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The effects of animal-assisted therapy on participation in rehabilitation in a patient post-stroke: a case study

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The Effects of Animal-Assisted Therapy on Participation in Rehabilitation in a Patient Post-Stroke: A Case Study

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Abstract

The human-animal bond is a powerful and emotional connection. The bond between dogs and people can provide numerous physiological and psychological benefits as well as potentially increasing the human's quality of life. Animal-assisted therapy (AAT) utilizes the human-animal bond by incorporating a dog into the patient's rehabilitation therapy. This case study examines if AAT sessions increase a stroke patient's participation in the rehabilitation sessions when compared to normal sessions. Participation in therapy reduces the length of stay for patients, improves outcome measures, and lessens the effects of depression.A key part of stroke rehabilitation is incorporating exercises that increase neuroplasticity. One way to increase neuroplasticity is by making the therapy more salient, or relevant, to the patient. Stroke patients are a population that are at an increased risk for mood disorders and low participation scores. The goal of the study is to determine if participation in therapy can be improved by using a dog as an integral part of the session. There are a total of 20 therapy sessions recorded. The PRPS scores for AAT averaged to be 3.25 (95% CI .83). The PRPS average for normal sessions was 2.33 (95% CI .23). The p-value was <0.016 showing statistical significance. The subjective and objective results show that AAT significantly increases patient participation.

Introduction

The American Veterinary Medical Association defines the human-animal bond as a mutually beneficial, dynamic relationship between people and other animals that is influenced by behaviors that are essential to the health and well-being of both.[1] This bond between humans and animals has been used for its therapeutic benefits for more than 12,000 years. Even in the 9th century, evidence was found in Belgium that indicates that dogs were used in the treatment of those with handicaps.[2] The literature shows the human-animal bond increases quality of life in humans of all ages.[2-5] Multiple studies have found that elderly adults that are dog owners have lower blood pressure, use less antidepressants, and have fewer medical interventions when compared to those that do not have the human-dog bond.[4,5]

Utilizing the human-animal bond, animal-assisted therapy (AAT) is a specific type of billable rehabilitation therapy that utilizes animals as an integral part of the therapy sessions. There are also other types of human-animal interactions seen in healthcare: animal-assisted interventions (AAI) and animal-assisted activities (AAA).[2] While all of these utilize the human-animal bond, AAT differs in that it is a more structured encounter, and is delivered by a variety of healthcare providers, including physical therapists and occupational therapists. Because it is used by healthcare professionals, the AAT session is goal-directed and utilizes outcome measures.

The purpose of AAT is to create an individualized, goal-directed therapy program based on animal care and relationships. The potential benefits of AAT are that it may be less threatening to the patient, incorporate functional tasks, and be more engaging.[3,6] Physiological

effects have also been documented and show that during AAT patients have lower blood pressure, heart rate, and respiratory rate in addition to decreased stress markers.[7,8] Further evidence demonstrates that AAT has benefited patients with psychiatric conditions, cognitive disorders, pain management, agitated behaviors, and social interactions.[6,9,10] A pilot study that investigated the effects of AAT in stroke patients found from a patient satisfaction survey that the sessions with the dog were found to be more enjoyable, less stressful, and more motivating for the patients.[11]

Stroke patients are a population that have a unique set of challenges when it comes to rehabilitation. There are nearly 800,000 individuals in the United States every year that have to face these challenges with more than two-thirds undergoing rehabilitation sessions after hospitalization.[12] People that survive a stroke have to finds ways to live with potentially permanent effects to their physical abilities, psychological functions, and social interactions.[13] High levels of disability and difficulty while completing everyday tasks are a just a few consequences that patients with stroke experience.[12,14] They also have to overcome depression, functional deterioration, reduced mobility, changes in family roles, and insufficient social or professional support.[15]

During a stroke or cerebrovascular accident (CVA), the blood supply is interrupted to the brain, typically one side, resulting in potential aphasia, paralysis, vision problems, and memory loss.[17] To minimize the effects of a stroke, blood flow must be restored quickly. Every minute without oxygen results in millions of dead brain cells.[18] After a patient experiences a stroke, healthcare professionals quickly form a rehabilitation plan with goals to improve the patient's quality of life. Physical rehabilitation is crucial, but is often easier for patients when compared to

the psychological challenges faced. The trauma experienced by the patient emotionally and physically makes him or her more susceptible to mood disorders such as depression and agitation.[18]

