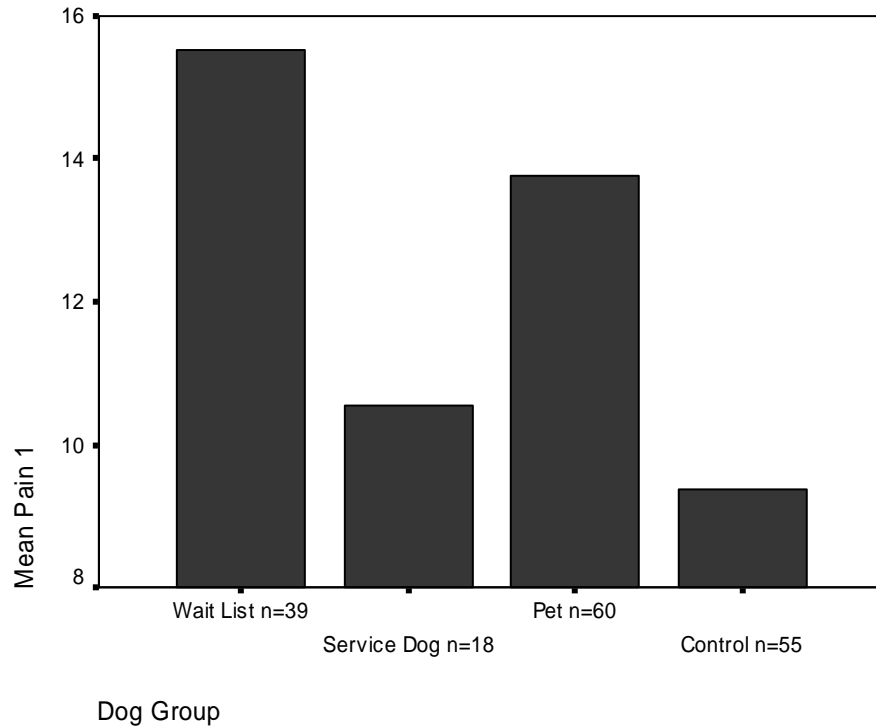


Figure 12 Baseline Means of Pain 1

Hypothesis 3.B.

Service dogs used as assistive technology will reduce scores reflecting feelings of depression, pain and fatigue over a nine month period of time.

Pain 1: A borderline significance ($p=.050$) was found in Total Pain Rating Index (Pain 1) between dog groups over time. A post hoc analysis did show individuals on the waiting list had a significant increase ($p=.008$) in pain values (Pain I) from 12.81 ± 2.27 at the three month visit to 16.00 ± 2.69 at the nine month visit. See Figure 11 for more detail.

Pain 3: There was a borderline significance ($p=0.051$) of change between the three month visit (1.385 ± 0.186) and the nine month visit (1.051 ± 0.151) for the “evaluative overall intensity of the total pain experience” (Pain 3) in the control group. (See Figure 15.)

Fatigue: Figure 15 shows significant decreases in the Fatigue Severity Scale for individuals who are on the waiting list. The score significantly decreases ($p=0.045$) from 5.14 ± 0.35 at the baseline to 4.53 ± 0.40 at three months. The score also significantly decreases ($p=0.02$) from 5.14 ± 0.35 at the baseline to 4.43 ± 0.47 at nine months. Individuals who owned service dogs had a significant decrease ($p=0.04$) in Fatigue Severity Scores from 5.01 ± 0.47 at three months to 4.63 ± 0.46 at nine months.

Depression: Depression changed over time when controlling for depression. A regression model controlling for depression was run and the significant differences persisted over time ($p=0.00$). When controlled for depression, the mean of individuals on the wait list increased from 15.52 to 18.00. The means of individuals in the service dog group increased from the baseline (11.46) to three months (14.62), then slightly decreased from 3 months (14.62) to 9 months (13.15).

Pain: Pain 3 had significant changes over time even when controlling for Pain 3. A regression model controlling for pain was run and it still indicated significance over time for Pain 3 ($p=0.00$). Pain 3 showed an increase in the wait list group and the pet group, and a decrease in pain perception in the dog group. When controlled for pain 1, there was no significance in Pain 1 ($p=0.11$). Levels of pain perception remained about the same for all dog groups over the nine months. Although Pain 2 did not show any significance, when Pain 2 was controlled for Pain 2, it did show a change where individuals with service dogs were the only group to decrease in pain perception ($p=0.07$).

Looking at the data (see Figures 13 -17), people who were on the waiting list to receive a service dog tended to have higher scores of depression, pain and fatigue. The people in the pet group tended to stay the about same for depression and fatigue, but the pain scores did increase over the nine months. The Pain II (Visual Analog Scale) and Pain III did tend to decrease in individuals with service dogs, while Pain I (Total Pain Rating Index) and the stayed about the same for individuals with service dogs.

