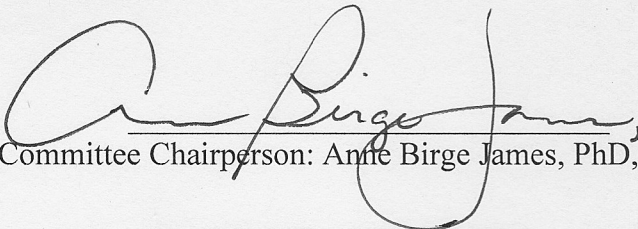
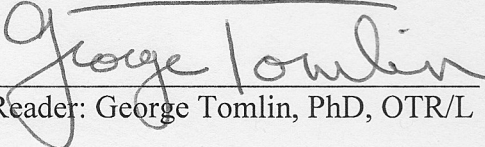



Animal-Assisted Therapy: A Dog's Influence on Occupational Therapy Outcomes of a Child  
with Cerebral Palsy

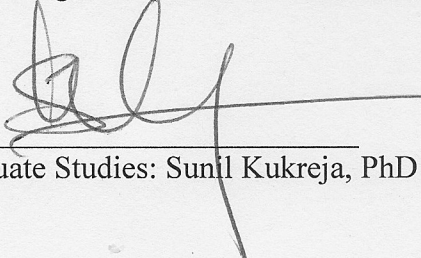
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This research, submitted by Emily Howell-Forbes and Kathryn Marxen, has been approved and accepted in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy from University of Puget Sound.

  
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### Abstract

Objectives: The purpose of this pilot study was to compare differences between traditional occupational therapy (OT) and OT delivered with a dog and handler, or animal-assisted therapy (AAT), on selected treatment goals for a 3-year-old child with cerebral palsy.

Methods: This mixed-methods research study included an A-B single subject design to collect data related to the child participant's OT goals and qualitative interviews to understand the subjective experiences of the occupational therapist and the child's parent.

Results: Visual and statistical analysis of the graphed data revealed that the child produced significantly more vocalizations when the dog was present. Visual analysis also indicated improvements in maintaining head at midline while seated. Two themes related to the child's participation in therapy emerged from the interviews, including: *Increased Enjoyment and Participation in Therapy with the Dog* and *Greater Improvement in Skills with the Dog*. Two additional themes emerged from the occupational therapist related to the delivery of treatment, including: *Incorporating AAT in OT is Challenging for the Therapist* and *Planning and Coordination is Critical for AAT Success in OT*.

Conclusion: Overall, the results suggest that AAT is at its best when all of the individuals involved in the therapy are collaborating and activities utilize the strengths of each individual. This occurs when the child is motivated by the dog, is able to interact with the dog without excessive effort, and when the therapist is able to utilize both her own skills and the skills of the dog.

Animal-Assisted Therapy: A Dog's Influence on Occupational Therapy Outcomes of a Child  
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Relationships between humans and animals have existed for over 4,000 years with canines being the first to be domesticated (Serpell, 1986). Words such as unconditional love, companion, therapeutic, and healing are often used to describe these relationships and their benefits for humans. In recent years, there has been increasing research into the therapeutic benefits and efficacy of incorporating animals into evidence-based practices such as occupational therapy (Friedmann & Son, 2009).

Animal-assisted therapy (AAT) is the use of animals in goal-directed interventions that are delivered by health service professionals within their scope of practice (Pet Partners, 2012a). Human-animal interactions have been shown to have positive physical health benefits for humans, including decreased blood pressure and decreased heart rate, and psychological benefits including improved self-esteem, improved social interactions and communication, decreased stress and anxiety, increased security, and sensory stimulation (Barba, 1995). In particular, dogs have been shown to facilitate social interactions in children, as well as offering lessons on self-respect, responsibility, and empathy. These lessons can be generalized to improve social interactions with teachers, family, and peers (Anderson & Olson, 2006). Interactions with a dog were also shown to increase sense of self and understanding of emotional triggers in children (Anderson & Olson, 2006).

Cerebral palsy (CP) is the most common motor disability in children (Accardo & Capute, 2008). The Centers for Disease Control and Prevention (2012) estimated that in the U.S. an average of 1 of every 303, 8-year-old children has cerebral palsy. Cerebral palsy is caused by damage to a developing brain in pre-natal, peri-natal, or post-natal, life, typically affecting

muscle tone, movement, and motor skills. CP may also be associated with other impairments such as vision, hearing, speech, and learning disabilities. Children with CP, like others with disabilities, often have fewer friends and are more isolated, are more victimized by peers, and have lower self-esteem (Mulderij, 1997; Yude & Goodman, 1999).

Occupational therapists who work with children and youth often direct interventions at both individuals and their families in order to increase participation in meaningful activities and occupations. These interventions address developmental, educational, and emotional-behavioral needs (American Occupational Therapy Association, 2010). AAT is an adjunctive therapy that works in conjunction with occupational therapy to achieve a client's specific goals and can be used to promote physical, social, emotional, and/or cognitive function (Pet Partners, 2012b). In conjunction with occupational therapy, AAT may also provide a unique motivation for client participation in therapy. Within occupational therapy, the use of dogs to address the physical impairments and social stigma of children with cerebral palsy is undocumented.

## **Background**

**Cerebral palsy.** Rosenbaum et al. (2007) defined CP as “a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain” (p. 11). CP is a broad category and as such the diagnostic label for it is composed of two parts. First is muscle tone, which is classified as spastic (velocity-dependent increased muscle tone, muscle contractures, and increased deep tendon reflexes), dystonic (abnormal movements that are slow, uncontrolled, writhing, and are especially noticeable on the initiation of a movement), ataxic (disturbance of coordination during voluntary movement with a mild intention tremor, and poor balance), or mixed (symptoms that fit in multiple categories). The second part of the diagnostic

label for CP refers to the area of the body demonstrating the altered muscle tone. Individuals can be classified as having diplegia (primarily involves the lower extremities), tetraplegia (involves all four extremities), or hemiplegia (involves one side of the body, often the upper extremity more than the lower extremity; Rosenbaum et al., 2007).

CP is caused by damage to the motor areas of the developing brain and can occur during pregnancy, birth, or after birth (Phipps & Roberts, 2012). Some common risk factors for developing CP include low birth weight, intrauterine infection, or multiple births (Odding, Roebroeck, & Stam, 2006). As a result of trauma to the brain, impairments in gross motor function and fine motor function are common in individuals with CP (O'Shea, 2002). Motor impairments in individuals with CP can be grouped into four main categories: abnormal muscle tone, an imbalance between agonist and antagonist muscles, impaired balance, and loss of selective motor control. Upper limb dysfunction is a common motor dysfunction associated with CP. Abnormal muscle tone and agonist/antagonist imbalance often result in joint contractures that contribute to this dysfunction and individuals may also experience muscle weakness, sensory impairment, or both (Fehlings, Rang, Glazier, & Steele, 2001). Impaired balance is often caused by poor postural control and may result in difficulty regaining balance after equilibrium is disrupted (Russman, Tilton, & Gormley, 1997). In combination, these symptoms can contribute to difficulties reaching, pointing, grasping, releasing, and manipulating objects and these difficulties are increased in individuals with postural instability (Boyd, Morris, & Graham, 2001). Decreased selective motor control may include lack of lower extremity muscle control and a stereotypical scissor gait with toe-walking. Other non-motor deficits may be present including mental retardation, visual impairment, hearing impairment, epilepsy, and speech and language impairments (Russman et al., 1997; Sankar & Mundkur, 2005).

Despite improving medical practices and decreasing prevalence of many other diagnoses in the past 50 years, the prevalence of CP has increased (Boyle et al., 2011; Odding et al., 2006; YeARGIN-Allsopp et al., 2008). This increase in prevalence and severity of CP is accounted for in part by the decreasing mortality rate of infants as neonatal and obstetric medicine improves (O'Shea, 2002; Sankar & Mundkur, 2005). Also contributing to the increasing prevalence is the fact that there is currently no known cure for CP (Collet et al., 2001). Those now surviving the initial damage to the central nervous system need to adapt to resulting impairments throughout their lifespan.