In a multivariate study conducted, the investigators found that nearly one-third of their patient population had low participation scores during their rehabilitation sessions and that of this low participating group, the diagnosis was primarily stroke.[19] Participation is a crucial factor in therapy; it has been correlated with higher functional outcomes, and conversely lower participation scores have been correlated with functional dependence and longer stays.[20,21] Studies have also identified patient participation as a predictor of outcomes at discharge and found that it helped to lessen the negative effects of depression and cognitive impairment on outcomes.[20,22]

Furthermore in other studies, it has been found that incorporating a dog into physical therapy improves walking parameters such as walking speed, walking distance, and gait pattern in stroke patients.[23,24] Another study that looked at canine-assisted ambulation, a form of AAT, found that the population's ambulation refusal rate dropped from 28% to 7.2% when offered the chance to walk with the therapy dog.[25] These findings regarding the benefits of AAT and the evidence of AAT improving walking parameters provide strong evidence that AAT could increase a stroke patient's participation in the therapy sessions.

When stroke patients are undergoing rehabilitation, a key principle during their recovery is neuroplasticity.[26] Neuroplasticity is described as the foundation of learning for the intact brain and the relearning that the damaged brain experiences when undergoing rehabilitation.[27,28] More

simply put, it is the rewiring of the brain and is the main mechanism of brain recovery.[26] During stroke rehabilitation, neuroplasticity can be increased when the health practitioner capitalizes on the principle of salience.[27] Salience of an item is its relevance or meaning to a person compared to the alternatives. Salience, therefore neuroplasticity, is increased when the task at hand is particularly relevant or interesting to the patient.[26,27] For example if a patient is a dog owner, practicing a fine motor task would have more salience to the patient if he or she is putting on a dog's leash rather than performing an artificial task such as putting pegs into a pegboard. Examples of normal therapies compared to AAT activities used during this case study are located in Table 1.

During occupational therapy sessions, salience can be increased by having the dog be an integral part of the therapy. As stated previously, stroke patients are less likely to participate in rehabilitation therapy and more likely to experience mood disorders, especially depression, making patients with this diagnosis a good candidate to benefit from the psychological effects and personalization provided during AAT.[18,25]

This study examines the belief that the patient's perceived salience can be increased by using an animal as a therapeutic tool instead of other common therapy tools that do not incorporate a level of importance and significance to the therapy. A literature search conducted in preparation for this study yielded no other studies investigating the effect that AAT could have on a stroke patient's participation in occupational therapy sessions. The hypothesis of this case study is that by utilizing AAT, the patient's participation in the rehabilitation sessions will be increased.

Materials and Methods

The research proposal was approved by the University of Tennessee at Chattanooga Institutional Review Board (IRB #:17-167). The study took place at a skilled nursing facility where the patient underwent inpatient rehabilitation. A patient post-stroke that was unmotivated during therapy was asked and agreed to have animal-assisted therapy (AAT) in addition to her normal occupational therapy sessions. Occupational therapy's main focus is to help the patient recover their functions necessary for independence such as bathing, grooming, dressing, toileting, etc. She was evaluated upon admission and was given an occupational therapy treatment plan. Both the normal and the AAT sessions were centered around helping the patient meet her goals. The patient's family agreed to have the patient participate and was present at several of the sessions to help gather subjective data. The patient and her family signed an informed consent form (Appendix A) and a picture release form (Appendix B). Her medical history from the hospital where she received care was also released with permission.

The patient had therapy sessions six times a week for one hour each day for approximately 8 weeks. The dog incorporated into the sessions belonged to the occupational therapist and was trained by her. The dog was up to date on all vaccinations and bathed before coming to the facility. The dog was brought in randomly throughout the patient's stay at the convenience of the therapist for therapy. Consistency with the sessions was achieved by having therapy sessions at the same time of day with the same therapist when the schedule allowed.

The therapist was able to facilitate 20 sessions with the patient during her stay. The dog was incorporated into the patient's occupational therapy in a way that was similar to the normal

sessions. Examples of AAT are given in Table 1. There was also a therapy session in which the patient worked on bathing that is included in the data. The Pittsburgh Rehabilitation Participation Scale (PRPS) was the main outcome measure used for this study. It has been shown to be valid and reliable as an outcome measure for for participation during rehabilitation when used by occupational therapists and physical therapists. It has a high interrater reliability (intraclass correlation coefficient [ICC]=.91) and the scores predict functional outcome.[29]

The PRPS was used after every session with the occupational therapist (Appendix 1). The PRPS rates the patient's participation in the session on a scale of 1 to 6 with 1 being "none" and 6 being "excellent." Poor is defined as "patient refused or did not participate in at least half the session." Excellent is defined as "patient participated in all activities with maximum effort, finished all activities, and actively took interest in activities and/or future therapy sessions." If the patient was unable to attend the therapy session due to a medical test, bed rest order, illness, or a scheduling conflict then the therapist was instructed not to mark a score. The therapist was also instructed to choose the lower rating if trying to decide between two scores.