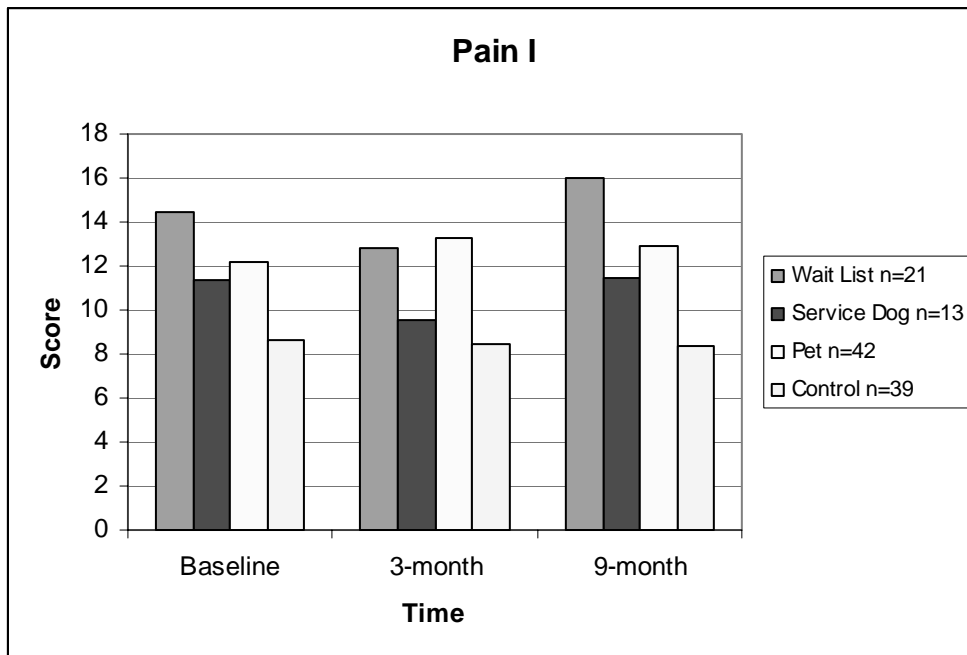


Figure 13 Pain I of the McGill Pain Questionnaire

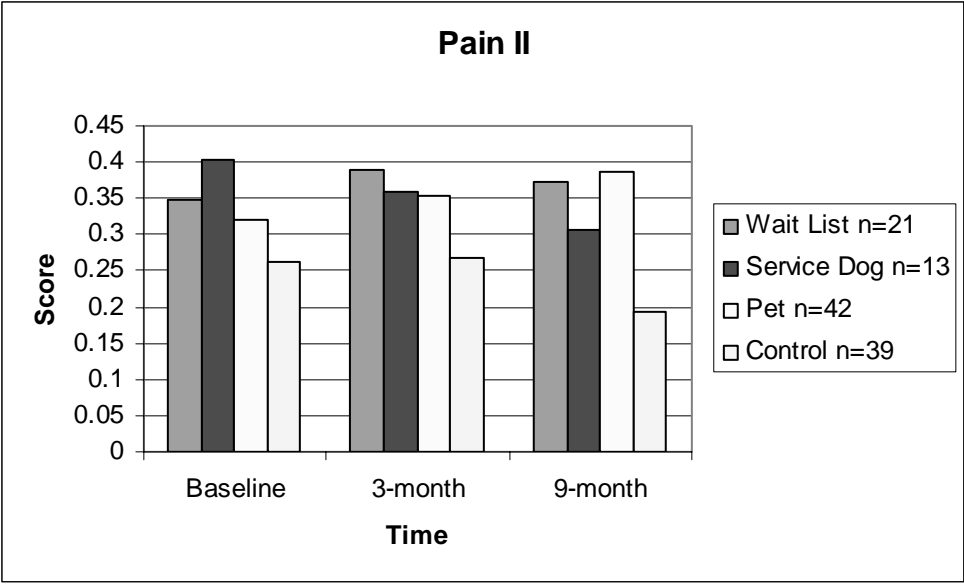


Figure 14 Pain II of the McGill Pain Questionnaire

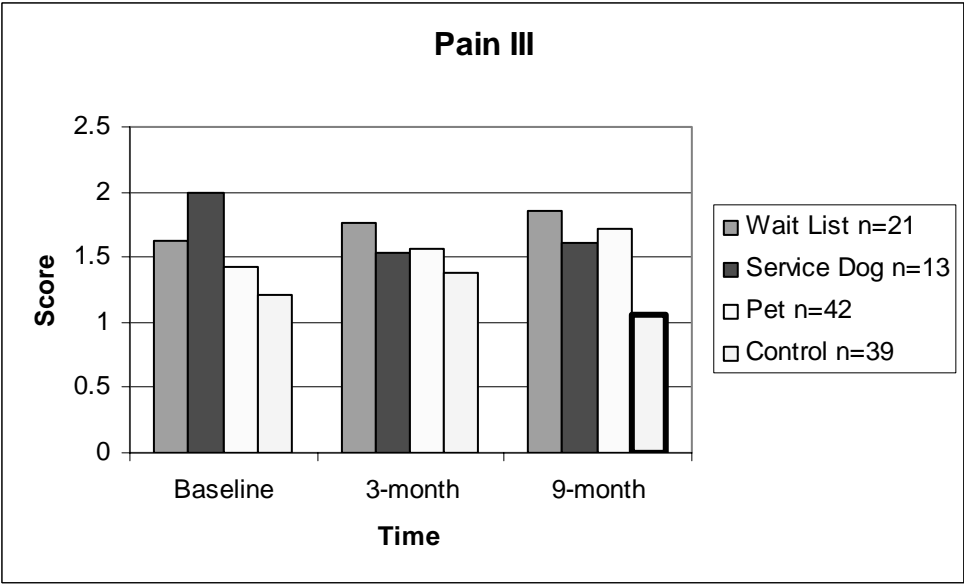


Figure 15 Pain III of the McGill Pain Questionnaire

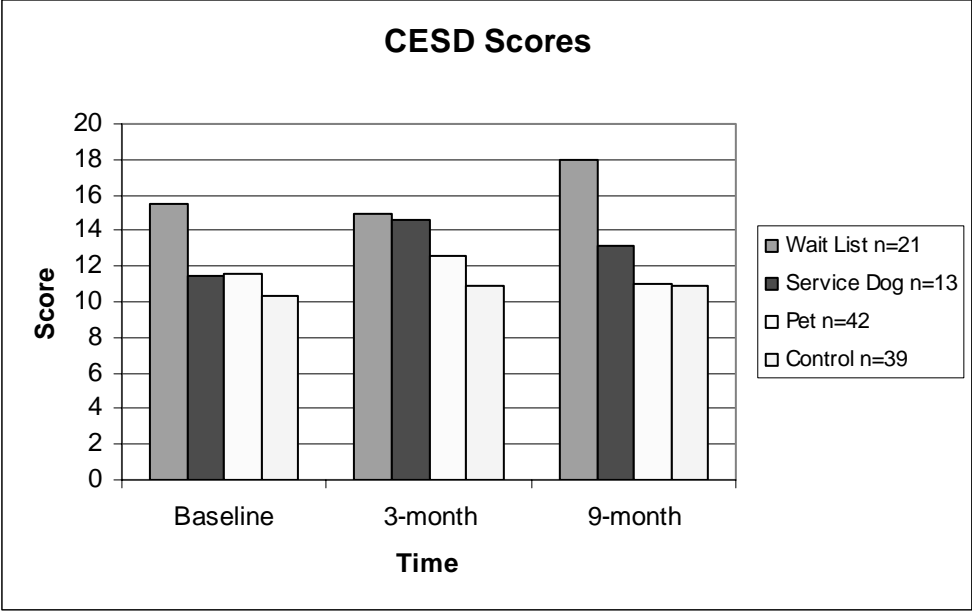


Figure 16 CES-D Scores

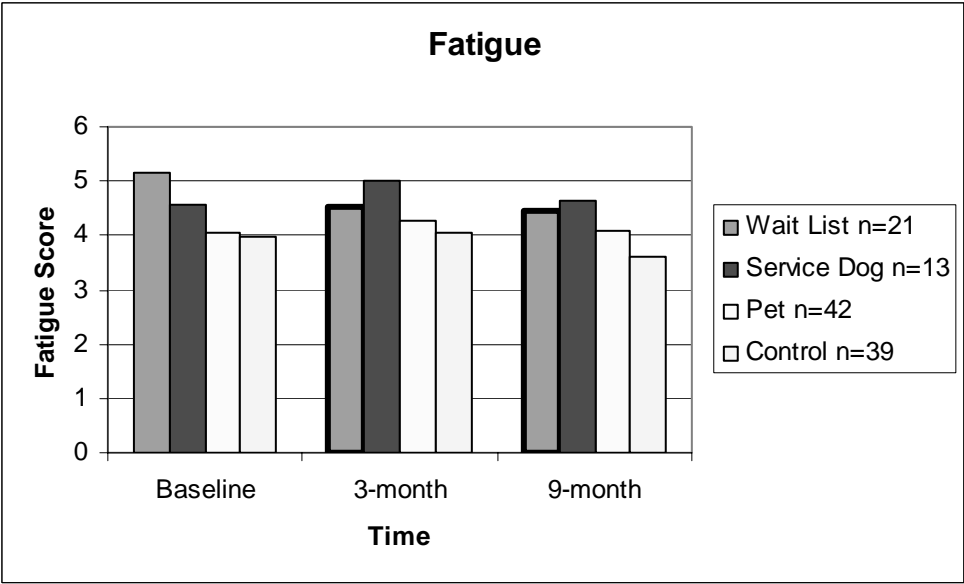


Figure 17 Fatigue Severity Scores

4.0 DISCUSSION

The results of this study show prognosis and time with a disability do affect the assistive technology the individual uses. Also, a significant relationship between the type of wheelchair used and the hours of assistance needed was found. A possible explanation may be that individuals with the properly prescribed wheelchair are more independent. We could assume that individuals who use power wheelchairs have less function and need more assistance, as individuals who have progressive disabilities need more human assistance over time. Although not significant, individuals who owned service dogs did have an increase in some human help for activities of daily living with a decrease in the amount of total human assistance for activities of daily living. These results suggest that individuals who receive service dogs are able to do more, although they do still need an element of human assistance. These results suggest service dogs do not eliminate the need for human assistance, but they do return an element of participation. Individuals using the service dogs are able to do more for themselves during activities of daily living, although they are not completely independent. These results are similar to the reported results from Rintala et al (45) that service dogs do improve the self esteem, happiness and independence of the individual. Individuals stated independence as one of the important areas of life (45). Service dogs can increase participation, bringing individuals closer to independence than before receiving the service dog (46).

While the other categories remained about the same, the individuals who own service dogs increase in the number of assistive technology devices used. A possible explanation for this may be that a section of the questionnaire asked how activities of daily living are completed and service dogs could have been considered an assistive technology device. Individuals completing

the questionnaire may have included their service dog in this category. Another possibility is that individuals with service dogs are gaining a level of confidence that allows them to use more assistive technology. A qualitative study has shown that individuals describe their experience with their service dog as having “someone to watch over me” (46).

Individuals on the waiting list showed no real change in the numbers, but individuals who were pet owners used the least amount of assistive technology. Service dogs were considered a form of assistive technology, so it is possible that these pet dogs are doing some tasks that take the place of assistive technology as well. These pet owners also decreased in the percent of activities of daily living that were able to be completed independently. This could possibly be because of progressive disabilities, or the skill of the pet was unable to progress with the person’s needs.

There was a significant increase in pet owners for the hours of assistance needed for errands, or IADLs. This could be because of the individuals in the group who have progressive disabilities, or because of the natural progression of need for assistance as an individual ages. An increase in hours was present for individuals with service dogs from the baseline to the third month, although it was not significant. The small decrease from the third month to the ninth month suggests that the individuals need more assistance when completing IADLs as they adjust to having their service dogs, but do not need as much assistance as the dog and owner become more comfortable with a routine. The results from this study did contradict the findings from Allen and Blascovich as they reported an overall decrease in hours of assistance for individuals who had service dogs (30).

The data shows individuals who were in the control group needed the most human help (highest percentage of total human help) for activities of daily living. These individuals also

used the least amount of “some human help” suggesting that individuals in the control group who need any human assistance are more likely to use total human help.

Individuals with service dogs had a slight increase in depression scores over time. The relationships between the dog group and CESD scores do show that individuals with service dogs actually increased in depression scores. This is actually the opposite of what was predicted, and could have a number of possibilities why. Initially, scores were lower for individuals with service dogs than those who were on the waiting list – at the baselines. Individuals may have had higher expectations of what having a service dog was going to be like. Individuals may have had lower depression scores at the baseline because of the excitement of receiving a new dog and the change in routine. However, after time elapsed, the scores gradually increased.

There was crossover information available to the researchers, but this information was not sufficient. Too many confounding factors are present to rely on the data previous to the individual receiving a service dog. Depression scores could decrease simply from the anticipation of receiving a service dog, which would also affect the scores a few months before the actual receipt of the dog.

Lane et al (18) found that dogs do provide individuals with comfort, self-esteem and support. Other studies have shown that service dogs are associated with improved psychological health (1, 46). Baun et al. states that the single act of being in the presence of a dog can reduce heart rates (13). However, the results from this study do contradict the findings from Allen and Blascovich (30). Allen claims that individuals with service dogs showed “substantial improvements” in “psychological well-being”, while our study showed that individuals with service dogs increased in depressive symptoms from the baseline data collection point.

Individuals with service dogs and individuals in the control group had lower scores for Pain I of the McGill Pain Questionnaire at the baseline. For Pain II and Pain III, the individuals in the control group had the lowest scores for pain overall, with a significant decrease in Pain III. Individuals who are in the control group may tend to be happier with their current living situations. Individuals who are on the waiting list are probably looking for help because of increased difficulties in their current lifestyles (for example, more pain, less independence, etc.). Individuals who have recently received service dogs probably still have the pain and depression. These pain scores may be lower because service dogs may take their mind off of the pain.

Individuals who were on the waiting list to receive a service dog had increases in Pain I, Pain II, and a significant increase in Pain III. The scores for Pain I, II, and III in individuals who owned service dogs either decreased or stayed the same over time.

Although there was little difference in Fatigue Severity Scores, individuals in the control group had the lowest scores with a significant decrease in scores overtime. There would be value in future studies further investigating these theories.

4.1 Limitations

Although the researchers made every effort to maintain the integrity of the research process, this study did have limitations. Some general basic limitations were directly related to a questionnaire based study. The validity of studies that relied solely on the response of subjects is affected by forms of bias. As subjects were asked to recall the past day, week, or month for this study, subjects may not have been remembering correctly for their answers. Questionnaires can also very subjective. Without objective measures, it was difficult to compare subjects to one another in a uniform, standard fashion.

This study asked individuals if they completed tasks independently, with an assistive technology device, with some human help, or with total human help. A number of subjects have indicated that they need more help than is available. This could result in individuals completing tasks independently when help should be utilized. Not only is this dangerous, but this could have distorted the data because individuals with similar functional levels could have been answering very differently.

For this study, subjects were given the option to complete questionnaires over the phone or to complete a copy on paper and return it to us by mail. This variation may have affected the consistency throughout the study. Individuals who completed questionnaires through the mail may have had questions or difficulty understanding certain sections of the survey. Not every individual was proactive enough (or willing to pay the long distance costs) to call and ask what he or she does not understand and may skip necessary questions.

Individuals who chose to complete the questionnaire over the phone occasionally had difficulty communicating with the researcher conducting the interview. Some individuals were

using speaker phones which caused some words to be cut out and needed to be repeated. Individuals may have had thick accents that may have also made it difficult for the two individuals to understand each other. Without having the questionnaire directly in front of them, the subjects tended to forget the scales that were used in the questionnaires. Most individuals would ask the researcher to repeat the options; however some would just answer randomly to avoid admitting the memory lapse. The verbal descriptions of scales (for example, the visual analog scale for the McGill Pain Questionnaire) and surveys were different than the interpretation received from visually seeing a scale or survey. Reading the questionnaire exactly may not have always conveyed all of the necessary information to complete the survey. Some individuals required more descriptions than others to fully understand the questionnaire. The researchers made every effort to not “coach” individuals in their answers, but subconscious verbal tones may have also affected answers.

In general, people grew tired of answering long surveys. Some individuals had high levels of pain, while others had disabilities that would not allow them to complete the questionnaire in one session. Even though the researcher explained one purpose of the study was to track changes over time, some individuals were frustrated with multiple surveys which all asked for exactly the same information. The information was also manually entered into a computer database, which could allow for human error despite regular information validations.

4.2 Future Studies

Future studies that observe individuals who have had service dogs a little longer may benefit the field of assistance dogs. These observations could track if the increase in assistance for errands and personal care was caused simply by the interruption of routine (receiving the service dog). It is possible that the hours needed for human assistance will decrease once the individual and the service dog become more accustomed to a routine that works for both members of the team. Since some subjects did mention more help is needed than help is available, future studies would be stronger if both aspects of this question are incorporated in the total response.

Additional studies with more of an equal distribution among the service dog groups would also benefit the findings of this paper. Having about twice as many controls and individuals with pets than individuals with service dogs may have had an affect on the results.

This study was mostly subjective. Future studies would be stronger if objective measures were combined with the subjective data collected. More objective data would assist in standardizing the data. Objective data could be collected by having a trained researcher follow a protocol for physical characteristics of tasks being completed. Each individual subject may have a different interpretation of what “independent” is, but the variability would be reduced if the researcher is able to actually observe how some tasks are completed by the subject firsthand.

Subjects lose interest toward the end of the long questionnaire. A future study might be stronger if the questionnaire was concise and took less of the subject’s time. It would be beneficial, but a challenge, to incorporate all of the significant and necessary information in a shorter form.

5.0 CONCLUSION

The amount of assistive technology an individual uses is directly related to the length an individual has had a disability and whether a disability is progressive or non-progressive. Individuals who have progressive disabilities need more human assistance over time.

From this study, it was learned that service dogs do not eliminate, or replace, the need for human assistance in activities of daily living. However, the service dogs do increase the individual's ability to participate in tasks of daily living.

Individuals who received service dogs had an initial increase in depression and then a subtle decrease. However, the overall depression scores for individuals with service dogs did gradually increase over time. Individuals with service dogs had an overall decrease in pain and fatigue, which was comparable to individuals in the control group. Futures studies are needed to explore these findings over longer periods of time.

APPENDIX A.

Old Version of Questions for Hours of Personal Care (ADL) and Errands (IADL)

We are interested in determining how much help you receive from others during every day life. The following questions deal with these factors. Please read each question and complete the following information as accurately as possible:

12. During the PAST MONTH did you need someone to help you or provide **PHYSICAL ASSISTANCE FOR PERSONAL CARE ACTIVITIES** such as eating, bathing, dressing, toileting and mobility?