Impairments that impact the functional performance of individuals with CP affect their participation in physical and social occupations. Phipps and Roberts (2012) found that increased severity of CP in children, adolescents, and young adults is related to a decreased level of self-care, mobility, and social function. CP is also often associated with difficulties in locomotion, related both to abnormal muscle tone and decreased balance. Lepage, Noreau, and Bernard (1998) found that locomotion abilities were positively associated with participation in both activities of daily living (ADL) and social roles. A lack of objective criteria for the classification of the severity of CP, however, places a limitation on their results as participants had a wide range in severity of symptoms, but this variable was not addressed in the data analysis. Boyd et al. (2001) found similar associations between upper limb use and educational outcomes, participation in ADL, and vocational pursuits, when they conducted a systematic review of the literature.

Three studies found that children with disabilities' social difficulties with peers in the school environment may be influenced by a combination of two factors: the visibility of the disability and the social behaviors demonstrated by a child (Engel-Yeger, Yarus, Anaby, & Law,

2009; Nadeau & Tessier, 2006; Yude & Goodman, 1999). Nangle, Erdley, Newman, Mason, and Carpenter (2003) added quality and quantity of friendships to the previous list of factors. Of these factors, the visibility of the disability of the child is the one factor that cannot be changed, as there is currently no effective treatment to significantly decrease the physical symptoms of CP (Goldstein, 2004). Because of this, interventions attempting to improve social interactions may be more effective if directed at improving the child's social behaviors and quality and quantity of friendships. These are elements of the support and relationships environmental factor, described in the International Classification of Functioning, Disability, and Health (ICF) that can pose barriers to an individual's function and may be addressed in treatment (World Health Organization, 2001).

**Occupational therapy.** Since there is currently no cure for CP, occupational therapy is one intervention commonly used to decrease or compensate for the negative effects of the disorder and increase an individual's function, independence, and participation in areas of occupation that are of personal importance to the individual. There are various theoretical approaches and treatment interventions used by therapists to improve or compensate for the impairments of individuals with CP. Some of the treatments include neurodevelopmental treatment (NDT), constraint-induced movement therapy (CIMT), and context-focused education (Case-Smith, Frolek Clark, & Schlabach, 2013; Wiart, Ray, Darrah, & Magill-Evans, 2010).

The primary goal of NDT is to produce changes in functional posture and movement skills often seen in individuals with CP by handling and positioning techniques conducted by the therapist with the child (Barthel, 2010; Case-Smith, et al., 2013). In addition, "the current theoretical foundations of NDT include aspects of Dynamic Systems Theory of Motor Control, the Neuronal Group Selection Theory, Sensory Contributions, and Motor Learning" (Barthel,

2010, p. 201). A systematic review of literature conducted by the American Academy for Cerebral Palsy and Developmental Medicine on the efficacy of NDT for children with CP found that the evidence for NDT was inconclusive and did not show an advantage over other interventions (Butler & Darrach, 2001). More recent research on NDT with the inclusion of motor learning theories (Franki et al., 2012) suggests that goal-oriented therapy and functional training were effective methods to address individuals' functional goals and participation.

A modality which has shown more conclusive positive results is CIMT, which is a treatment intervention used for children with hemiparesis or unilateral CP, in which the less affected upper extremity is constrained and the occupational therapist facilitates activities using motor learning theory to encourage improved function of the affected upper extremity (Case-Smith et al., 2013). CIMT interventions are intensive, typically lasting 2-6 hours with the application of the constraint. While CIMT has been shown to be effective at increasing an individual's use of the affected hand both in quality and frequency (Case-Smith et al., 2013), the time and financial commitment required means that it is often not a feasible option for individuals and their families. Another limiting factor for this treatment method is that individuals must also be able to tolerate the frequency and duration of the constraint of the unaffected upper extremity. CIMT is also limited because it is best suited to treat children who have one upper extremity that is more involved than the other.

One method to teach individuals with CP to compensate for limitations is through context-focused interventions. These methods focus on barriers to functional performance presented by the task or environment and modifying the task or environment to promote independence. While context-focused interventions have proven effective at improving self-care, mobility, and social function through modification of the task or environment (Law et al., 2011),



they do not address the underlying impairment or skills necessary to generalize and complete other tasks or perform in other environments without modifications.

In conclusion, no single treatment modality has proven to be conclusively more effective for all individuals with CP. This is likely in part due to the wide variety in presentation of symptoms and impairments seen in CP. As a result, it is important to have a wide range of therapeutic approaches to choose from to address individual client needs. These approaches may be used in combination. In addition, since there is no cure for CP, individuals often spend many hours in therapy throughout their childhood and early adult years. Incorporating AAT into occupational therapy for this population may increase a child's motivation to attend therapy. It may also increase a child's active participation during the treatment session in situations when a client may not otherwise want to participate.

**Animal-assisted therapy.** The use of animals in the treatment of individuals with CP can address both improvement in function (physical, social, and emotional) and modifications to the environment or task. One of these methods is AAT. AAT can incorporate a variety of animals, but two of the most commonly used are horses and dogs. AAT with both species has been found to be effective for a number of different disabilities. The research into the incorporation of dogs is lacking for several populations, but both dogs and horses have been found to be effective in treating a single disability, such as autism (Sams, Fortney, & Willenbring, 2006; Taylor et al., 2009). It stands to reason that other disabilities may benefit from incorporation of either species depending on the individual's needs.

AAT specifically incorporating horses is labeled as hippotherapy and is typically aimed at increasing physical function. Physical therapists, occupational therapists, and speech and language pathologists have used hippotherapy as an adjunct to traditional therapeutic strategies

since the 1960's (American Hippotherapy Association, 2010; Casady & Nichols-Larsen, 2004). This form of AAT utilizes the natural movement of the horse to influence the movement of the rider to achieve functional outcomes (Debuse, Gibb, & Chandler, 2009).

The use of hippotherapy as a treatment modality for individuals with CP has been well documented. It is said to increase muscle symmetry, increase functional outcomes, increase trunk control, decrease abnormal muscle tone, provide sensory stimulation, and it provides the individual with a sense of achievement (Benda, McGibbon, & Grant, 2003; Casady & Nichols-Larsen, 2004; Debuse et al., 2009; Haehl, Giuliani, & Lewis, 1999; Lechner et al., 2003; Liptak, 2005; MacKinnon et al., 1995; Sterba, 2007).

AAT with dogs has been researched as an adjunct to current therapy practices with individuals with other conditions such as developmental disabilities, mental illness, and the geriatric population. Nimer and Lundahl's (2007) meta-analysis found that AAT with a variety of animals shows promise as an additive to established therapies. This meta-analysis examined AAT interventions for all ages and found that AAT was associated with improving outcomes in four areas: autism-spectrum symptoms, medical difficulties, behavioral problems, and emotional well-being. Herbert and Greene (2001) examined the use of AAT with elderly residents and its impact on their preference for and performance of a walking task. The distance walked was significantly greater when walking with a dog versus without. Residents had a statistically significant preference for walking with a dog versus walking without a dog (Herbert & Greene, 2001). In another study on the influence of AAT with motor tasks, Gee, Harris, and Johnson, (2007), examined the presence of a dog during gross motor activities in a group of language-impaired and typically developing preschoolers. In this study, three broad categories of gross motor function (locomotion, stability, and manipulation) were assessed by the time to complete

the task and by a rating of task performance. Participants performed the task either with or without a dog present. The results showed that the children completed the tasks faster when the dog was present; indicating the presence of a therapy dog was beneficial for gross motor tasks of pre-school children.

Researchers have also examined the effectiveness of AAT for increasing satisfaction and improving social participation. Sams et al. (2006) found that the frequency of social interactions and language use in occupational therapy sessions for children with autism that incorporated AAT, using a variety of animals, was higher than in occupational therapy sessions without animals. The researcher, however, was not blind to the purpose of the study and potentially could have created a bias in results. The inference was made that incorporating animals into traditional occupational therapy sessions provided motivation for clients. The use of a therapy dog has been found to have a positive effect on clients' satisfaction with speech therapy treatment for individuals with cerebral vascular accident (CVA). Both traditional therapy and AAT saw equivalent results, however, patients who participated in sessions where a therapy dog was present felt more motivated and reported increased enjoyment of therapy, decreased stress, and felt that the atmosphere was lighter (Macauley, 2006). However, since these studies did not include participants with CP, it is not clear if AAT would also improve participation during therapy for children with CP.