The Modified Barthel Index (MBI) was completed upon admission and at the end of each ten day period by the designated occupational therapist. The MBI scores are used to determine the dependency level of the patient and range from "total assist" to "supervision." It scores eleven categories including personal hygiene, bathing, feeding, toileting, stair climbing, dressing, bowel control, bladder control, ambulation, wheelchair, and chair/bed transfer. A score of 0 to 24 indicates the patient requires total assistance and would require a maximum of 27 hours of help per week. Scores of 25 to 49 indicate the patient needs maximum assistance with no more than 23.5 hours of help required. If the patient has a score of 50 to 74, they will need moderate

assistance with a maximum of 20 hours of help per week. A score of 75 to 90 puts the patient at a mild assistance level where they would need no more than 13 hours of help in a week. Lastly, a score of 91 to 99 indicates the patient only requires supervision and would need less than 10 hours of help a week.

The Functional Independence Measure (FIM) was completed upon admission and at the end of each week by the designated occupational therapist. It evaluates the functional status of the patient undergoing rehabilitation. It addresses seven categories including: feeding, grooming, upper body (UB) dressing, lower body (LB) dressing, upper body bathing, lower body bathing, and toileting. It is measured on a scale from 1 to 7 with 1 being total assistance and 7 being independance. The FIM was completed by the therapist upon admission and 3 additional times during the patient's stay at the facility.

Table 1 - Table demonstrating how AAT can be incorporated into therapy.

Functional Goal	**Traditional Exercise**	**AAT Exercise**	**Grading Activity**	**Application in Therapy**
Grip Strength	The patient is instructed to perform stress ball squeezes.	The patient can grip and hold a dog treat in the affected hand. The dog is trained to sit during the exercise.	Grip endurance, finger movement, grip strength	The patient opened her fingers on the affected hand and the therapist placed the treat in between her thumb and forefinger to grip. She held the treat for 3 seconds before dropping it into the therapist's hand. After repeating the exercise, she dropped the treat for the dog.
Core strength	The patient performs unsupported sitting and shifts weight from side-to-side.	The patient can sit next to the dog. With assistance the patient can lean side-to-side and front-to-back.	Core strength, balance	The patient sat next to the dog with the therapist on the other side. With her affected arm on the dog, she leaned from side-to-side and front-to-back with assistance from her therapist. She also engaged in twisting movements to pet the dog with her unaffected arm.
Functional Reach	The patient flexes and extends the arm by grabbing and returning an object to the therapist.	The patient can sit next to the dog. The dog stays at arm level. The therapist places a glove brush over the patient's hand and instructs the patient to brush the dog.	Arm strength, Range of motion	The patient sat in her wheelchair next to the table where the dog was laying. The therapist placed the glove brush on her hand. The patient then lifted her arm onto the dog's back with assistance and brushed the dog by moving her arm and hand forward and back.

Patient History

The patient used in this study is an 88-year-old female who presented to the hospital after developing acute neurologic changes. She was diagnosed by a computed tomography (CT) scan with a large right-sided intraparenchymal hemorrhage with a small amount of extension into the subarachnoid space. She was admitted to the skilled nursing facility for inpatient rehabilitation with the diagnosis of hemiplegia and hemiparesis following a nontraumatic intracerebral hemorrhage affecting the left non-dominant side leading to a need for assistance with personal care, lack of coordination, and generalized muscle weakness. She had prior medical history of hypothyroidism, osteoporosis, and dementia-likely Alzheimer's. The patient was also considered a fall risk.

The patient and her family were "adopted" by their first dog while her children still lived at home. The patient has five children, four daughters and one son. The oldest was working in a skilled nursing facility when she found their dog. He came home with her and later became a therapy dog and visited with patient's at the facility she was employed. The patient remembers feeling safe and protected when the dog was home with her, even when she was alone. She enjoyed watching the dog play with her children and snuggling together on the couch.

The occupational therapist and the patient's family reported that the patient would refuse therapy and become bored with therapy after a few minutes. This led to her being selected for this case study. The therapist found it necessary to continually encourage the patient during the sessions without the therapy dog. The patient's family attended many of her sessions and often asked what they could do to encourage her to use her affected arm when she was not in therapy.