- _____ (0) No → PLEASE GO TO QUESTION #13
 _____ (1) Yes → Please use the **CODE** numbers in this grey box to answer the questions below:

0	1	2	3	4	5
0 hours a week	1-9 hours a week	10-19 hours a week	20-29 hours a week	30-39 hours a week	40 or more hours a week
No help at all or not applicable	For example: A couple of hours, a few times a week	For example: A couple of hours every day	For example: About half a day, every day	For example: Most of the day, every day	All day, every day

Circle the choice which best represents the total amount of time during the week that someone helps you with just PERSONAL CARE ACTIVITIES such as bathing, dressing, toileting, eating and mobility:			
Who helps you?	Use the chart (see grey box) to circle the CODE ↓	Do you pay them? (Circle YES/NO)	Do they take time off from work to help you? (Circle YES/NO)
Spouse/Partner	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Parent	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Daughter/Son	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Other Relative	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Friend	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Friend	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Paid Helper (\$____/hr)	____hrs/ week	Not Applicable	Not Applicable

13. During the PAST MONTH did you need someone to help you with things such as **GROCERY SHOPPING, HOUSEKEEPING, OR RUNNING ERRANDS** because of your disability? (Do not include any help or time related to seeing physicians or any health professional – this will be addressed separately in another question)

- _____ (0) No → PLEASE GO TO QUESTION #14
 _____ (1) Yes → Please use the **CODE** numbers in this grey box to answer the questions below:

<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
0 hours a week	1-9 hours a week	10-19 hours a week	20-29 hours a week	30-39 hours a week	40 or more hours a week
No help at all or not applicable	For example: A couple of hours, a few times a week	For example: A couple of hours every day	For example: About half a day, every day	For example: Most of the day, every day	All day, every day

Circle the choice which best represents the **total amount of time during the week** that someone helps you with just **GROCERY SHOPPING, HOUSEKEEPING OR RUNNING ERRANDS**:

Who helps you?	Use the chart (see grey box) to circle the CODE ↓	Do you pay them? (Circle YES/NO)	Do they take time off from work to help you? (Circle YES/NO)
Spouse/Partner	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Parent	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Daughter/Son	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Other Relative	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Friend	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Friend	<u>0</u> <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u>	YES NO	YES NO
Paid Helper (\$____/hr)	____hrs/ week	Not Applicable	Not Applicable

APPENDIX B.

New Version of Questions For Hours of Personal Care (ADL) and Errands (IADL)

People with disabilities often need assistance. We would like to differentiate between personal care for physical disabilities and supervision for cognitive problems. First, focus on physical “hands on” assistance: This includes help with eating, grooming, bathing, dressing, management of a ventilator or other equipment, transfers etc. Keeping in mind these daily activities please read each question and complete the following information as accurately as possible:

12. How many hours in a typical 24-hour day do you have someone with you to provide physical assistance for **personal care activities such as eating, bathing, dressing, toileting and mobility?**

_____ Hours paid assistance per **24-hour day**

_____ Hours unpaid (family, others) per **24-hour day**

14. How many hours in a typical week do you have someone with you to provide physical assistance for **GROCERY SHOPPING, HOUSEKEEPING, OR RUNNING ERRANDS** because of your disability? (Do not include any help or time related to seeing physicians or any health professional – this will be addressed separately in another question)

_____ Hours paid assistance per **week**

_____ Hours unpaid (family, others) per **week**

APPENDIX C. Activities of Daily Living: Questions Asked From the Activity Diary

TRANSFERS:

Do you require assistance during transfer activities?

Any assistance provided by a service dog should be listed as using an ASSISTIVE DEVICE, and then ‘service dog’ (or SD) can be listed in the blank for type of assistive device.

_____ (0) No, please skip to next section
 _____ (1) Yes, please complete the following section

	Indep.	Assistive Device	Some Human Help	Total Human Help	N/A
Bed to Wheelchair	3	2	1	0	-2
Wheelchair to Bed	3	2	1	0	-2
Wheelchair to Toilet/Commode	3	2	1	0	-2
Toilet/Commode to Wheelchair	3	2	1	0	-2
Wheelchair to Vehicle	3	2	1	0	-2
Vehicle to Wheelchair	3	2	1	0	-2
Wheelchair to Shower/Tub	3	2	1	0	-2
Shower/Tub to Wheelchair	3	2	1	0	-2
Wheelchair to comfortable chair	3	2	1	0	-2
Comfortable Chair to Wheelchair	3	2	1	0	-2

If you marked (2), please list the Assistive Device used: _____

BATHING:

Do you require assistance during bathing activities?

_____ (0) No → If no, please skip to next section.
 _____ (1) Yes, please complete the following section

	Indep.	Assistive Device	Some Human Help	Total Human Help	N/A
Wash/Dry upper body	3	2	1	0	-2
Wash /Dry lower body	3	2	1	0	-2
Wash/Dry Feet	3	2	1	0	-2
Wash/Dry hair	3	2	1	0	-2

If you marked (2), please list the Assistive Device used: _____

GROOMING:

Do you require assistance during grooming activities?

_____ (0) No → If no, please skip to next section.

_____ (1) Yes, please complete the following section.

	Indep.	Assistive Device	Some Human Help	Total Human Help	N/A
Oral hygiene routine (brushing teeth, dentures)	3	2	1	0	-2
Brushing /Combing hair	3	2	1	0	-2

If you marked (2), please list the Assistive Device used: _____

DRESSING:

Do you require assistance during dressing activities?

_____ (0) No → If no, please skip to next section.

_____ (1) Yes, please complete the following section

	Indep.	Assistive Device	Some Human Help	Total Human Help	N/A
Upper indoor clothes on	3	2	1	0	-2
Upper indoor clothes off	3	2	1	0	-2
Lower indoor clothes on	3	2	1	0	-2
Lower indoor clothes off	3	2	1	0	-2
Upper(heavy) outdoor clothes on	3	2	1	0	-2
Upper(heavy) outdoor clothes off	3	2	1	0	-2
Socks on/off	3	2	1	0	-2
Shoes on/off	3	2	1	0	-2

If you marked (2), please list the Assistive Device used: _____

BED MOBILITY ACTIVITIES:

Do you require assistance during bed mobility activities?

_____ (0) No → If no, please skip to the next section.
_____ (1) Yes, please complete the following section.

	Indep.	Assistive Device	Some Human Help	Total Human Help	N/A
Rolling over	3	2	1	0	-2
Rolling Side to Side	3	2	1	0	-2
Sit to lying on your back	3	2	1	0	-2
Lying on your back to sit	3	2	1	0	-2
Blankets, pulling on	3	2	1	0	-2
Blankets, pulling off	3	2	1	0	-2

If you marked (2), please list the Assistive Device used: _____

BODY POSITIONING ACTIVITIES:

Do you require assistance during positioning activities?

_____ (0) No → If no, please skip to next section.
_____ (1) Yes, please complete the following section.

	Indep.	Assistive Device	Some Human Help	Total Human Help	N/A
Weight-shift for positioning in chair	3	2	1	0	-2
Maintaining sitting balance	3	2	1	0	-2

If you marked (2), please list the Assistive Device used: _____

WHEELCHAIR MOBILITY:

Do you require assistance during wheelchair mobility activities?

_____ (0) No → If no, please skip to next section.
_____ (1) Yes, please complete the following section.

	Indep.	Assistive Device	Some Human Help	Total Human Help	N/A
Turn corners	3	2	1	0	-2
Reverse direction	3	2	1	0	-2
“POP” Wheelie (manual only)	3	2	1	0	-2
Traverse in Wheelie (manual only)	3	2	1	0	-2
Propel w/c through rough/uneven surface	3	2	1	0	-2
Propel w/c on an incline	3	2	1	0	-2

If you marked (2), please list the Assistive Device used: _____

ENTERING/EXITING HOME:

Do you require assistance entering/exiting your home?

_____ (0) No → If no, please skip to next section.
_____ (1) Yes, please complete the following section.

	Indep.	Assistive Device	Some Human Help	Total Human Help	N/A
Propel w/c up a ramp	3	2	1	0	-2
Use lift	3	2	1	0	-2
ENTERING house/apartment (incl. unlocking & opening door(s))	3	2	1	0	-2
EXITING house/apartment (incl. locking & closing door(s))	3	2	1	0	-2

If you marked (2), please list the Assistive Device used: _____

MISCELLANEOUS:

Do you require assistance with these miscellaneous activities?

_____ (0) No → If no, please skip to next section.
_____ (1) Yes, please complete the following section.

	Indep.	Assistive Device	Some Human Help	Total Human Help	N/A
Use television/VCR controls/remote	3	2	1	0	-2
Use home environmental controls such as heat/air conditioning controls	3	2	1	0	-2
Use light switches	3	2	1	0	-2

If you marked (2), please list the Assistive Device used: _____

APPENDIX D. Number of Assistive Technology Devices Used

In the PAST 6 MONTHS, have you used any assistive devices to help you reach or grip things, or to assist you in the use of your hands or arms -- for example, a reacher or dressing stick?

(0) No

(1) Yes → Please list each device or aid below and rank according to your satisfaction in using each device or aid:

Device or Aid	Reason Used	Satisfaction 1 = Dissatisfied 2 = Satisfied 3 = Very Satisfied

APPENDIX E. Center for Epidemiologic Studies Depression (CES-D)

Circle the number next to each item that best reflects how frequently you have experienced that event in the past seven days.	Rarely or None of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	0	1	2	3
2. I did not feel like eating; my appetite was poor.	0	1	2	3
3. I felt that I could not shake off the blues even with help from my family or friends.	0	1	2	3
*4. I felt that I was just as good as other people.	0	1	2	3
5. I had trouble keeping my mind on what I was doing.	0	1	2	3
6. I felt depressed.	0	1	2	3
7. I felt that everything I did was an effort.	0	1	2	3
*8. I felt hopeful about the future.	0	1	2	3
9. I thought my life had been a failure.	0	1	2	3
10. I felt fearful.	0	1	2	3
11. My sleep was restless.	0	1	2	3
*12. I was happy.	0	1	2	3
13. I talked less than usual.	0	1	2	3
14. I felt lonely.	0	1	2	3
15. People were unfriendly.	0	1	2	3
*16. I enjoyed life.	0	1	2	3
17. I had crying spells.	0	1	2	3
18. I felt sad.	0	1	2	3
19. I felt that people disliked me.	0	1	2	3
20. I could not get going.	0	1	2	3

APPENDIX F. Fatigue Severity Scale

Please circle the number to indicate your agreement with each statement regarding your level of fatigue in the past week.

	<i>Statement</i> <i>Not Appropriate</i> → <i>Agree</i>						
During the past week, I have found that:	Score						
1. My motivation is lower when I am fatigued.	1	2	3	4	5	6	7
2. Exercise brings on my fatigue.	1	2	3	4	5	6	7
3. I am easily fatigued.	1	2	3	4	5	6	7
4. Fatigue interferes with my physical functioning.	1	2	3	4	5	6	7
5. Fatigue causes frequent problems for me.	1	2	3	4	5	6	7
6. My fatigue prevents sustained physical functioning.	1	2	3	4	5	6	7
7. Fatigue interferes with carrying out certain duties and responsibilities.	1	2	3	4	5	6	7
8. Fatigue is among my three most disabling symptoms.	1	2	3	4	5	6	7
9. Fatigue interferes with my work, family or social life.	1	2	3	4	5	6	7

APPENDIX G. McGill Pain Questionnaire – Short Form

Consider each of the following adjectives, and for each that describes any pain you have had during the past week, rate the intensity of that particular quality of your pain. If you have not experienced pain in the past week, check “none” for each of the adjectives.