The use of AAT with dogs to improve social interactions in various populations has been documented, but the use of AAT with dogs to improve physical dysfunction, as often seen with CP, is less well documented. It is generally acknowledged that children need physical activity for healthy development, specifically, functions including language, sensation, perception, intellectual ability, and emotional and social development (Gee et al., 2007). In children, self-

esteem and self-confidence are mainly developed through successful experiences with motor tasks (Bunker, 1991). The interactions of dogs and children tend to promote physical activity.

**Purpose of the study.** There are several factors that are important to consider when determining the next logical step for furthering the evidence-based practice of AAT in occupational therapy. Individuals with CP present with impairments in gross motor, fine motor, and social skills and there is evidence that the addition of a dog (through AAT) can positively influence motivation and social participation. Given the lack of literature specifically addressing AAT with dogs for individuals with CP, the purpose of this pilot study was to compare differences between AAT occupational therapy with a dog and traditional occupational therapy on selected occupational therapy outcome measures for a 3-year old child with CP. The following research questions were asked:

1. Is an occupational therapy intervention with a dog more effective in meeting an individual's OT goals than traditional occupational therapy interventions for a child with CP?
2. What are the subjective experiences of the occupational therapist and participant's parent related to the occupational therapy sessions incorporating AAT with a dog as compared with those of the traditional occupational therapy sessions and their perceived effectiveness for the child?

## **Method**

### **Design**

The study used a mixed research design, with a single subject (A-B) methodology to collect outcome data related to the client's occupational therapy goals and qualitative methods with data from semi-structured interviews to better understand the impact of AAT from caregiver

and therapist perspectives. There were two phases of treatment in this study; for the first phase, the child participant acted as her own control with a baseline treatment phase (A) of traditional occupational therapy and the second phase was an intervention treatment phase (B) of occupational therapy enhanced with AAT. This design allowed for the specification of target behaviors based on the child's treatment goals that were measured during treatment sessions in order to document changes in performance throughout both phases of treatment. As a pilot study exploring the efficacy of animal-assisted occupational therapy for a population not previously studied, only one child participant was used.

Following both treatment phases, the primary and co-investigators conducted semi-structured interviews with the occupational therapist and the participant's mother to collect data on the perceived effectiveness of the AAT intervention. Because quantitative tests may not always reflect a complete picture of the subjective results of treatments, such as perceived self-competence, perceived effectiveness of treatment, and self-esteem, semi-structured interviews following the two treatment phases were thought to provide a more complete picture.

### **Participants**

There were three participants in this study: the occupational therapist, the occupational therapy client (also referred to as the child), and the child's parent or guardian. Participants were not excluded from participation on the basis of gender, sex, or race.

**Occupational therapist.** The occupational therapist was invited to participate because she met the following inclusion criteria: (1) current clinical instructor for the Pediatric On-Site Occupational Therapy Clinic at the University of Puget Sound, with at least one year of experience in the on-site clinic; (2) a minimum of three years of experience treating children

with CP; (3) no fear, aversion, or known allergies to dogs; (4) willingness to incorporate a dog and handler into the child's occupational therapy.

**Occupational therapy client (child).** Inclusion criteria for the child participating in this study were (1) diagnosis of CP, (2) between the ages of 18 months and 13 years, (3) ability to tolerate occupational therapy three times per week for two weeks, based on parent report, and 4) had a parent or guardian willing to arrange for consistent attendance to occupational therapy three times per week for two weeks and also willing to participate in an interview following the child's occupational therapy sessions. A child was excluded if (1) she had demonstrated or voiced a fear or aversion to dogs, (2) had a known allergy to dogs, or (3) required an English language translator during treatment or had a parent or guardian who required an English language translator to participate in an interview about their child's occupational therapy experience during the study.

**Child's parent or guardian.** The child's mother was also enrolled in the study and participated in a semi-structured interview upon completion of both treatment phases of this study. Inclusion criteria included (1) having a child enrolled in this study and (2) having the ability to participate in an interview in English.

## **Procedures**

Institutional Review Board (IRB) approval was received prior to the initiation of this study. After IRB approval, an occupational therapist was recruited through a broadcast email to all five pediatric clinical instructors at the University of Puget Sound Occupational Therapy On-Site Clinic. The selected occupational therapist was then asked if she knew of any children who met the inclusion criteria and whose parents may be interested in the treatment offered through this research project. Parents or guardians who expressed interest in this study received a brief

description of the study from the researchers or the occupational therapist through email or over the phone. Of the families who expressed interest, one became unavailable for contact, and another's child did not meet the inclusion criteria. The parent of the child who did not meet the inclusion criteria identified the child who was ultimately selected to participate in this study and contacted the child's mother. The family gave permission to be contacted for consideration. The researchers then contacted the child's family and provided them with information regarding the study and an opportunity to ask questions.

The participants signed informed consent forms and video/photography releases. The occupational therapist conducted a 60-minute initial evaluation in the university pediatric clinic space, including an occupational profile and skilled observation, to establish occupational performance strengths and deficits. Skilled observations were made of the child participant in sitting, prone, and on a large rectangular platform swing. Standardized assessments were attempted, but abandoned due to the child's inability to complete the required tasks. The initial evaluation revealed that the child was a social girl who enjoyed interacting with people. She was able to self-initiate some arm movements in flexion and abduction of the shoulders. She could move from prone to side lying by falling to the side. When supine she was able to self-initiate rolling to prone with her legs and arms, but was unable to complete the roll. The child had poor head control and lacked full range of motion in any joints. She presented with variable muscle tone in her upper extremities and demonstrated a clasp knife reflex in both upper extremities. Her symmetrical tonic neck reflex (STNR) and her asymmetrical tonic neck reflex (ATNR) were not integrated, decreasing her ability to reach with her arms.

The occupational therapist and researchers collaborated to identify goals for the client.

Specific measurable behaviors were defined in order to document progress towards those goals.

The behaviors were defined and measured as follows:

- Seated head control; measured by recording the total number of seconds per session that the child was able to maintain a midline head position. Midline head position was counted when the child was able to hold her head between 15 degrees of neck hyperextension and 15 degrees of neck flexion for greater than one second.
- Prone head control; measured by recording the total number of seconds per session that the child was able to maintain a vertical head position as measured within five degrees of vertical for greater than one second.
- Open hand; measured by counting the number of times the child's left or right hand was in active movement to a position of less than 90 degrees of metacarpophalangeal joint flexion.
- Voluntary arm movement; measured by counting the number of times the child self-initiated arm movements outside of abnormal synergy patterns.
- Isolated vocalizations; measured by counting each isolated vocalization that the child made throughout the session. Vocalizations that occurred in a string were counted as one vocalization.
- Rolling supine to prone; measured by approximating the percentage of the roll completed independently and recording the greatest percent rolled per session.

After the initial evaluation, the child received a total of three baseline (A) sessions (regular occupational therapy treatment) and three intervention (B) sessions (occupational therapy with AAT) for 60 minutes per session. Because of schedule restrictions of the



researchers, the need for an occupational therapist to volunteer time, the time commitment required of the participant, and the intent of the study to provide pilot data, this was deemed the most feasible number of sessions. The sessions took place in the university pediatric clinic space. It was a large open room with a padded floor and mounts on the ceiling for suspended equipment. The six sessions were spread over four weeks, which deviated from the initial plan due to scheduling difficulties between all individuals involved in the study, the child's medical events that necessitated postponement of treatment including a visit to the emergency department.

All sessions with the child participant were videotaped to allow for data collection and comparison between sessions and phases. The principal and co-investigators compared data from the videos over the course of two days after the completion of the baseline and intervention phases.