Because the patient did have some difficulty becoming and staying motivated regarding her rehabilitation and had a pertinent history with a dog, it was believed she would be a good candidate as her salience would be increased and she would benefit from the emotional support provided during AAT.

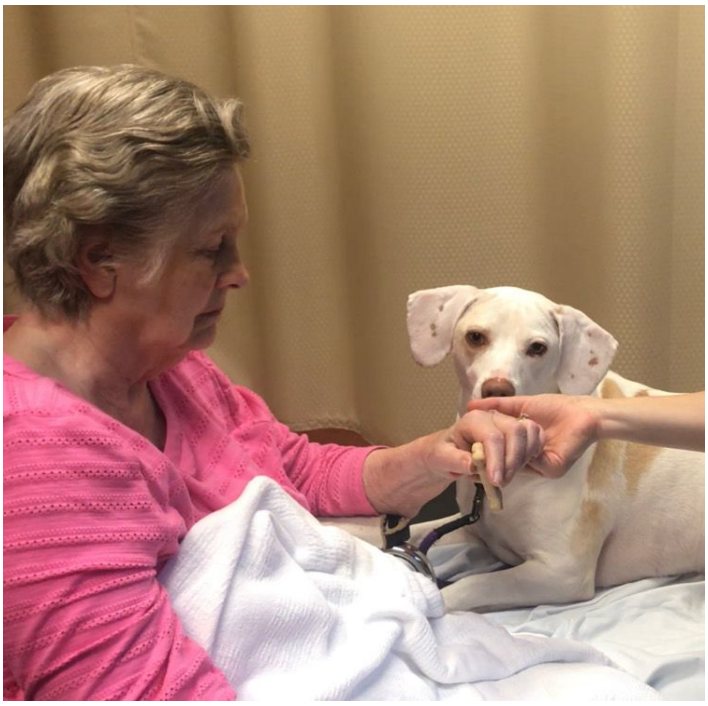

Image 1: Patient gripping treat with affected hand and moving arm laterally to give to the dog.

Period 1 of Therapy

The patient had nine therapy sessions during the ten day period. The first three sessions were completed by other therapists and are not being included in the PRPS data to ensure consistency with the scoring. There was another session that was completed on a day that the therapist was not there and is also being excluded from the PRPS data. The scores for the session are represented by 1-5 on Table 2. There was one AAT session during the period on day six of

admission. Her baseline MBI was 23/100 showing her need for total assistance with activities of daily living and functional mobility. At the end of the period, it had improved to 37/100. Her FIM score upon admission was 14/49 and improved to 19/49 at the end of this period.

The patient exhibited guarding of the left hand and arm. During AAT, she would often have to be reminded to move her left arm independently rather than assisting with her right hand. She did not complain of pain during the AAT session and was surprised that she was able to complete the therapy tasks with her left hand.

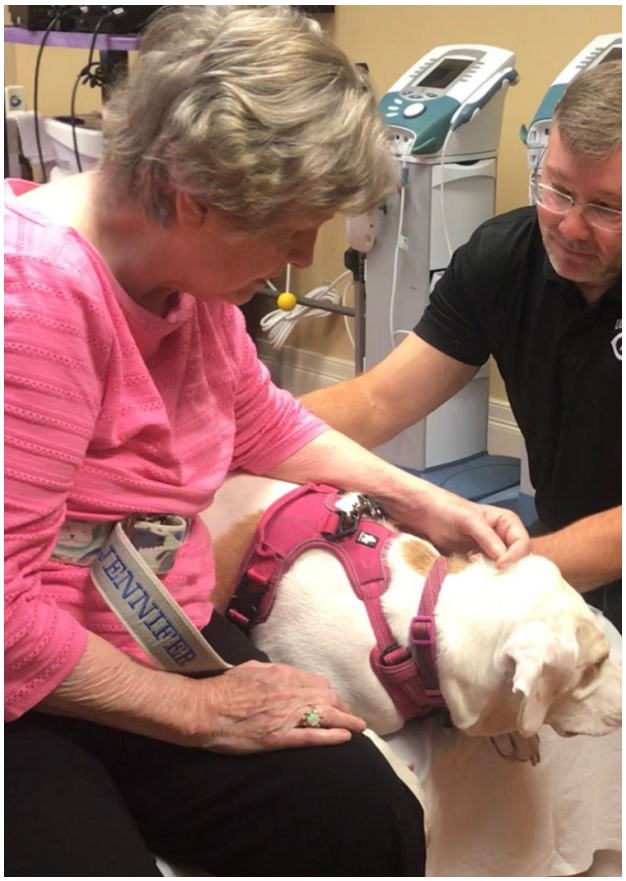

Image 2: Patient moved the affected arm on the dogs back while leaning side-to-side and front-to-back.