	None	Mild	Moderate	Severe
1. Throbbing	0) _____	1) _____	2) _____	3) _____
2. Shooting	0) _____	1) _____	2) _____	3) _____
3. Stabbing	0) _____	1) _____	2) _____	3) _____
4. Sharp	0) _____	1) _____	2) _____	3) _____
5. Cramping	0) _____	1) _____	2) _____	3) _____
6. Gnawing	0) _____	1) _____	2) _____	3) _____
7. Hot-burning	0) _____	1) _____	2) _____	3) _____
8. Aching	0) _____	1) _____	2) _____	3) _____
9. Heavy	0) _____	1) _____	2) _____	3) _____
10. Tender	0) _____	1) _____	2) _____	3) _____
11. Splitting	0) _____	1) _____	2) _____	3) _____
12. Tiring-exhausting	0) _____	1) _____	2) _____	3) _____
13. Sickening	0) _____	1) _____	2) _____	3) _____
14. Fearful	0) _____	1) _____	2) _____	3) _____
15. Punishing-cruel	0) _____	1) _____	2) _____	3) _____

15. Make the line below to indicate the level of pain you are experiencing at this time.

No Pain _____ Worst
Possible Pain

16. Place a check next to the number to indicate your present level of pain.

- _____ (0) No Pain
- _____ (1) Mild
- _____ (2) Discomforting
- _____ (3) Distressing
- _____ (4) Horrible
- _____ (5) Excruciating

APPENDIX H. Demographic Distributions

Table 5 Wheelchair Used Most with Progressive/Non-Progressive Distributions

	Manual	Power	 Scooter	Total Percentages
Total	73 (42%)	82 (48%)	17 (10%)	172 (100%)
Non – Progressive	55 (75%)	40 (49%)	2 (12%)	97 (56%)
Progressive	18 (25%)	42 (51%)	15 (88%)	75 (44%)

Table 6 Progressive / Non-progressive Distributions Among Dog Groups

	Wait List	Service Dog	Pet	Control	Total Percentages
Total	39 (23%)	18 (11%)	60 (34%)	55 (32%)	172 (100%)
Non – Progressive	16 (41%)	8 (44%)	41 (61%)	32 (58%)	97 (56%)
Progressive	23 (59%)	10 (56%)	19 (32%)	23 (42%)	75 (44%)

Table 7 Ethnicity Distributions Among Dog Groups

Ethnicity	Wait List*	Service Dog	Pet*	Control	Total Percentages
African American	5.1%	0%	1.7%	7.3%	4.1%
American Indian	0%	5.6%	1.7%	0%	1.2%
Asian American	0%	0%	1.7%	1.8%	1.2%
Caucasian	74.4%	88.9%	85.0%	87.3%	84.9%
Hispanic	0%	5.6%	1.7%	1.8%	1.7%
Other	17.9%	0%	6.7%	1.8%	7.0%

* Missing two data points

Table 8 Spinal Cord Injury Distributions Among Dog Groups

Disability	Wait List	Service Dog	Pet	Control	Total
SCI Combo	1 (20.0%)	0 (0.0%)	3 (60.0%)	1 (20.0%)	5 (100.0%)
C3	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	1 (100.0%)
C4	0 (0.0%)	0 (0.0%)	3 (60.0%)	2 (40.0%)	5 (100.0%)
C5	1 (8.3%)	0 (0.0%)	7 (58.3%)	4 (33.3%)	32 (100.0%)
C6	0 (0.0%)	1 (14.3%)	2 (28.6%)	4 (33.3%)	12 (100.0%)
C7	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	1 (100.0%)
T3	0 (0.0%)	0 (0.0%)	1 (33.3%)	2 (66.7%)	3 (100.0%)
T4	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	1 (100.0%)
T5	2 (66.7%)	0 (0.0%)	0 (0.0%)	1 (33.3%)	3 (100.0%)
T6	0 (0.0%)	0 (0.0%)	1 (33.3%)	2 (66.7%)	3 (100.0%)
T7	0 (0.0%)	0 (0.0%)	3 (75.0%)	1 (25.0%)	4 (100.0%)
T8	0 (0.0%)	1 (50.0%)	1 (50.0%)	0 (0.0%)	2 (100.0%)
T9	1 (33.3%)	0 (0.0%)	2 (66.7%)	0 (0.0%)	3 (100.0%)
T10	0 (0.0%)	0 (0.0%)	2 (50.0%)	2 (50.0%)	4 (100.0%)
T11	0 (0.0%)	0 (0.0%)	1 (33.3%)	2 (66.7%)	3 (100.0%)
T12	1 (16.7%)	1 (16.7%)	2 (33.3%)	2 (33.3%)	6 (100.0%)
L1	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	1 (100.0%)
L4	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	1 (100%)

Table 9 Disability Distributions Among Dog Groups

	Wait List	Service Dog	Pet	Control	Total
Cerebral Palsy	8 (38.1%)	5 (23.8%)	4 (19.0%)	4 (19.0%)	21 (100.0%)
Muscular Dystrophy	2 (15.4%)	3 (23.1%)	3 (23.1%)	5 (38.5%)	13 (100.0%)
Spina Bifida	0 (0.0%)	0 (0.0%)	1 (33.3%)	2 (66.7%)	3 (100.0%)
Multiple Sclerosis	6 (28.6%)	4 (19.0%)	5 (23.8%)	6 (28.6%)	21 (100.0%)
Other	7 (33.3%)	2 (9.5%)	7 (33.3%)	5 (23.8%)	21 (100.0%)
Rheumatoid Osteoarthritis	2 (50.0%)	0 (0.0%)	1 (25.0%)	1 (25.0%)	4 (100.0%)
Spinal Muscular Atrophy	2 (28.6%)	1 (14.3%)	2 (28.6%)	2 (28.6%)	7 (100.0%)
Post Polio Syndrome	3 (33.3%)	0 (0.0%)	1 (12.5%)	5 (55.6%)	9 (100.0%)
CVD	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	1 (100.0%)
Amputee	1 (50.0%)	0 (0.0%)	1 (50.0%)	0 (0.0%)	2 (100.0%)
Osteogenesis Imperfecta	1 (50.0%)	0 (0.0%)	1 (50.0%)	0 (0.0%)	2 (100.0%)
RSD	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	1 (100.0%)
SLE or Lupus	1 (100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)
ALS	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	1 (100.0%)

Table 10 Gender Distributions Among Dog Groups

	Wait List	Service Dog	Pet	Control	Total Percentages
Total	39 (23%)	18 (11%)	60 (34%)	55 (32%)	172 (100%)
Male	10 (25.6%)	5 (27.8%)	25 (41.7%)	26 (47.3)	26 (47.3%)
Female	29 (74.4%)	13 (72.2%)	35 (58.3%)	29 (52.7)	29 (52.7%)

Table 11 Age and Years of Disability Means in Dog Groups

	Wait List	Service Dog	Pet	Control	Total Percentages
Age	44.0 (+13.3)	42.8 (+12.8)	46.4 (+11.9)	48.4 (+ 11.9)	46.0 (+12.4)
Years with Disability	54.3 (+14.3)	23.2 (+12.9)	22.7 (+15.5)	27.6 (+ 17.0)	25.5 (+15.6)

Table 12 Veteran Status in Dog Groups

	Wait List	Service Dog	Pet	Control	Total Percentages
Total	39 (23%)	18 (11%)	60 (34%)	55 (32%)	172 (100%)
Veteran	3 (7.7%)	3 (16.7%)	9 (15%)	44 (80%)	25 (14.5%)
Civilian	36 (92.3%)	15 (83.3%)	50 (83.3%)	10* (18.2%)	145 (84.3%)

*Missing 1 data point

APPENDIX I Box Plots

Figure 18 Percentage of Activities Done Independently

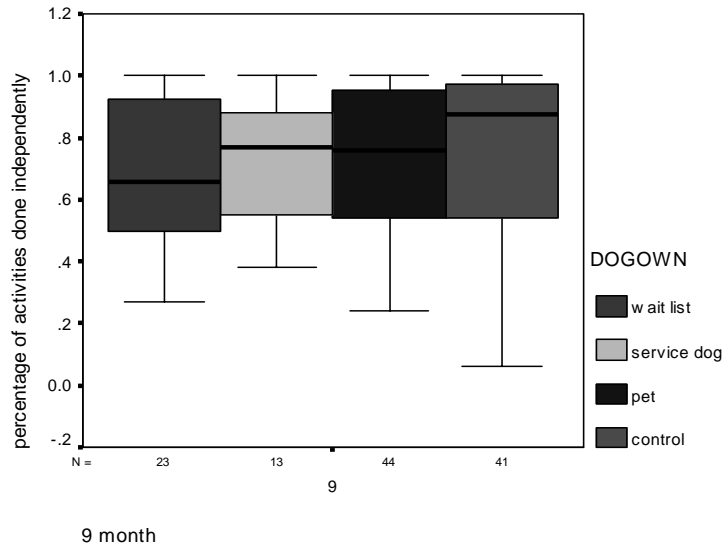
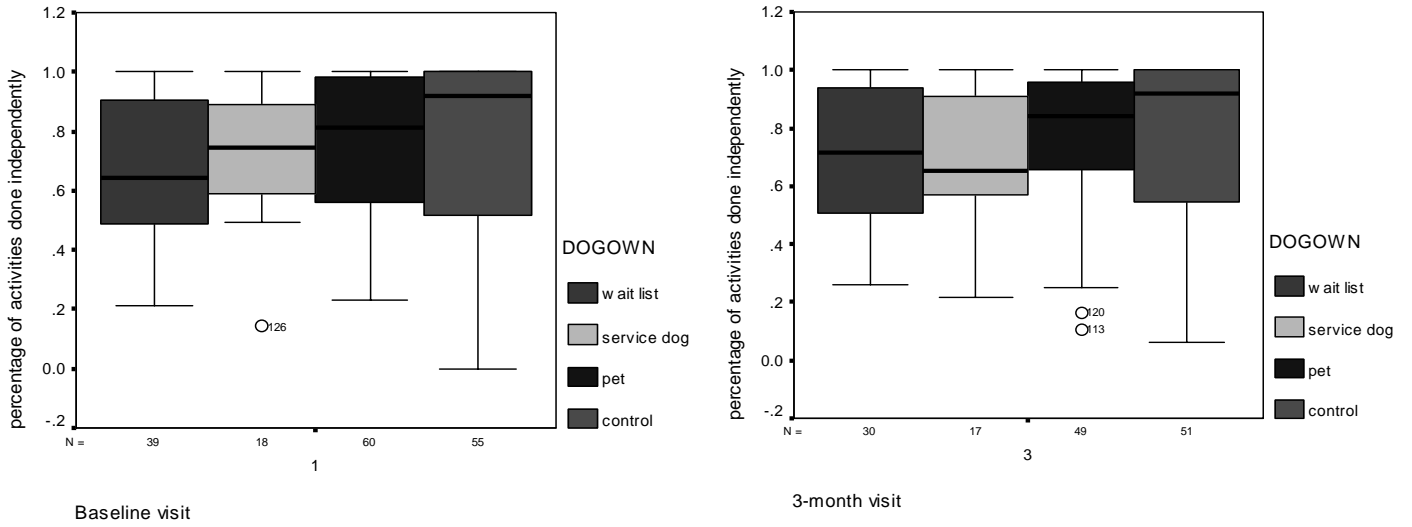