The primary and co-investigators conducted a six-minute parent interview directly following the final intervention session with the child's mother. Despite open-ended questions and encouraging further responses, the child's mother responded to questions with brief answers, limiting the amount of data collected on her perceived effectiveness of the AAT intervention. The occupational therapist also participated in a 30-minute interview four weeks following the last intervention session. The interviews started with a brief introduction and then specific questions were asked to gather data related to participants' experiences in occupational therapy with and without a dog present. Additional follow up questions were asked when needed. At the conclusion of the interview, the investigator summarized the participants' responses, asked if there is any other information they would like to add, and thanked them for participating. See the

Appendix for the guiding questions used. The interview sessions were audio recorded for later transcription and analysis.

### **Intervention**

For the baseline treatment sessions, the child received traditional occupational therapy interventions with activities designed by the occupational therapist to meet her specific goals. These activities included preparatory methods on the therapy ball, playing with toys both seated and prone on the floor, rolling supine to prone on floor, and playing with toys while seated at a bench placed at chest height. For the intervention treatment phase, a Pet Partners registered AAT team was incorporated into the therapy sessions. The therapy dog that participated in this study was an 8-year old Labrador retriever. The dog and her handler, who was a co-investigator in this study, have been registered with Pet Partners as a therapy-animal team since 2008. In order to receive registration, the dog passed the Pet Partners skills and aptitude tests. These tests require the dog to demonstrate basic obedience skills (sit, down, stay, come, walk on loose leash, walk through a crowd, ignore distractions, accept petting, and ignore a neutral dog). Potential participation in AAT activities is evaluated through testing the dog's ability to accept clumsy petting, accept a hug, accept staggering gestures by people, accept angry yelling, be bumped, be petted by several people, and ignore a toy (Pet Partners®, 2012c).

The therapy animal team followed the policies and procedures set forth by Pet Partners for AAT activities and were covered by Pet Partners liability insurance. During intervention sessions the therapy animal team volunteered their time and worked under the direct supervision and direction of the occupational therapist.

The activities that were completed with the dog had similar task demands as those in the baseline phase and were aimed at achieving the same treatment goals. Activities were performed

in both seated and prone positions and included making eye contact with the dog, petting the dog, rolling towards the dog, and dispensing treats to the dog. Treatment goals were identified by the occupational therapist and activities were decided upon in conjunction with the researchers in order to ensure that intervention activities in both conditions were essentially equivalent. The goal of all activities was to facilitate midline head position and voluntary arm movements. Rolling was also encouraged during prone activities. During initial evaluation, baseline, and intervention phases efforts were made to keep all sessions at regularly spaced intervals and at the same time of day; both in order to coincide with the family/child's routine and to control for the variability seen both in child's behavior and spasticity commonly seen based on the time of day. Due to scheduling restrictions of the therapist, researchers, dog handler, and child participant, therapy times were unable to be kept at regularly spaced intervals and at the same time of day. However, researchers took all possible measures to ensure consistency between phases. For example, the child wore her glasses and Stabilizing Pressure Input Orthosis (SPIO) in the same number of sessions in each phase. The organization of each treatment session was consistent with approximately 7 minutes of preparatory activities on the therapy ball, approximately 45 minutes of treatment activities and approximately 8 minutes of time on the platform swing at the end as a reward.

### **Data Analysis**

Measures of the dependent variables for the participant were plotted on a graph for visual analysis. Statistical analyses were performed on each measurable behavior individually using the two standard deviation band method. A statistically significant change was defined as two consecutive data points in the intervention phase of treatment that fell more than two standard deviations outside the mean of the baseline phase of treatment.

The data collected during the semi-structured interviews with the parent and the occupational therapist were analyzed to find key words and common themes, in order to reveal more information about individual subjective experiences during the study. The interview recordings were transcribed and the researchers coded the transcriptions using an a posteriori method to identify common words, phrases, and themes that pertained to the participant's experience. Triangulation of data was achieved through comparison of the themes extracted from the interviews with the videos of the intervention sessions.

### **Results**

The child participant in this study was Rachel (pseudonym), a 3-year old, left hand dominant, female diagnosed with mixed tone tetraplegia CP. Rachel was fully dependent in all areas of care, requiring assistance with all activities of daily living and positioning. She was non-verbal, but expressed yes and no, albeit inconsistently. She was unable to maintain anti-gravity postures when not supported by her wheelchair. She presented in a forward slumped posture with rounded shoulders and forward neck flexion with her chin resting on her sternum. Her right leg was externally rotated at the hip and her feet were in a position of plantar flexion. Rachel had scoliosis and had received bilateral hip surgery. She received nutrition through a gastrostomy tube because of a risk of aspiration. Rachel presented with vision challenges including esotropia of the left eye. She was able to see 12-18 inches in front of her face. She wore corrective lenses prescribed by an ophthalmologist. She had an uncontrolled seizure disorder, which presented with approximately one seizure every four weeks and resulted in status epilepticus, requiring the administration of emergency medication for seizure cessation. She also experienced small myoclonic seizures, which were seen as brief muscle jerks. At the time of the study, she was

enrolled in a pre-school program that she attended three days a week for three hours and she received occupational, physical, and speech therapies.

The occupational therapist who participated in this study was generally recognized as an expert in pediatric occupational therapy and was licensed by the State of Washington. At the time of the study, she had 30 years of experience as a pediatric occupational therapist and has specialized in working with children with CP and other neuromuscular disorders her entire career. The therapist has her basic and baby certifications in NDT. Prior to this research study, the therapist had worked with service dogs in therapy sessions and has had dogs present in the clinic space, but had not actively incorporated an AAT team into her occupational therapy treatments.

Possible confounding variables were noted throughout data collection. Rachel wore her glasses for sessions one and three during the baseline phase and for sessions two and three during the intervention phase. She also wore a SPIO suit, with stays on the back panel, for session two during the baseline phase and session two during the intervention phase. She experienced a seizure between sessions one and two of the intervention phase, which resulted in session two being delayed by a week. Results from session two of the intervention phase were also impacted by a longer than normal commute to therapy and the fact that she needed a diaper change immediately upon arrival to the session because of extreme discomfort due to loose stool. During this session an increase in myoclonic seizures, generalized muscle tone, plantar flexion of Rachel's left foot, and reflux were observed.

### **Two Standard Deviation Band**

The two standard deviation band method was used to determine statistical significance for all measurable behaviors recorded for Rachel. Measures of prone head control ( $M = 72.9$ ,  $SD$

= 62.6; see Figure 1), open hand ( $M = 4.5$ ,  $SD = 2.72$ ; see Figure 2), voluntary arm movement ( $M = 10.2$ ,  $SD = 3.4$ ; see Figure 3), and rolling supine to prone (see Figure 4) did not show statistically significant results. No visual trend was observed on graphs for open hand or voluntary arm movement. While not statistically significantly worse than the baseline treatment phase, measures of prone head control did show a downward trend in the intervention phase of treatment during visual analysis. During the first session of the intervention phase of treatment Rachel was able to achieve about 75% of a roll from supine to prone independently, which was reported by her mother as the most she has ever achieved.

A statistically significant increase was seen in the number of vocalizations observed in the intervention phase of treatment as compared to the baseline phase ( $M = 9.3$ ,  $SD = 3.8$ ; see Figure 5). This was the only measurable behavior that showed a statistically significant increase. However, because of the external factors that may have influenced the outcomes in treatment session number two of the intervention phase it is also notable that two non-consecutive points (sessions one and three of the intervention phase) fell more than two standard deviations above the mean ( $M = 20.3$ ,  $SD = 2.5$ ) for measures of seated head control (see Figure 6).

### **Semi-Structured Interviews**

The semi-structured interviews with the occupational therapist and Rachel's mother provided information regarding the subjective experiences of incorporating a dog into the occupational therapy sessions. Four major themes emerged from the interviews that describe various aspects of AAT.

**Increased enjoyment and participation in therapy activities when the dog was present.** This theme relates to Rachel's performance and level of engagement in activities during therapy. Interview participants noted that Rachel seemed to enjoy therapy sessions more when

the dog was present. The therapist stated, "The first day that we brought Minnie in was really wonderful and saw a lot of great things...excitement, participation..." and went on to say, "There were times when it was more effective because a child really enjoyed having Minnie there. And I think it meant a lot to her to have the dog there." Rachel's mother also noted that Rachel enjoyed "talk[ing] to [the] dog" during therapy.