Period 2 of Therapy

The patient had nine therapy sessions during the second ten day period. Three of which were completed by a therapist other the designated therapist and were excluded from the PRPS data. The sessions for this period are represented by 6-11 on Table 2. The patient's MBI increased to 45/100 and the FIM increased to 22/49. The patient's baseline on the left lateral pinch measured a 1# and she still did not register on the grip during this period. At the end of this period, a new goal to increase the left lateral pinch to a 3# and the left grip strength to a 2# in order to improve with grooming tasks was added.

During this period, the patient began experiencing symptoms associated with Complex Regional Pain Syndrome (CRPS) but as shown with the addition of the pinch goal, she was greatly improving in the control of her hand. When compared to her normal sessions, there was a noticeable subjective difference in the patient's willingness to participate during the AAT session that was noticed by the therapist, investigator, and the patient's family.

Period 3 of Therapy

During period 3 of therapy, the patient once again had nine therapy sessions. Two of these sessions were completed by a different therapist. There were seven PRPS scores recorded for this period shown by sessions 12-18 on Table 2. The patient's MBI score stayed stable at 45/100 and the FIM also remained stable at 22/49. The patient was unable to be measured on the lateral pinch or the grip strength due to the pain she was experiencing attributed to CRPS.

The patient began to experience more intense pain in her left upper extremity and many of the sessions were spent looking for therapies to decrease the patient's discomfort. The patient began to require much convincing from the therapist and her family to attend and engage in the therapy sessions, but when the therapist brought the dog to her room on the AAT day, she came much more willingly to the session. Having the dog in the session motivated her to reach and guard her affected hand less because of her desire to pet the therapy dog. She enjoyed talking to the dog and would pet her in between exercises.

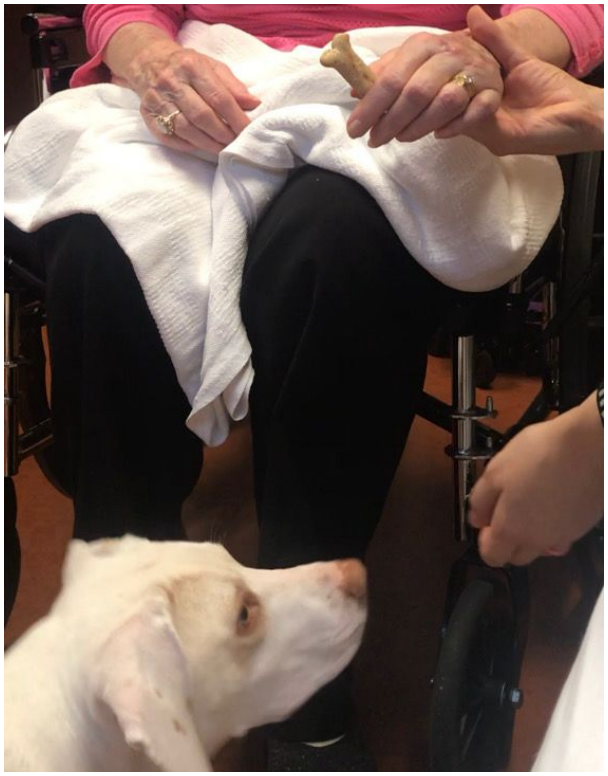

Image 3: Patient grips treat for dog while dog sits in the floor waiting for her to drop it when instructed.

Period 4 of Therapy

Period 4 of therapy consisted of five therapy sessions, two of which were facilitated by the designated occupational therapist. The PRPS scores for these sessions are represented by sessions 19-20 on Table 2. The patient still was experiencing a great deal of pain likely from the CRPS in her affected arm and hand. Unfortunately, at the end of this period the patient was admitted back to the hospital due to severe chest, hypoxia, and blood clots in the leg and lung. Because of this, there was not an MBI for the end of this period as the patient was not able to be assessed. During this period, her participation declined in all aspects due to her illness and pain.

The patient had a total of 20 therapy sessions with the designated occupational therapist. Of the 20 sessions, 4 incorporated AAT and the remaining 16 sessions were classified as normal therapy sessions. The normal therapy sessions did not incorporate a dog and were a mixture of rehabilitation exercises similar to those performed in the AAT sessions and pain treatments. The results for the PRPS are located in Table 2 which includes the session number, PRPS score, and the position the patient was in during the session.