Figure 19 Percentage of Activities Done with AT

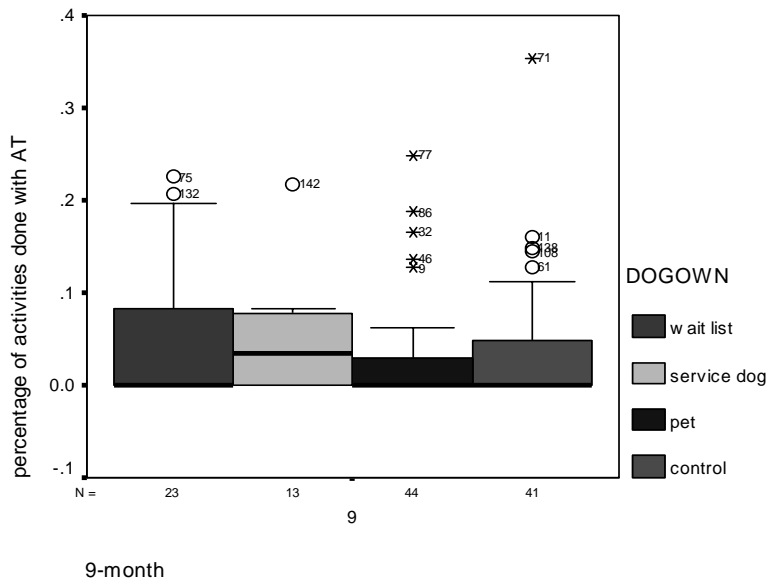
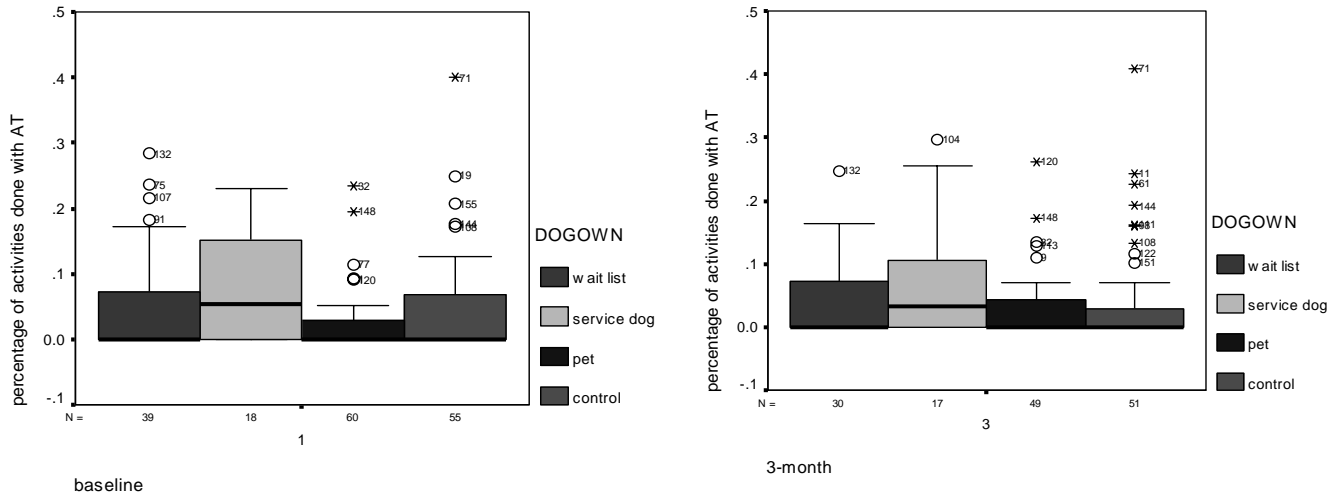


Figure 20 Percentage of Activities Done with Some Human Help

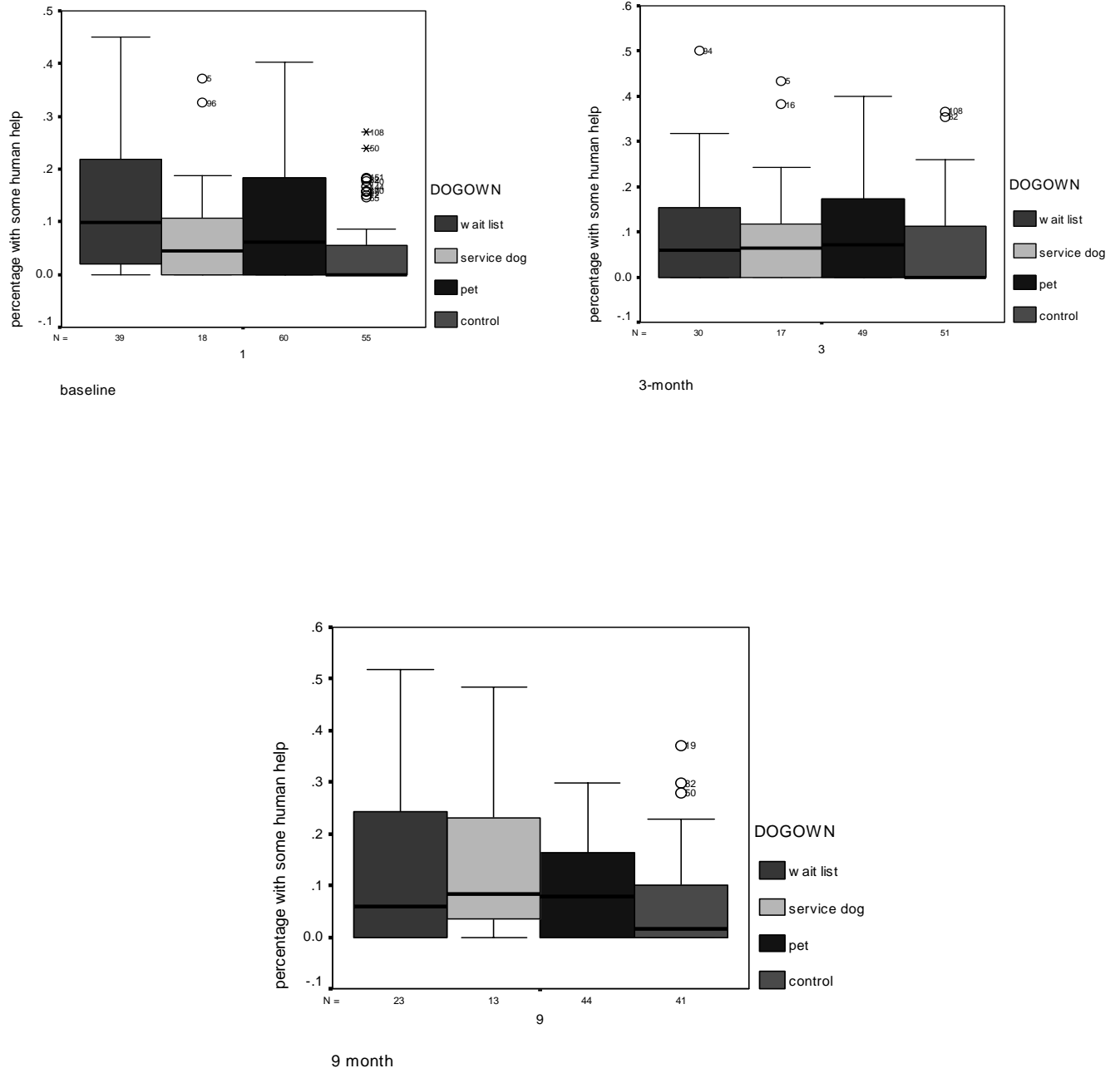


Figure 21 Percentage of Activities Done with Total Human Help

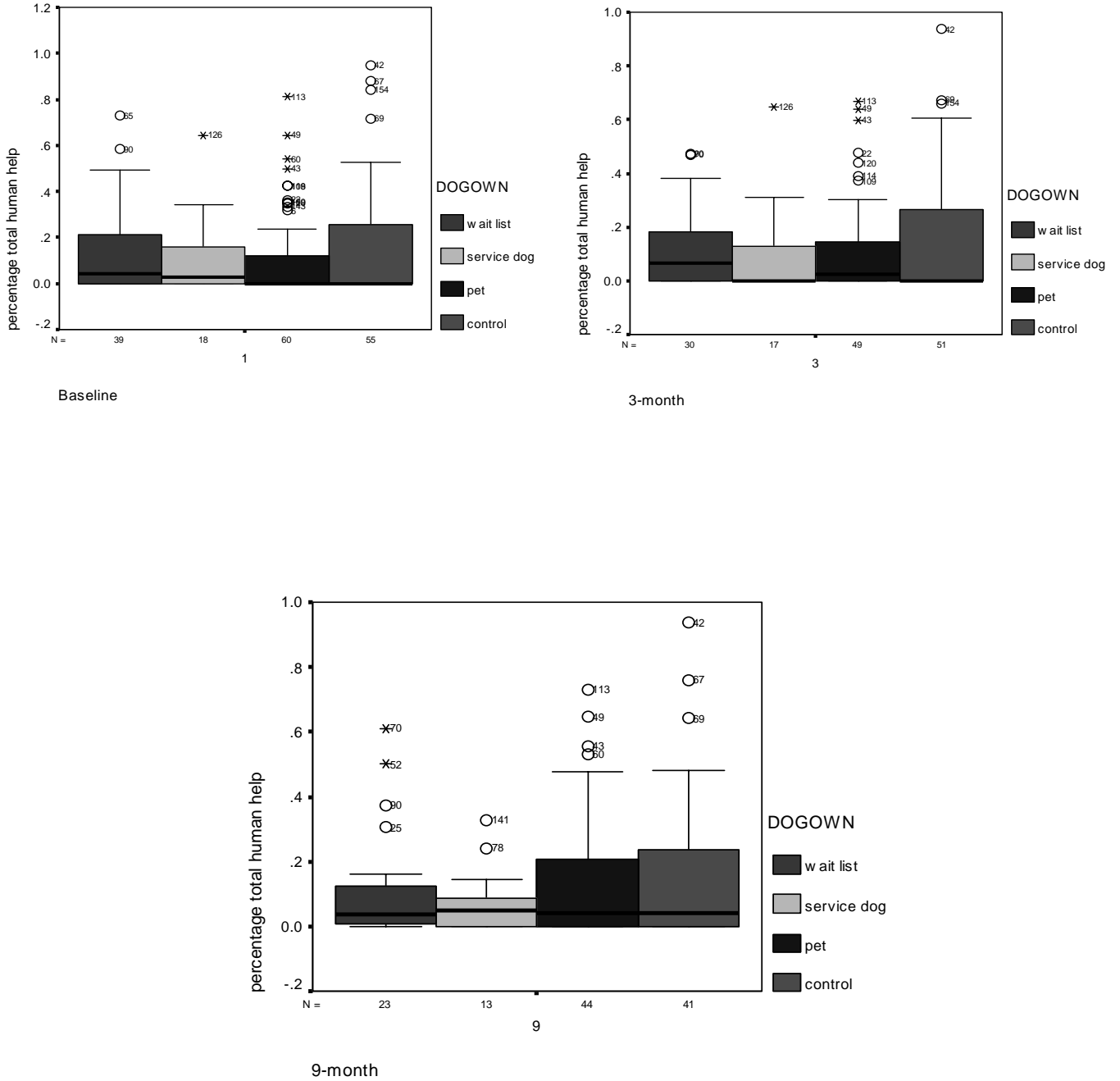
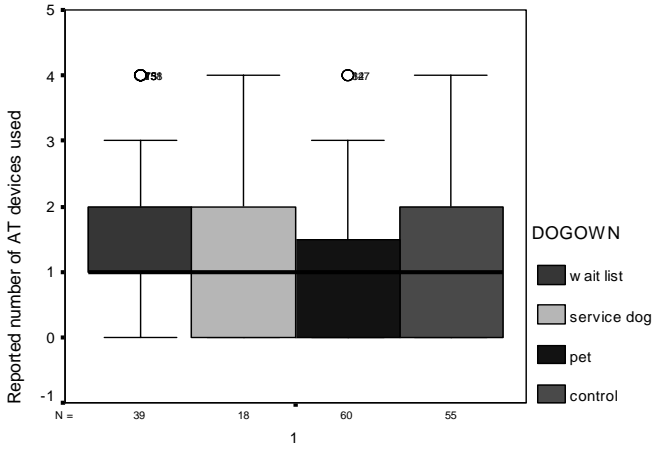
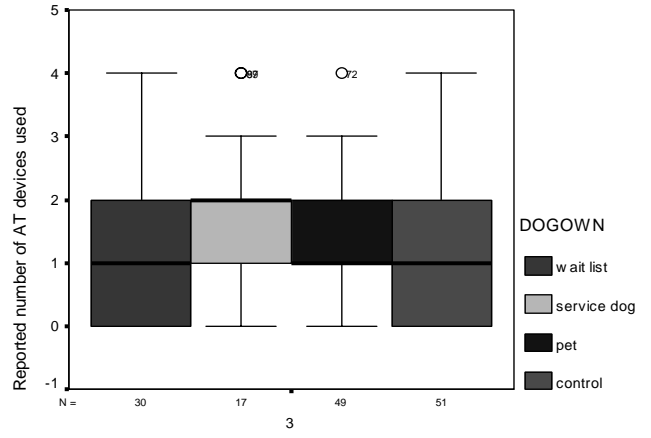