Both interview participants also indicated that Rachel seemed more motivated to work towards achieving her goals on days when the dog was present. As the therapist described, "She definitely was very motivated the day you brought Minnie. That was the most remarkable day..." In addition, Rachel's mother stated, "I knew she loved animals, but she seemed more motivated... to work for the dog"

**Greater improvement of skills when the dog was present.** The incorporation of the dog into the therapy sessions seemed to facilitate improvement of some of the skills that Rachel had worked on during therapy. The interview participants indicated that having the dog present helped both during therapy and had carryover to other environments outside of therapy. The therapist stated, "I thought Minnie did a really good job of trying to get [Rachel] to bring her hand up." In addition, her mother described how Rachel had taken the skills that she has learned in therapy and was practicing and working on them outside of therapy. She stated,

She seems to be lifting her head more at home, trying to show off her head at home, she seems to be trying to roll over everywhere she goes now. She wants to get on the ground and try and show people that she can do it. I think it is definitely given her more confidence, showing her that she can do stuff and now she wants to do it.

During the interview with the therapist two additional themes emerged that were unique to her experience of incorporating an AAT team into her treatments.

**Incorporating AAT into occupational therapy was challenging for the therapist.** During her interview the therapist often described the challenges that arose for her

when incorporating the dog both while planning treatment and administering it. Related to the planning of the sessions she described the difficulties that she faced when planning to incorporate multiple bodies into the session, stating “It is harder, because I had to constantly pay attention to Kathryn and Minnie... I had to think about the planning of the session with the dog in mind.”

While speaking about difficulties faced during sessions she said that “...it was harder for me, as a therapist, to be able to freely move with her [Rachel], because I am always having to think about where the dog is and where the handler is, and that interaction...”

**AAT would be improved by planning and coordination between the occupational therapist and the dog handler.** Throughout the interview, the therapist suggested ways that incorporating the dog into treatment could have been easier, making treatment smoother. She said, “I think if the handler and therapist are in sync, then I think it will move a lot smoother.”

Many of her suggestions related to developing relationships between all of the members of the therapy team (therapist, handler, and dog) before starting therapy. She stated, “So I think one of the things that would be important to do to continue this on is to really look at the relationship between the handler, the therapist, [and] the dog...”

The therapist noted that increased communication and planning prior to treatment sessions would also probably make treatment sessions run a lot smoother and she stated that “planning ahead of time would be really helpful... if we had gotten together a little bit more with Minnie in the room and worked together more with her without the child -- maybe that would have made the difference...” She also indicated that planning activities that were structured to incorporate the dog in the most beneficial way was key. She suggested finding various ways to



position the dog that would maximize the therapeutic benefit for the child along with keeping the dog comfortable.

According to the therapist, improved planning and communication between the dog handler and therapist prior to the treatment sessions would result in better interactions during the therapy sessions. She described that having multiple people present in a treatment session, especially interacting with the child, may make it difficult for the child to know who to attend and respond to. She stated, "If I am going to work with someone - a handler again - then I would want to have really sat down and talked through the sessions way ahead of time so I could actually have an understanding of, 'do I back off and not talk and just the handler talks and communicates with the child and the dog?'" She thought this would have possibly decreased some of the confusion during the sessions and contributed to them running smoother.

### **Discussion**

The purpose of this pilot study was to compare differences between AAT occupational therapy with a dog and traditional occupational therapy on selected occupational therapy goals for a three-year-old child with CP.

The results of this study provide a preliminary level of evidence for the use of AAT with youth diagnosed with CP. Rachel demonstrated a significant increase in vocalizations in occupational therapy sessions that incorporated the dog versus the traditional occupational therapy sessions, which supports the findings of Sams et al. (2006) who found that the frequency of language use in occupational therapy sessions was higher than in occupational therapy sessions without animals. The inference was made in that study that incorporating animals into traditional occupational therapy sessions provided motivation for clients.

Supporting the findings of both Bunker (1991) and Macauley (2006), both Rachel's mother and the occupational therapist noted during interviews that incorporating a dog into the occupational therapy sessions appeared to provide Rachel with increased motivation and confidence to engage with activities during therapy, as well as increased performance of skills outside of therapy.

Because of the increased number of individuals involved when AAT is incorporated into occupational therapy, the relationships between those individuals are important to examine. Figure 7 provides a conceptual framework of the interactions that take place during the course of AAT treatment. By examining the collective relationships of the individuals involved in therapy, conclusions can be drawn regarding the successfulness of the AAT intervention. The interactions of the therapist and child, the therapist and dog/handler and the child and the dog/handler all overlap in the three circles of the Venn diagram. In theory, the greater the degree of overlap among all three circles the more effective and therapeutic the AAT intervention is going to be.

The interaction between the therapist and the child is the primary focus of any occupational therapy session and is always present, but adding the therapy dog poses some unique challenges to that relationship. The presence of the dog can distract the child from interacting with the occupational therapist. For children who require extensive handling techniques, like Rachel, occupational therapists also experience challenges as they are forced to maneuver around a dog and handler.

For therapy to be the most effective, the occupational therapist needs to be comfortable directing the handler and dog to achieve positions that will best facilitate therapeutic interactions between the child and dog. In order for this to occur the occupational therapist needs to have an understanding of the unique characteristics of both dog and handler. Occupational therapists also

need to be able to conceptualize what positions and activities will best utilize both their unique clinical skills and the abilities of the dog. Based on the results of this study the researchers believe that planning and coordination between the occupational therapist and the dog and dog handler prior to the occupational therapy sessions will improve the occupational therapist's ability to optimize the therapist-dog/handler-client fit.

Differentiating activities that are enhanced by a dog from those in which the dog's presence adds no value or detracts from the treatment may also be an important role of the occupational therapist. In the current study, the researchers found it difficult to identify interactions between the dog and child where the skills of the dog were well suited to the treatment needs of the child. In this case, then, the area of overlap between dog and child was fairly small. The child had difficulty interacting with the dog because of her severe motor limitations and positioning them at eye level to facilitate interaction was challenging due to the size difference between the child and dog. Because of this the researchers came to the conclusion that determining which therapy activities best fit the strengths of the dog and the child prior to interventions may allow for better and smoother incorporation of the dog into the child's therapy sessions. The results of this study suggest that AAT may be most effective when the dog is only used for select activities where the fit of the dog, child, and therapist fall into the AAT therapeutic zone (see Figure 7). The use of AAT in a treatment session is not an all or nothing choice, the dog may be used for some activities and others may not include the dog at all.

Overall, the results suggest that AAT is at its best when all of the individuals involved in the therapy are collaborating together and therapy activities utilize the strengths of each individual. This occurs when the child is motivated by the dog, is able to interact with the dog without excessive effort, and when therapists can utilize both their own skills and the skills of the

dog. In this study, AAT seemed to be the most effective when Rachel was seated while interacting with the dog. The therapist was able to focus on handling the child while directing the dog handler to position the dog for best results. This allowed Rachel to more easily see and interact with the dog while being supported by the therapist.

### **Limitations**

Due to the nature of a single-subject design, the generalization of findings to other individuals is limited. The validity of these results may have been affected because Rachel was also attending other occupational, physical, and speech therapies throughout the study.

The primary limitation in the methodology of this study was the short duration of baseline and intervention phases. This resulted in a small number of data points, which ultimately impacted the ability to make definitive conclusions on the effectiveness of the AAT intervention. Additionally, the child's seizure between the first and second intervention sessions seemed to have impacted her performance in therapy during session two of the intervention phase, based on the return to baseline performance seen on the graphs. The child's performance was also potentially impacted by the irregular number of days between sessions and the variable times of day for each baseline and intervention session. Collectively, these factors may have impacted the outcome measures in important ways. Another factor was the occupational therapist's lack of experience incorporating an AAT team into therapy sessions and the therapy dog's limited experience working alongside a therapist in AAT. One final limitation in this study was the fact that the dog handler was a co-investigator in this study and thus potentially biased in favor of the dog, impacting her interpretation of the child's behavior during data collection.