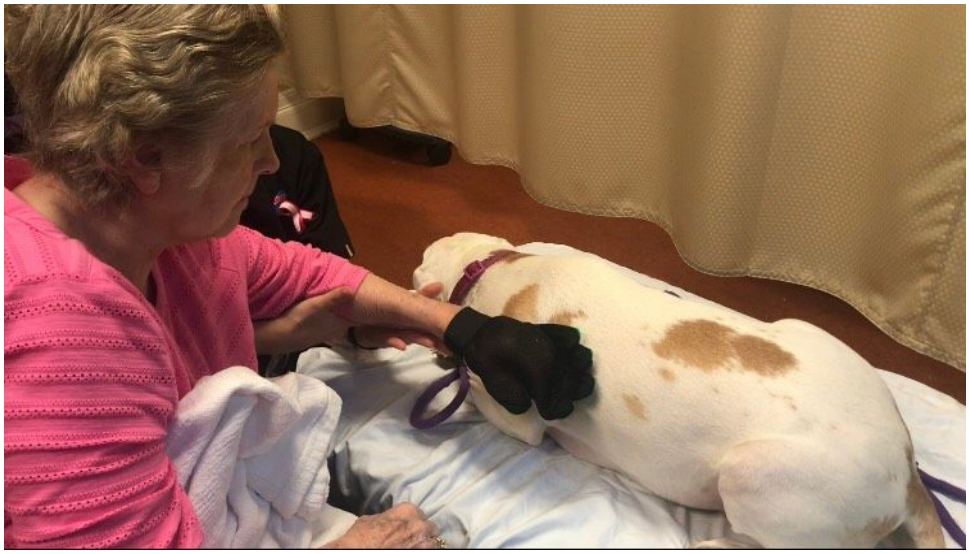

Image 4: Patient brushing dog with glove brush.

Table 2 - Pittsburgh Rehabilitation Participation Scale scores from therapy sessions.

Session Number	**PRPS Score**	**Position of Therapy**
1	3	Seated in wheelchair (W/C)
2	3	Seated in W/C
3 (AAT)	4	Seated on edge of mat (EOM)
4	3	Seated in W/C
5	3	Seated on EOM
6 (AAT)	4	Seated in W/C
7	3	Seated on Shower Bench
8	2	Seated in W/C and on bed
9	2	Seated in W/C
10	2	Seated in W/C
11 (AAT)	2	Seated on EOM
12	3	Seated in W/C and on EOM
13	2	Seated in W/C
14 (AAT)	3	Seated in W/C and on EOM
15	2	Seated in W/C
16	2	Seated in W/C
17	2	Seated in W/C
18	2	Seated in W/C
19	2	Seated in W/C
20	2	Seated in W/C

Results

During normal occupational therapy sessions without AAT, the PRPS average was 2.33 out of 6 (95% CI .23); the sessions that incorporated AAT, the PRPS averaged 3.25 out of 6 (95% CI .83) ($p< 0.016$) (Table 2). The PRPS scores demonstrate that AAT did significantly increase patient participation when compared to normal sessions.

In addition to the PRPS scores, the therapist also indicated subjectively that the patient was more engaged when she had an AAT session. The patient's husband and children attended the AAT sessions and the normal therapy sessions. They noticed a positive difference in the patient's experience and reported that she was more positively engaged in the AAT when compared to the normal sessions they observed. The therapist also noticed less guarding of the hand during AAT and noted a decrease in necessary verbal motivation. The patient and her family expressed their satisfaction with the AAT to the therapist.

Table 3 - Results from statistical analyses of PRPS scores.

	Normal Session	**AAT Session**
PRPS Average	2.33	3.25
Confidence Interval	95% - CI 0.23	95% - CI 0.83
Standard Deviation	0.49	0.96
t-value	2.72	
p-value	$p<0.016$	

Discussion

As discussed in the patient history, the 88-year-old patient had limited willingness to participate in therapy as a result of the stroke that she experienced. She exhibited guarding of her affected hand during her therapy sessions and required verbal encouragement from her occupational therapist and family. She would become bored during normal therapy sessions after a short amount of time and show signs of agitation. Her participation in therapy was subjectively considered to be improved when it was an AAT session, as well as objectively confirmed as shown by the results in Table 3.

The therapist, family of the patient, and the patient herself all found the AAT sessions to be more productive and noticed the time for the session passed more quickly. The patient was drawn to the dog and demonstrated increased motivation and participation. When the patient began experiencing the constant pain, her motivation was noticeably affected. The therapist had a more difficult time getting her to participate in therapy sessions, both normal and AAT. However, she did participate more during AAT and talked to the dog rather than about her discomfort.