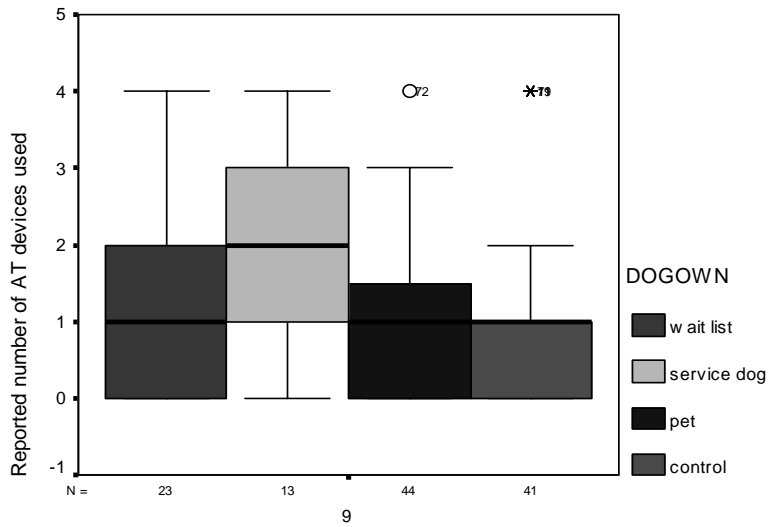
Figure 22 Reported Number of AT Devices Used



baseline



3-month



9-month

Figure 23 Hours of Assistance Used for Personal Care

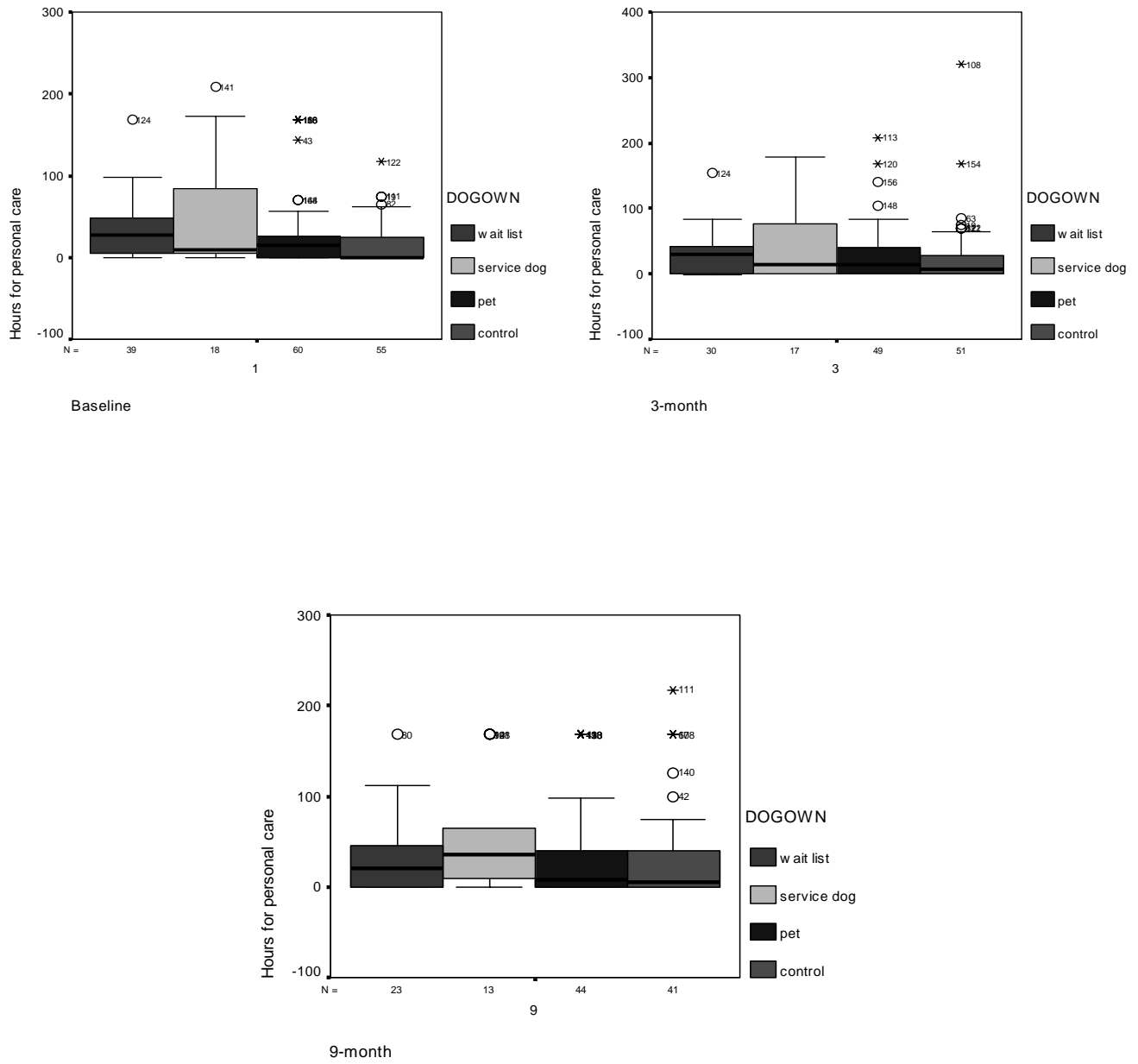


Figure 24 Hours of Assistance Used for Errands

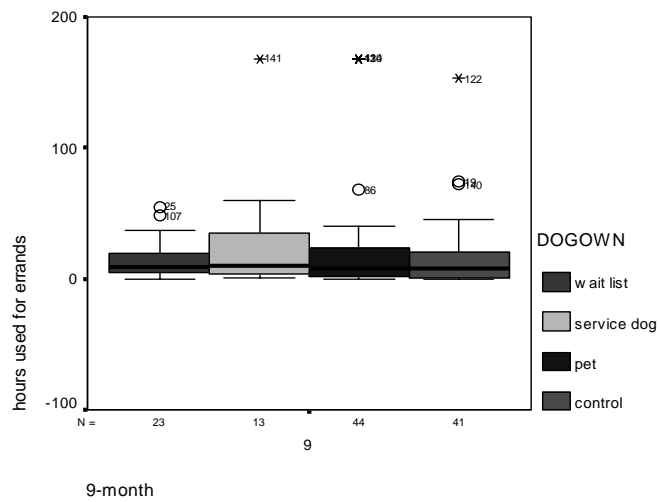
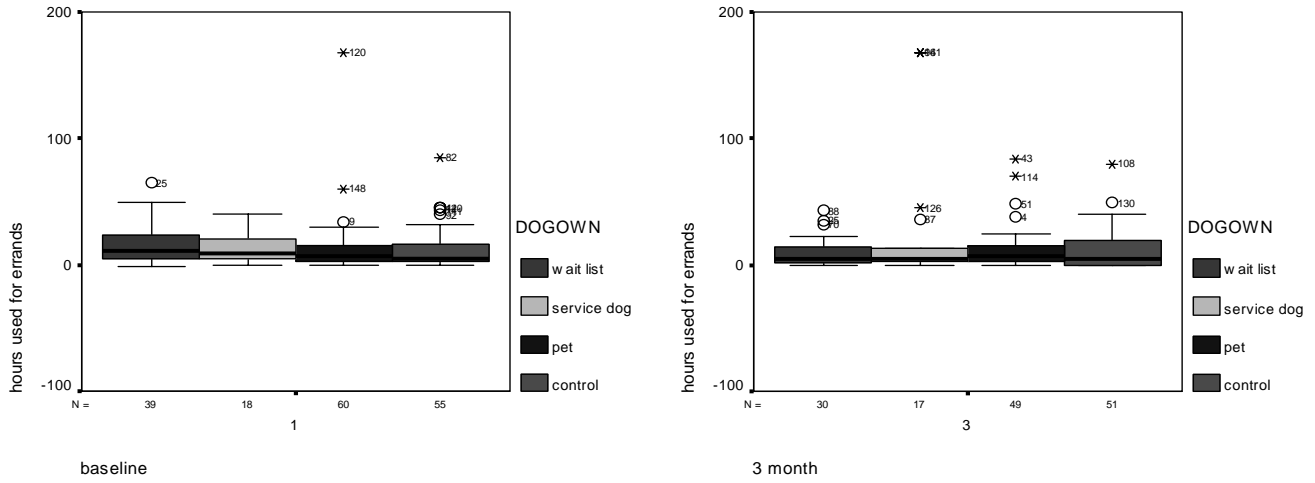


Figure 25 Pain I

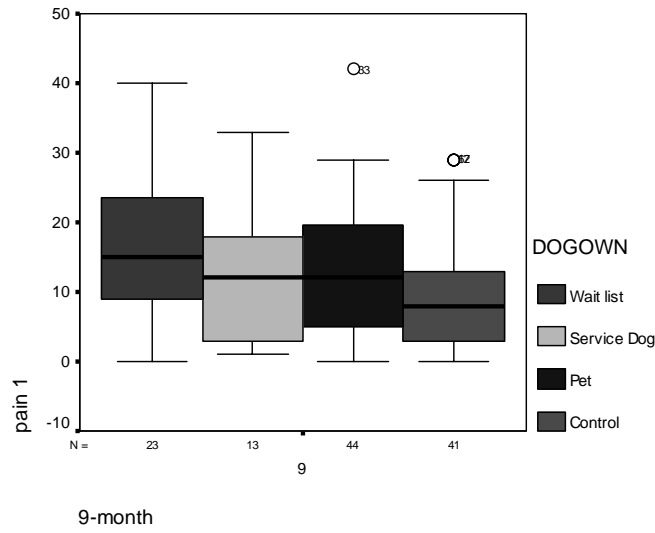
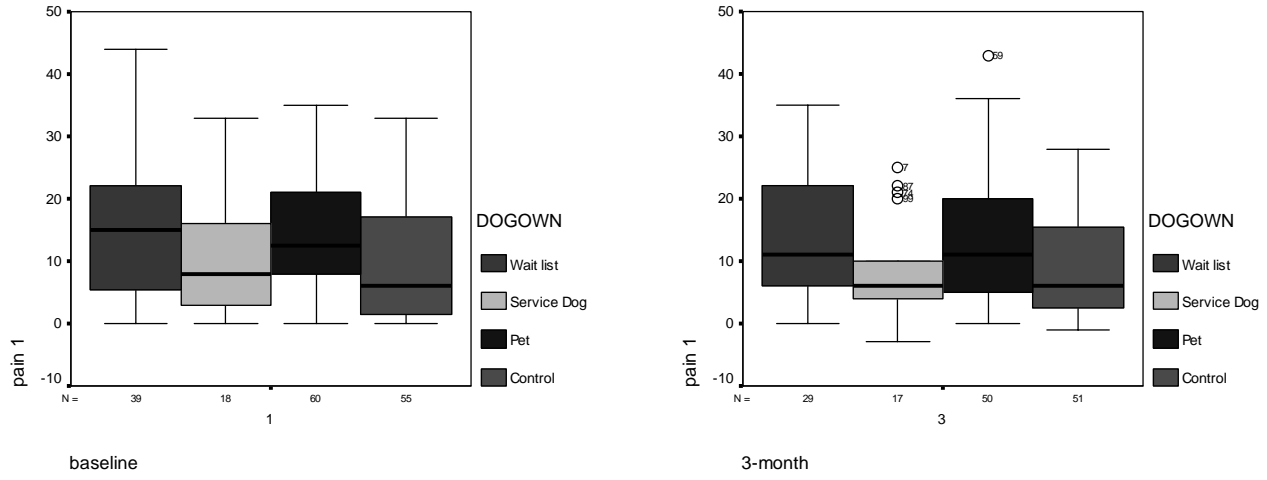