### **Implications for Occupational Therapy**

The results of this pilot study, which are congruent with the literature, suggest that the

incorporation of a dog into the occupational therapy sessions of a child with CP could be an effective treatment modality, and could potentially increase the vocalization, motivation, and confidence of children. Because gains seen in this study were related to social engagement (vocalization and head control in sitting, which is necessary for eye contact and effective use of facial expressions), interventions may be more beneficial for individuals at a high enough functional level to be able to engage and interact with the dog without assistance.

For therapists who are interested in incorporating an AAT team into their sessions, results of this study suggest that developing a relationship between the therapist, handler, and dog prior to the introduction of the dog into the session may be important. Recommendations include providing the therapist and dog handler the opportunity to practice prior to treatment sessions, providing time for the therapist and the dog to become more familiar with one another, giving the therapist time to gain an understanding of what the dog is capable of doing, increasing time for the therapist and handler to communicate and clearly define roles, and designating time to decide on specific treatment activities for the child and dog in order to match the client's needs. Another option would be to have the therapist also be the dog handler to eliminate the inclusion of another person.

### **Future Research**

In order to advance the practice of AAT with dogs in the field of occupational therapy, specifically for children with CP, future research should have longer baseline and intervention phases with a possibility of doing an ABA design to gather more data and explore the effectiveness in more detail. Future researchers should also consider a longer time period between evaluation and the start of treatment, in order to train the therapy dog in skills specifically related to client(s) needs.

Because cognitive and functional limitations of the client impacted the range and variety of treatment activities for this study, it is also important to determine if there is a minimum age, cognitive level, or motor ability of a child with CP that is necessary in order to produce positive effects from an AAT intervention. Finally, future research should examine whether activities that provide the client with increased control of the animal result in better outcomes.

### **Conclusion**

Children with CP may benefit from the incorporation of a dog in occupational therapy sessions through AAT. In this study the AAT team was incorporated into all therapy activities. It was shown to be a successful addition for some therapeutic activities, but not all. Preliminary results, combined with previous research, suggest that AAT interventions with a dog may be effective to address skills such as vocalization or head control or to increase motivation to participate in therapy activities.

Another factor that appears to influence the effectiveness and outcomes of the treatment is the interactions among all of the individuals involved in a therapy session. When implementing AAT, one must consider the interactions of the therapist, child, and dog/handler and the overlap between each pair of these individuals in order to improve the AAT intervention. In addition, these interactions should influence the decision of when it would be most beneficial to incorporate the dog into activities and when it would be more beneficial to stay with traditional therapy activities.

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Appendix  
Semi-Structured Interview Plan

**Semi-Structured Interview Plan: Occupational Therapist -**

Introduction -

- Introduce interviewer
- Introduce topics that will be covered during the interview, which will include:
  - Experiences related to occupational therapy treatment with and without the dog present.
  - Experiences related to client behaviors and outcomes with and without the dog present.

Interview Topics and Possible Questions -

- Experiences related to occupational therapy treatment with and without the dog present.
  - What differences did you notice in treatment sessions between the traditional occupational therapy and the occupational therapy combined with AAT?
  - What effect do you think having the dog handler present had on treatment sessions?
  - Is there anything you would change about the occupational therapy sessions that incorporated the dog?
- Experiences related to client behaviors and outcomes with and without the dog present.
  - Do you feel treatment was more or less effective when the dog was present?
    - Why do you think it was [more or less] effective?
  - What changes in the child's behavior if any did you observe during the two intervention phases?

Conclusion

- Summarize comments to confirm understanding and ask for clarification of earlier comments if needed.
- Is there anything that you would like to add that we did not address during this interview?

**Semi-Structured Interview Plan: Parent or Guardian -**

## Introduction -

- Introduce interviewer
- Introduce topics that will be covered during the interview, which will include:
  - Initial reactions related to AAT.
  - Perceived differences in child's behavior and abilities at home, school or in the community.

## Interview Topics and Possible Questions -

- Initial reactions related to AAT.
  - What did you think about the idea of incorporating a dog into your child's therapy through AAT when you first heard about it?
    - What are your thoughts about it now?
  - What effect did you think the dog would have on your child's participation in therapy?
    - Did you see that effect?
  - If the option for animal-assisted therapy with a dog were available to your child in the future, would you enroll him [her]?
- Perceived differences in child's behavior and abilities at home or in the community.
  - What changes, if any, did you observe in your child's behavior and/or abilities at home, school or in the community during the first week of treatment?
    - During the second?
  - What, if anything, changed that you didn't expect?

## Conclusion

- Summarize comments to confirm understanding and ask for clarification of earlier comments if needed.
- Is there anything that you would like to add that we did not address during this interview?

Figures

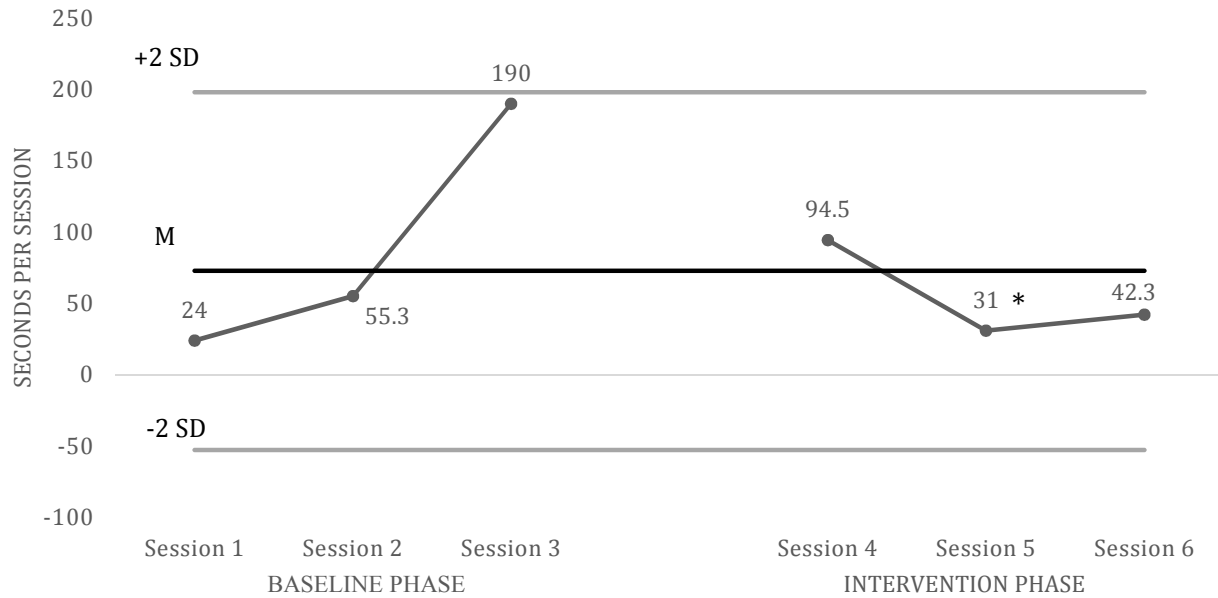


Figure 1. Head held at midline, prone, seconds per session  
 \* See notes on confounding factors durring session two of the intervention.