The patient's pain was likely associated with Complex Regional Pain Syndrome. CRPS was first described in 1872 but is still not well defined or understood.[30] It is currently diagnosed based on regional pain that is more significant than the trauma would suggest, changes in skin color, changes in skin temperature, swelling, vasomotor and sudomotor changes, decrease in limb function, and trophic changes.[30] The therapist used a portion of multiple of the later rehabilitation sessions to provide pain management therapy such as paraffin wax and

desensitization therapy. AAT has been shown to improve pain management.[6,9,10] This benefit of AAT allowed the patient to participate more even though she was experiencing pain. The dog served as a distractor and allowed her to focus on the dog by talking to and petting her throughout the session.

The patient talking to the dog through the session incorporated another rehabilitation factor to the therapy and strengthened the human-animal bond she had with the dog. The patient explained to the dog what exercise she was doing which could have helped improve her participation scores and also incorporated a problem-solving component into the session. By talking to the dog through the exercises, she was distracted from discomfort and was mindful about the importance and goal of the exercise.

Because of the patient's history as a dog owner, the AAT sessions were likely more salient to her compared to the normal sessions. She was more engaged during AAT and desired to pet the dog and give her treats. Having the dog in the therapy incorporated an interactive component. When she would give the dog the treat or brush her with the glove brush, the dog interacted with her and appeared to enjoy the sessions which encouraged her to continue. The salience of the therapy being increased could have increased the neuroplasticity component of her rehabilitation therapy. More research on measuring salience and its role in AAT is necessary to determine the extent AAT increases salience and therefore its potential to increase neuroplasticity. Research on how AAT can increase neuroplasticity during therapy sessions would provide valuable information for future rehabilitation plans for stroke patients.

The limits of a case study are recognized but the results show promise that incorporating a dog into the patient's therapy increases the patient's participation during occupational therapy sessions post-stroke. The patient also experienced the psychological benefits previously shown to come from AAT and the human-animal bond based on the comments and observations from the therapist, the patient's family, and the patient herself. The benefits that were subjectively noted included pain management, fewer agitated behaviors, and more engagement in therapy.

This evidence shows that more extensive research should be conducted on animal-assisted therapy and the effect it has on participation during rehabilitation sessions. While this case study was conducted with stroke patients in mind, AAT could potentially increase participation in other populations, especially those that rehabilitation professionals have a difficult time motivating.

Conclusion

The patient's participation increased significantly during the AAT sessions. Research supports neuroplasticity that is driven by task-specific practice salient to the patient.[26,27] Research also supports that AAT is less threatening to the patient, can help with pain management, and encourages engagement in therapy.[3,6,9,] This particular patient was drawn to the dog in AAT and demonstrated increased motivation and participation when the dog was incorporated into her therapy. The subjective and objective results obtained during this case study provide evidence that AAT has the potential to increase patient participation and should be the focus for more extensive research.

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Appendix A: Informed Consent

UNIVERSITY OF TENNESSEE AT CHATTANOOGA

INFORMED CONSENT

TITLE: The Effects of Animal-Assisted Therapy on Participation in Rehabilitation in an Individual with Stroke: A Case Study.

Principle Investigator: Dr. David Levine, PT, PhD, DPT, OCS, CCRP

Other Investigators: Chloe Cross

Other Investigators: Jennifer Matthews, OTR/L

UTC Department: Physical Therapy/Biology

Phone Number: 423-425-5240

Please read this consent document carefully before you decide to participate in this study.

Purpose/Background of the research study:

Our goal is to measure the effects of Animal Assisted Therapy (AAT) on participation during therapy. AAT is typically performed using a therapy dog and used as a therapeutic tool to invoke the human animal bond to improve participation in therapy. The therapy dog will be used in manners such as brushing or combing the dog, walking the dog, opening containers to feed the dog, and other therapeutic tasks. The treatment session will last one hour during which you will participate in tasks as instructed by the therapist which involve the dog. You will have some therapy sessions with the dog and some therapy sessions without the dog throughout the duration of your stay at facility.

This study has been approved by the University of Tennessee Chattanooga's International Review Board (IRB). You must be 18 or older to participate in this study. If you decide not to participate you will receive therapy as normal (a therapy dog will not be included).

Procedures:

If you decide to participate, you will be asked demographic information, and one of the following scenarios will happen:

- Scenario 1
  - o Your therapy session will involve a dog.
- Scenario 2
  - o Your therapy session will not involve a dog and will instead involve a typical therapy session.

Therapy with the dog will vary from day to day. The therapist will fill out a form (Pittsburgh Rehabilitation Participation Scale) after each therapy session.