Figure 26 Pain II

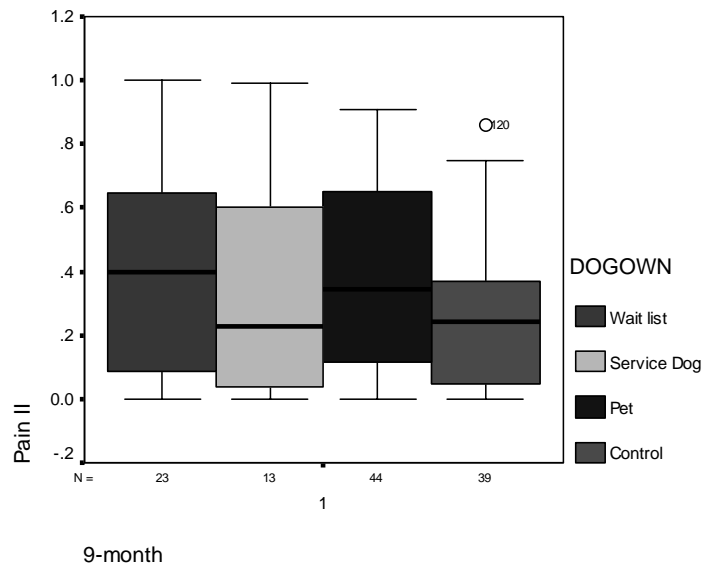
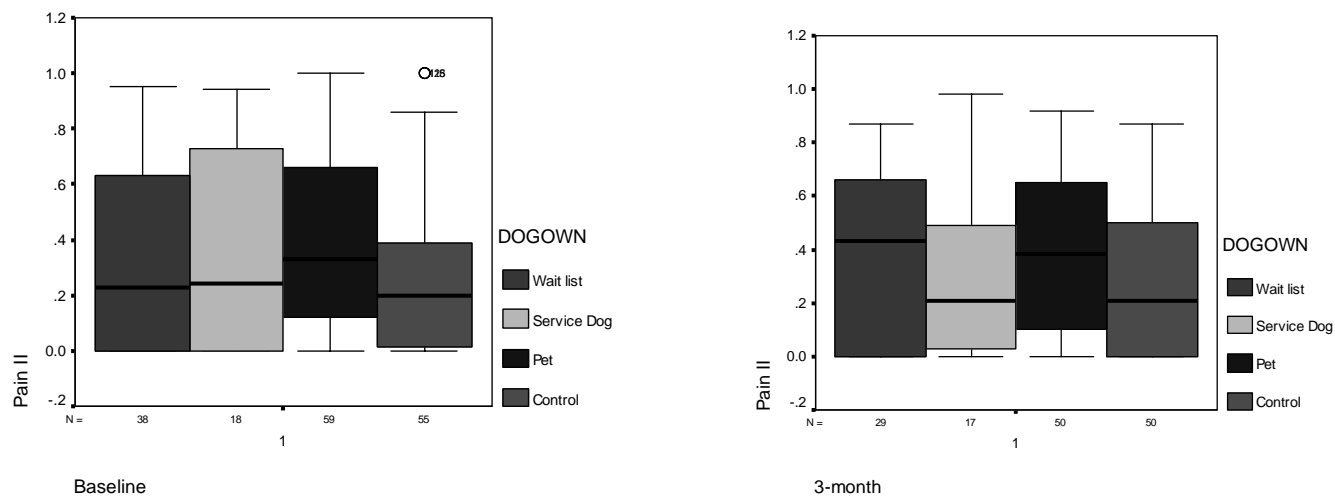


Figure 27 Pain III

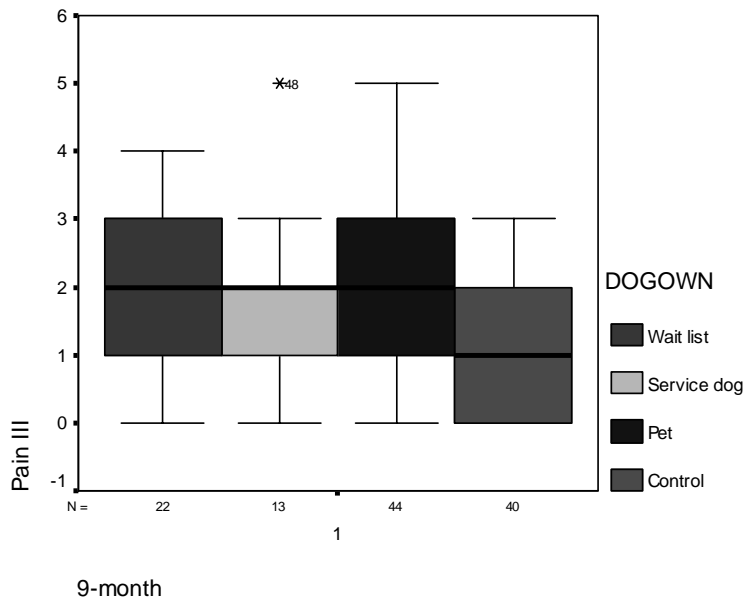
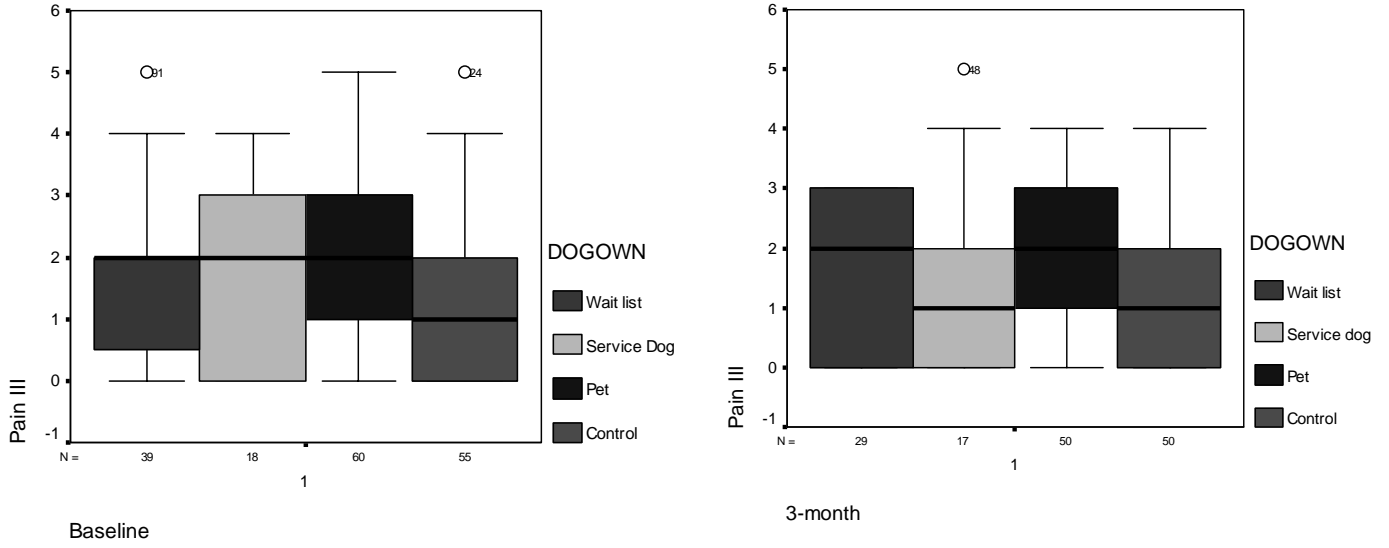
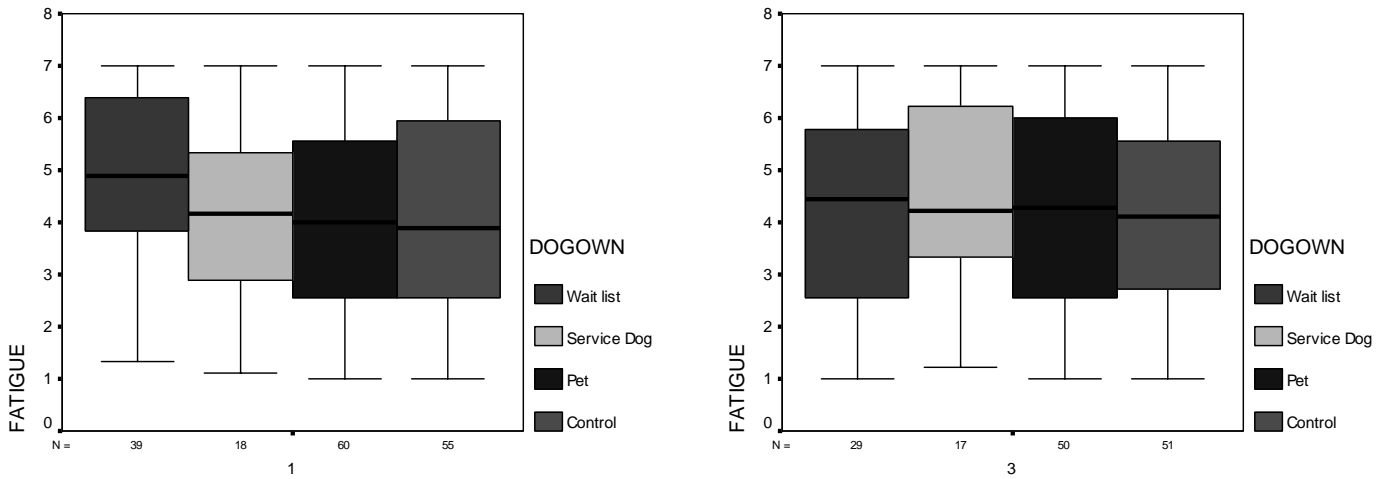
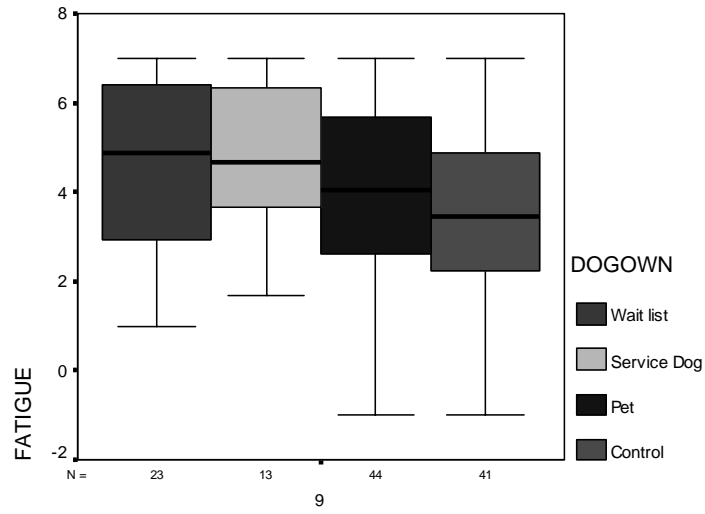