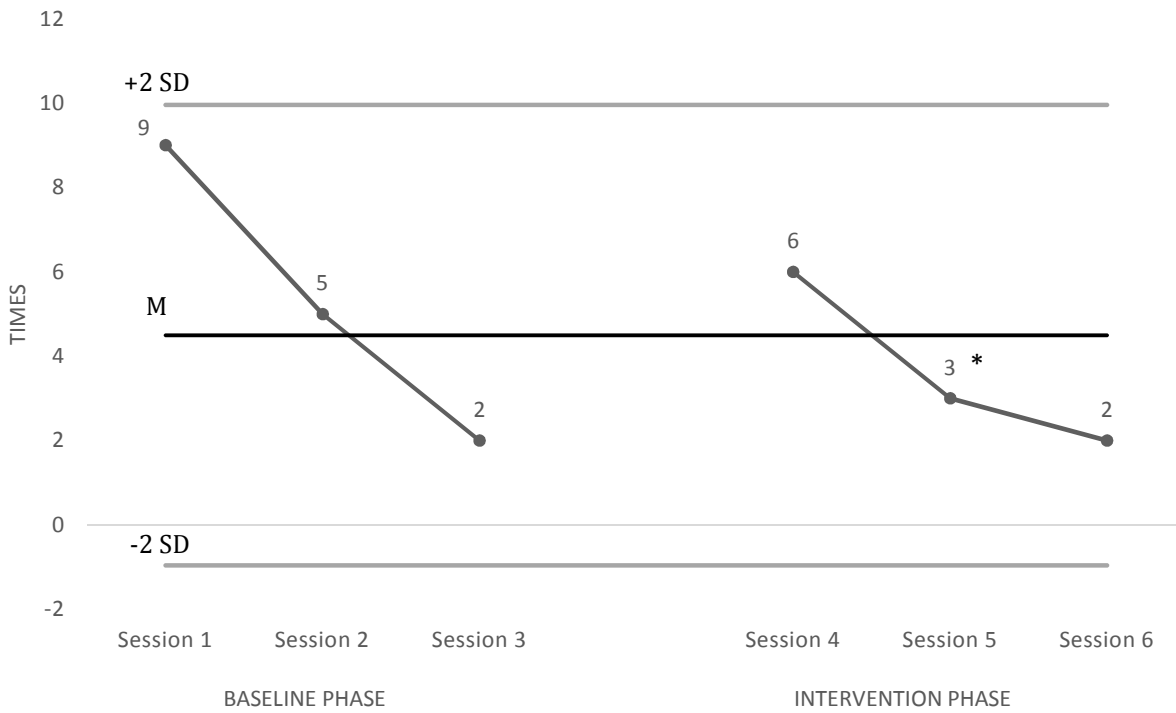


Figure 2. Hand open past 90 degrees, times per session

\* See notes on confounding factors during session two of the intervention.

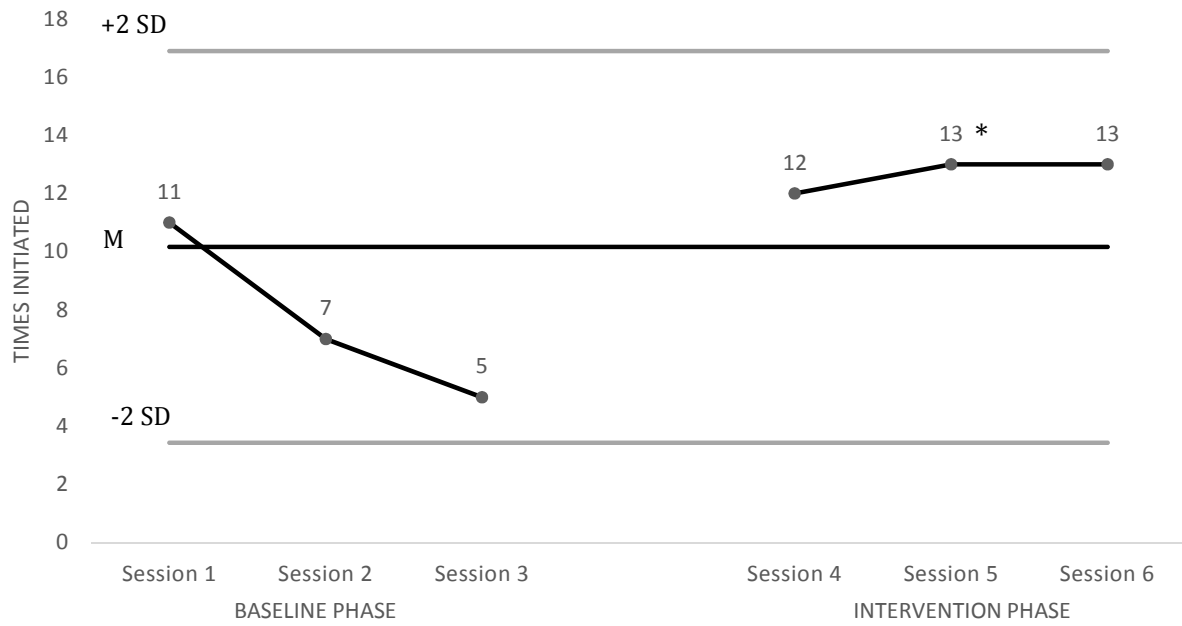


Figure 3. Voluntary arm movement initiated, times per session  
 \* See notes on confounding factors during session two of the intervention.

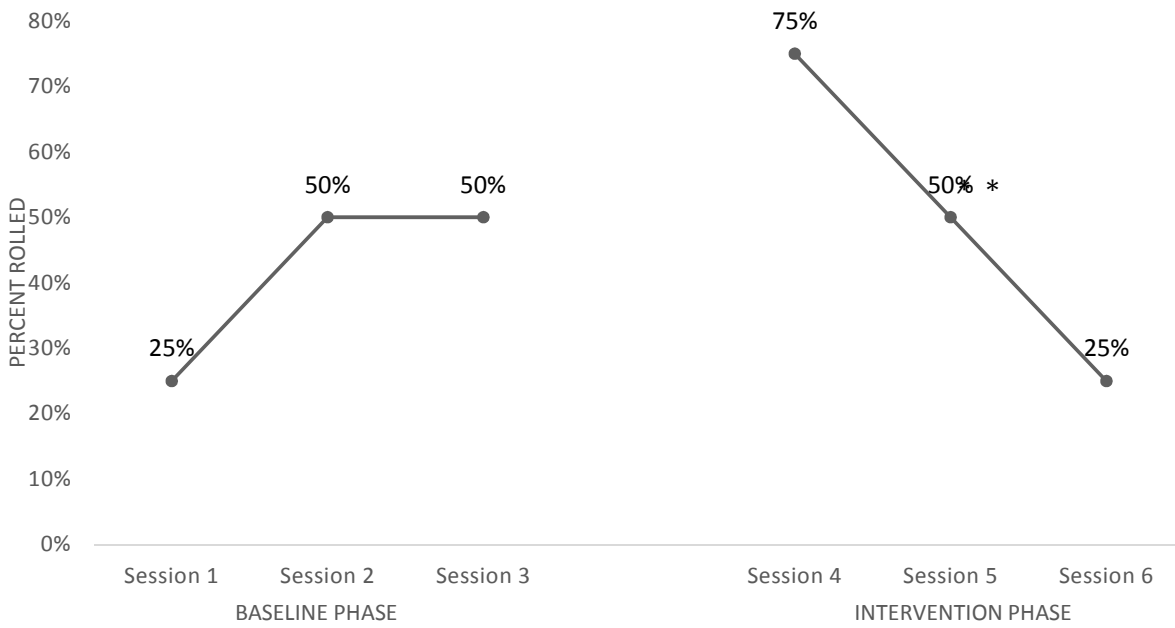


Figure 4. Greatest percent rolled per session

\* See notes on confounding factors during session two of the intervention.