Time required:
Your participation in this study will not add any additional time. The time involved in this study will only require the time it would take for a typical therapy session.

Risks and/or Discomforts:
Overall, risk factors are very few and honest completion of demographic will help our researchers to screen any individuals who should not participate in this study. Risk factors include possible skin irritation/allergy from working with a dog.

Compensation:
There is no compensation for participation in this study.

Confidentiality:
Your personal information and all related documentation will be kept confidential at all times. You will be assigned a coded number that will be used to identify your information on all research materials/data collection instruments.

Information gathered will be coded for confidentiality. It will be stored on a password-protected computer in Dr. Levine's possession.

Individuals with permission to view your information include: Dr. David Levine, Jennifer Greene, and Chloe Cross.

All documentation will be kept confidential, without personal identifying information.

Beneits:
The results of this study may benefit patients who suffer from stroke, general orthotic procedures, and generalized weakness by improving participation in therapy which has been linked to positive outcomes with therapy. Dr. David Levine will ensure that these are emailed to you at project end upon request.

Voluntary participation:
Your participation in this study is completely voluntary. There is no penalty for not participating. If you decide not to participate you will receive therapy as normal.

Right to withdraw from the study:

You have the right to withdraw from the study at any time without consequence. If you should withdraw from the study, the investigators will no longer access your information for study purposes.

Upon request, you also have the right to inspect the personal information obtained by the investigators.

Whom to contact if you have questions about the study:

If you have any questions or concerns regarding the information provided here, please contact Dr. David Levine through the Physical Therapy Department in the University of Tennessee at Chattanooga, at 423-425-5240 or David-Levine@utc.edu.

If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact Amy Doolittle, the Chair of the Human Subjects Committee, Institutional Review Board at 423-425-5563. Additional contact information is available at www.utc.edu/irb. A contact at the facility (Life Care, Ooltewah) is Jennifer Greene, OTR/L.

Agreement:

I have read the study description as outlined above. I voluntarily agree to participate in the study and I have received a copy of this description.

Participant (Printed Name):_____

Participant (Signature):_____ Date:_____

Principle Investigator:_____ Date:_____

I wish to receive a copy of the results once the study is completed: □ Yes □ No

If you checked/circled yes, please provide us with an email address so that you may receive the study results:

Name:_____

Email Address:_____

If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Committee, Institutional Review Board at 423-425-4289. Additional contact information is available at www.utc.edu/irb.

Appendix B

Authorization for Photography and/or Videotaping
And Release from Liability

I, _____

Or I, The Parent and/or Guardian, of _____

a patient at _____,

authorize members of the University of Tennessee at Chattanooga, Department of Physical Therapy, to take photographs and/or videos, which will only be used for educational purposes, and will not be shared with anyone outside of the Department of Physical Therapy. I release the Department of Physical Therapy from any and all liability resulting from said photography/videotaping.

_____	_____
Signature	Witness
_____	_____
Date	Date

Appendix C

PITTSBURGH REHABILITATION PARTICIPATION SCALE

Patient name: _____

Admission date: _____

Instructions to therapist: for each therapy session, please circle one of each of the following to assess the patient's participation (effort and motivation as perceived by you) in the therapy session. Please rate as follows: None: patient refused entire session, or did not participate in any exercises in session. (see Note below)

Poor: patient refused or did not participate in at least half of session.

Fair: patient participated in most or all of exercises*, but did not show maximal effort or finish most exercises*, or required much encouragement to finish exercises*.

Good: patient participated in all exercises* with good effort and finished most but not all exercises* and passively followed directions (rather than actively taking interest in exercises* and future therapy).

Very good: patient participated in all exercises* with maximal effort and finished all exercises, but passively followed directions (rather than actively taking interest in exercises* and future therapy).

Excellent: patient participated in all exercises* with maximal effort, finished all exercises*, and actively took interest in exercises* and/or future therapy sessions.

Note: if patient was unable to attend therapy because of medical test, bed rest order, illness, or scheduling conflict, do not mark any score.

Note: in cases of doubt, choose the lower rating, eg, "good" rather than "very good."

Session Number	Date	Therapist Initials		None	Poor	Fair	Good	Very Good	Excellent
1				1	2	3	4	5	6
2				1	2	3	4	5	6
3				1	2	3	4	5	6
4				1	2	3	4	5	6
5				1	2	3	4	5	6
6				1	2	3	4	5	6
7				1	2	3	4	5	6
8				1	2	3	4	5	6
9				1	2	3	4	5	6
10				1	2	3	4	5	6