Figure 28 Fatigue



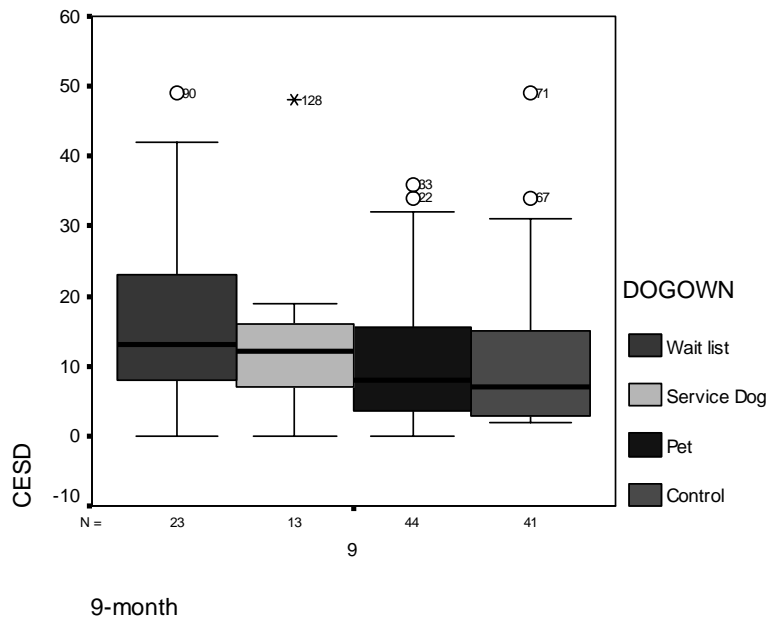
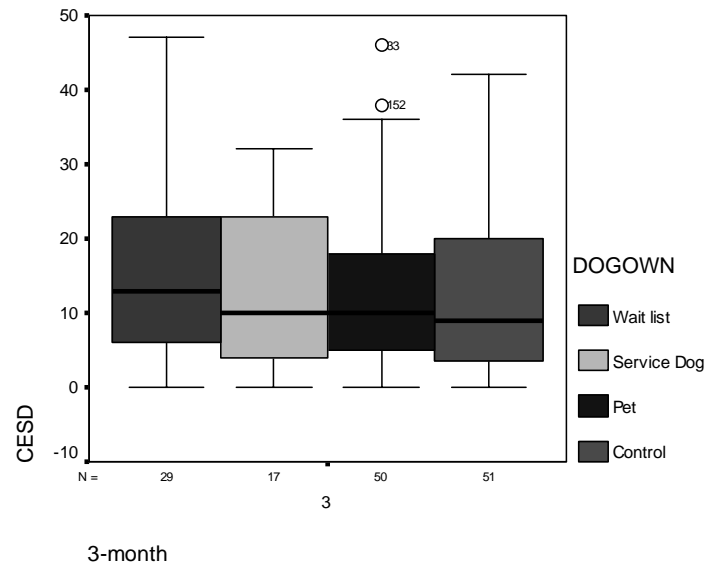
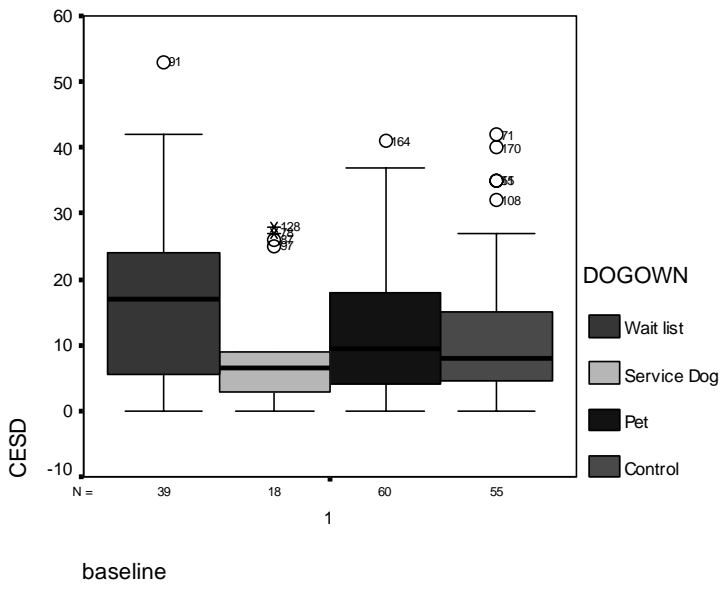
baseline

3-month



9-month

Figure 29 CESD



BIBLIOGRAPHY

1. Frost K, Fitzgerald S, Collins D, Sachs-Ericsson N. (2001). Psychosocial and Functional Benefits of Service Dogs. *Seventeenth International Seating Symposium*. 189-190.
2. Houtenville Andrew J. (2005, April 4). *Disability Statistics in the United States*. Ithaca, NY: Cornell University Rehabilitation Research and Training Center on Disability Demographics and Statistics (StatsRRTC), Retrieved October 26, 2005 from www.disabilitystatistics.org
3. Asada, Y. (2005). Medical Technologies, Nonhuman Aids, Human Assistance, and Environmental Factors in the Assessment of Health States. *Quality of Life Research*. 14: 876-874.
4. Spillman, BC. (2004). Changes in Elderly Disability Rates and the Implications for Health Care Utilization and Cost. *The Milbank Quarterly*. 82(1): 157-194.
5. Platts RGS, and Andrews K. (1994). How Technology Can Help Rehabilitation. *British Medical Journal*. 309(6963); 1182.
6. ABLEDATA. Information retrieved from www.abledata.com on October 10, 2005.
7. Quartet Technology Incorporated. Information retrieved from www.qtiusa.com on October 10, 2005.
8. Motorola, Inc. (2004). *Motorola user manual: V300GSM*. Schaumburg, IL: Motorola, Inc.
9. Brodie SJ, Biley FC. (1999). An Exploration of the Potential Benefits of Pet-Facilitated Therapy” *Journal of Clinical Nursing*. 8(4), 329-337.
10. Cole KM, Gawlinski A. (2000). Animal Assisted Therapy: The Human – Animal Bond” *American Association of Critical Care Nurses*. 11(1), 139-149.
11. Barker PB. (1999). Therapeutic Aspects of the Human – Companion Animal Interaction. *Psychiatric Times* 16(2), 1-8.
12. Collins LF. (1996, May). Pets in Therapy? How Animal-Assisted Therapy Can Be a Part of The Healing Process. *OT Practice*. 38-47.
13. Baun MM, Oetting K, Bergstrom, N. (1991). Health Benefits of Companion Animals in Relation to the Physiologic Indices of Relaxation. *Holistic Nursing Practice*, January. 16-23.

14. Lynch JJ, Delta Society. (2001). *Developing a Physiology of Inclusion: Recognizing the Health Benefits of Animal Companions*. Retrieved September 5, 2005 from www.deltasociety.org/dsx109.htm.
15. Modlin S. (2001). From Puppy to Service Dog: Raising Service Dogs for the Rehabilitation Team. *Rehabilitation Nursing* 26(1) 2001.
16. Winkle M. (2003). Dogs in Practice. *OT Practice*. 12-17.
17. Blaustone J. (2000). *Service Dog or Psycho Dog*. *Quest*. 7(6). Retrieved on September 15, 2005 from <http://www.mdausa.org/publications/Quest/q76servicedogs.html>
18. Lane DR, McNicholas J, and Collis GM. (1998). Dogs for the disabled: benefits to recipients and welfare of the dog. *Applied Animal Behavior Science* 59; 49-60.
19. U.S. Department of Justice. (1996). *Commonly asked questions about service animals in places of business*. Retrieved August 10, 2005 from <http://www.doj.gov/crt/ada/animal.htm>
20. Miller J, Ingram L. (2000). Perioperative Nursing and Animal –Assisted Therapy. *AORN Journal*. 72(3), 477–479, 481–483.
21. Voelker R. (1995). Puppy Love Can Be Therapeutic, Too. *The Journal of the American Medical Association*. 274(24), 1897.
22. Representative from Canine Assistants, personal communication, October 31, 2005.
23. Representative from Assistance Dogs Institute, personal communication, November 15, 2005.
24. Representative from Susquehanna Service Dogs, personal communication, November 15, 2005.
25. Zapf SA. (1998). *Service Animal Adaptive Intervention Assessment*. Pamphlet available through <http://members.aol.com/IMPT97/orderform.html>
26. Zapf SA. (nd). *Matching Person and Technology (MPT) Assessment Process*. Information available through <http://members.aol.com/IMPT97/mptdesc.html>
27. Eddy J, Hart LA, and Boltz RP. (1988, January). The Effects of Service Dogs on Social Acknowledgments of People in Wheelchairs. *Journal of Psychology*. 122(2):39-45.
28. Mader B, Hart LA, and Bergin B. (1989). Social Acknowledgements for Children with Disabilities: Effects of Service Dogs. *Child Development*. 60(6) 1529-1534.

29. Hart LA, Hart BL, and Bergin B. (1987). Socializing Effects of Service Dogs for People with Disabilities. *Anthrozoos*. 1, 41-44.
30. Allen K, Blascovich J. (1996). The Value of Service Dogs for People with Severe Ambulatory Disabilities: A Randomized Clinical Trial. *The Journal of American Medical Association* 275(13); 1001-1006.
31. Eames E, and Eames T. (1996). Economic Consequences of Partnership with Service Dogs. *Partners' Forum*, 3(1), Spring 1996, 15-16.
32. Assistance Dogs International Inc. Retrieved on November 15, 2005 from <http://adionline.org>
33. International Association of Assistance Dog Partners. Retrieved on November 15 2005 from <http://www.iaadp.org>
34. Devins GM, Orme CM. (1985). Center for Epidemiologic Studies Depression Scale. *Test Critiques*. (2):144-159.
35. Schroevers MJ, Sanderman R, Van Sonderen E, and Ranchor AV. (2000, December). The Evaluation of the Center for Epidemiologic Studies Depression (CES-D) Scale: Depressed and Positive Affect in Cancer Patients and Health Reference Subjects. *Quality of Life Research* 9:1015-1029.
36. Beekman ATF, Deeg DJH, Van Limbeek J, Braam AW, DeVries MZ, VanTilburg W. (1997 January). Criterion Validity of the Center for Epidemiologic Studies Depression Scale (CES-D): Results from a Community – Based Sample of Older Subjects in the Netherlands. *Physical Medicine* 27(1); 231-235.
37. Towery S, and Fernandez E. (1996, December). Reclassification and Rescaling of McGill Pain Questionnaire Verbal Descriptors of Pain Sensation: A Replication. *The Clinical Journal of Pain*. 12(4), 270-276.
38. Grafton KV, Foster NE, Wright CC. (2005). Test-Retest Reliability of the Short-Form McGill Pain Questionnaire. *Clinical Journal of Pain*. 21: 73-82.
39. Melzack, R. (1987). The short-form McGill Pain Questionnaire. *Pain*.30:191-197.
40. Bernt, F. (1991). McGill Pain Questionnaire. *Test Critiques*. (8): 402-412.
41. Laberge L, Gagnon C, Jean S, and Mathieu J. (2005). Fatigue and Daytime Sleepiness Rating Scales in Myotonic Dystrophy: A Study of Reliability. *Journal of Neurology, Neurosurgery, and Psychiatry with Practical Neurology*. 76: 1403-1405.

42. Stouten B. (2005). Identification of Ambiguities in the 1994 Chronic Fatigue Syndrome Research Case Definition and Recommendation for Resolution. *BMC Health Services Research*. 5:37. Available at <http://www.biomedcentral.com/1472-6963/5/37>
43. Kleinman L, Zodet MW, Hakim Z, Aledort J, Barker C, Chan K, Krupp L, and Revicki D. (2000). Psychometric Evaluation of the Fatigue Severity Scale for Use in Chronic Hepatitis C. *Quality of Life Research*. 9: 499-508.
44. SPSS, Inc. Retrieved on April 20, 2006 from <http://www.spss.com/corpinfo/index.htm>
45. Rintala DH, Sachs-Ericsson N, Hart KA. (2002) The Effects of Service Dogs in the Lives of Persons With Mobility Impairments: A Pre-Post Study Design. *Psychosocial Process: American Association of Spinal Cord Injury Psychologists and Social Workers*. 15(2): 1-17.
46. Camp MM. (2000). The Use of Service Dogs as an Adaptive Strategy: A Qualitative Study. *The American Journal of Occupational Therapy*. 55(5): 509 -517.