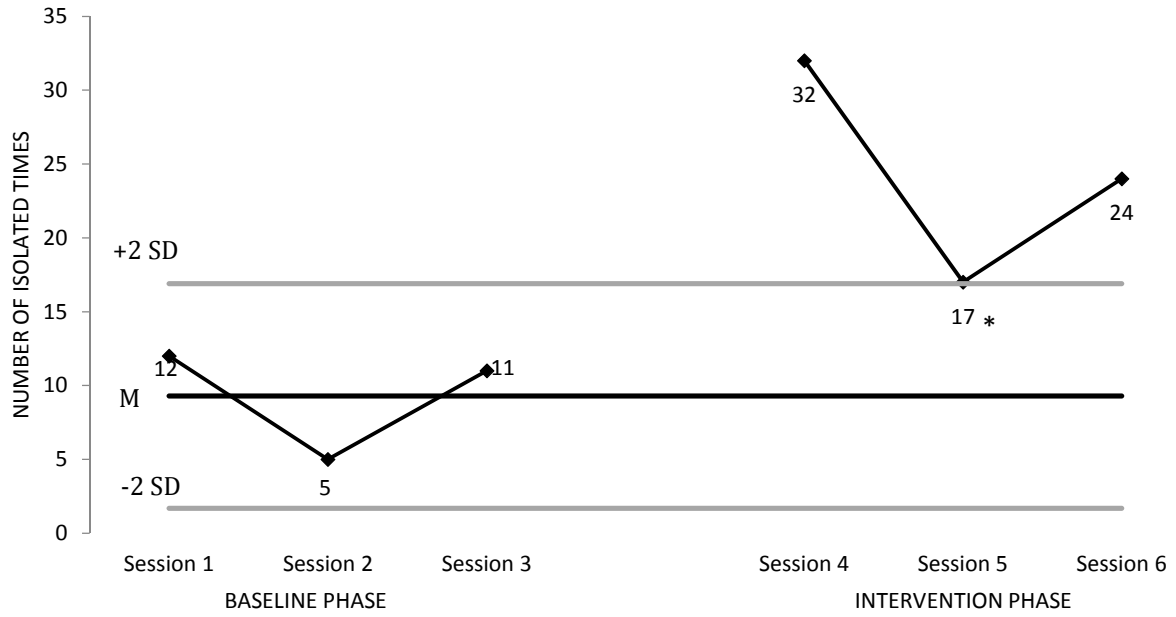


Figure 5. Isolated vocalizations by session.

\* See notes on confounding factors during session two of the intervention.

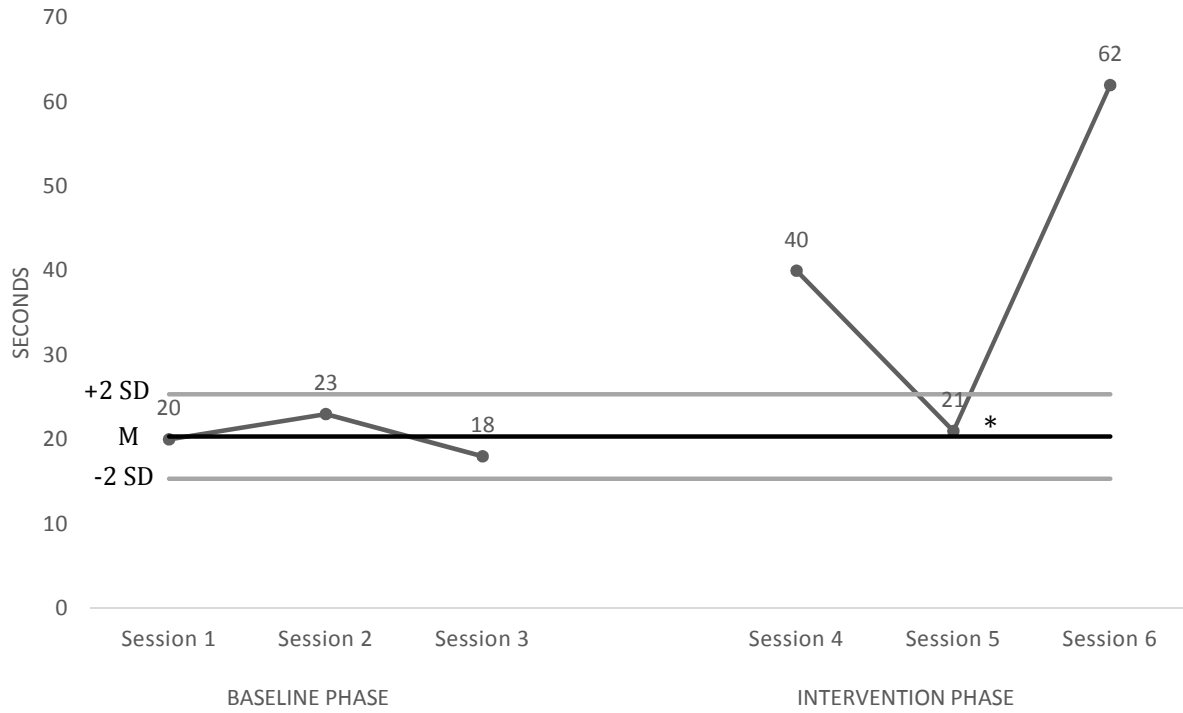


Figure 6. Head held at midline, seated, seconds per session  
 \* See notes on confounding factors during session two of the intervention.

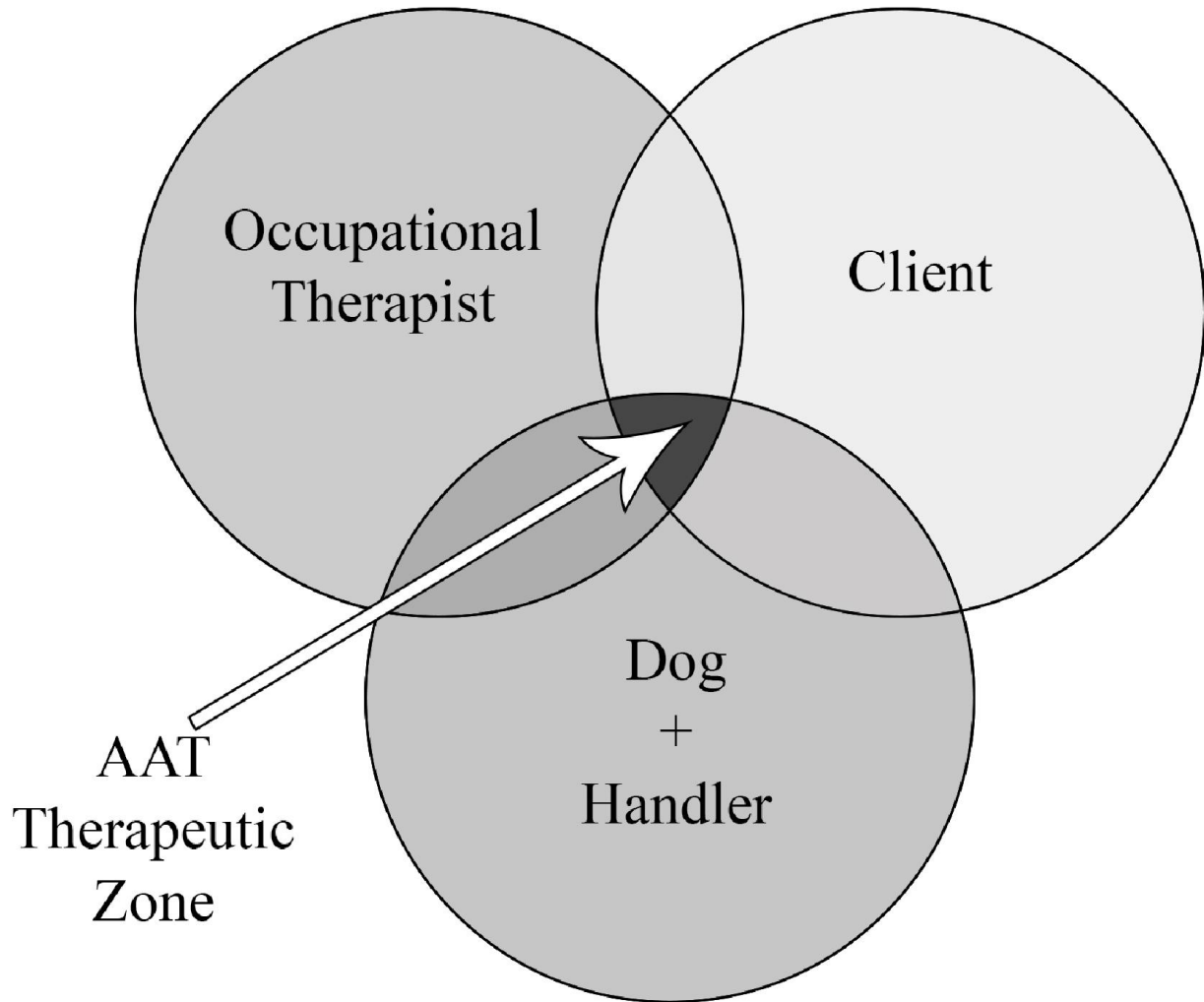


Figure 7. AAT Relationships Venn Diagram

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