An Animal-Assisted Intervention with College Students with Asperger’s Syndrome

By

Suzanne Elizabeth Engel

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Advisor: Jana G. Atlas, PhD.

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AN ANIMAL ASSISTED INTERVENTION WITH COLLEGE STUDENTS WITH ASPERGER’S SYNDROME

BY

SUZANNE ELIZABETH ENGEL

Geneseo State University, B.S. (2003)
Alfred University, M.A. (2007)

APPROVED BY

Jana G. Atlas, Ph.D.
Committee Chairperson

Ellen Faherty, Psy.D.
Committee Member

Edward Gaughan, Ph.D.
Committee Member

Terry Taggart, Psy.D.
Committee Member

ACCEPTED BY

Nancy Evangelista, Ph.D.
Chairperson, Division of Counseling and School Psychology

Nancy Evangelista, Ph.D.
Associate Provost and Director of Graduate Studies

William Hall, Ph.D.
Provost & Vice President for Academic Affairs
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Animal-assisted intervention (AAI), an intervention that uses a therapy animal to assist an individual in reaching his or her goals, has received little attention in the research literature. What is available is anecdotal in nature, with few available studies that use adequate controls and well-defined populations. Given the unique social needs of college students with Asperger’s syndrome (AS), AAI may be an effective intervention for this population. A multiple-baseline design was used to evaluate the effectiveness of an AAI with college students with AS. The consultation sessions students attended were recorded and the occurrence of operationally-defined behaviors, including the attention the student paid toward the consultant, the attention he or she paid toward the therapy dog, repetitive behaviors, and appropriate verbalizations, were coded. While the participants did not decrease repetitive behaviors nor increase their attention toward the consultant or appropriate verbalizations during the AAI sessions, the students had better attendance when the therapy dog was scheduled and reported enjoying having the dog present in the sessions. This is the first known study to evaluate an AAI with college students with AS using scientific control and rigor.
Introduction

An animal-assisted intervention (AAI) is defined as “any intervention that intentionally includes or incorporates animals as a part of a therapeutic or ameliorative process or milieu.” The goal of any AAI is to affect the participant’s life in a positive manner. AAI encompass a variety of interventions, including animal-assisted activities, equine-facilitated programs, and animal-assisted therapy, but they do not include the use of the use of guide, assistance and service animals (Kruger & Serpell, 2006, p. 25).

One type of AAI is animal-assisted therapy (AAT), a therapeutic intervention that incorporates an animal as a primary component of the treatment in order to assist clients in reaching their goals. AAT “utilizes the human/animal bond in goal-directed interventions as an integral part of the treatment process” (Gammonley et al., 1997, introduction). It is the process by which a credentialed therapist integrates an animal into his or her therapy approach to set goals for the client and measure progress towards these goals. The therapist also guides the client-animal interactions and evaluates the therapy process. The animals and handlers involved in AAT are expected to go through training and are required to adhere to set standards (Delta Society, 1996). The Delta Society was developed to disseminate research as to how to effectively implement AAT and has grown to develop a manual that outlines the necessary processes for developing an AAT program, the Standards of Practice for Animal-Assisted Activities and Therapy, and has also developed a curriculum for training dog handlers (2007).

In 1965, Boris Levinson wrote, “I would like to point out that the use of animals in the treatment of human beings is not new” (p. 695). Throughout history, animals have played a significant role in humans’ lives, with the benefits of animals in therapy emerging through anecdotal research. Using animals as therapeutic adjuncts is one way in which to improve
societal mental health needs (Levinson, 1970). AAI has been demonstrated to be effective in developing the therapist-client relationship, as well as increasing motivation and participation in therapy among participants. Furthermore, AAI has been used to provide medical benefits for individuals, such as decreased blood pressure and heart rate (Wilson & Barker, 2003). Participation in AAI has also been shown to be useful in creating a social support network for individuals and providing an avenue for individuals to interact with others (Kruger & Serpell, 2006). However, the majority of the literature regarding AAI is qualitative, lacks empirical validity, and fails to examine the effects animals have on the therapeutic process or behaviors of individuals (Wilson, 1991). Also, since many studies and programs do not strictly adhere to the definition of AAT, the term AAI is more inclusive regarding the use of the therapy animal to positively impact the participant’s life.

**College Students**

Many students find entry into college to be extremely stressful and only 53% of students entering a four-year college or university receive a degree within five years. Further, 24% of college students will leave higher education without earning a degree (Wirt et al., 2004). In particular, first year students tend to have a higher attrition rate, with approximately 18% dropping out and transferring to another institution and 13% not enrolling in another educational institution (Berkner & Choy, 2008).

College students with disabilities confront additional difficulties and stressors when entering college. Under the Americans with Disabilities Act, institutions of higher education must provide supports that assist the student academically, as well as ensure that they are not excluded from participating in programs or activities that are provided by the university. Students with disabilities must advocate for themselves and locate additional supports when
transitioning to college. Specifically, individuals with Asperger’s syndrome face unique difficulties which need to be addressed individually by the college (Glennon, 2001).

Asperger’s syndrome is on the spectrum of autism disorders, and is often considered a highly functioning autism disorder. Individuals with Asperger’s syndrome, originally defined by Dr. Hans Asperger in 1944, exhibit difficulty with social situations, unusual patterns of language and communication abilities, repetitive motor behaviors, and may have sensitivity to sensory stimuli (Attwood, 2007). These students are confronted with unique challenges and often benefit from additional accommodations, extending beyond those provided for most college students with disabilities (Thierfeld-Brown & Wolf, 2007).

A therapy animal may be used as an accommodation that assists college students with AS. Currently, therapy animals have been found to be useful for those clients who “might be discouraged, unmotivated, resistant, or defiant, or who have poor self-insight, deficits in social skills, or barriers to developing relationships” (Chandler, 2005, p. 13). Given the developmental level of college students, they may possess a number of these characteristics and therefore benefit from the use of therapy animals. Further, therapy animals can be used to develop relationships, form attachments, provide socialization, and decrease anxiety and stress which may also be a benefit to some college students (Delta Society, 1996). The use of therapy animals may assist college students with Asperger’s syndrome in better understanding social cues, due to the simple social signals provided by the animals, which may aid in the increased understanding of other social interactions (McNicholas & Collis, 2006).

Many individuals who discover the usefulness of animals as therapeutic agents happen upon it by chance, usually through the introduction of an animal and an observation of the positive results obtained (Levinson, 1965). This is the case for this author, who owned a small
dog as a pet and on a stormy day brought the dog to work with her. The dog was sleeping on a chair when a client walked in. The dog raised his head, jumped off the chair, and approached the client with a wagging tail. The client, who had Asperger’s syndrome, saw the dog and bent down to touch it. This particular client had little spontaneous speech and often did not engage in conversation with the author, but when the client saw the dog, he began to tell a humorous story about his childhood dog; this was completely uncharacteristic of the client. The positive changes in the client’s behavior noted by the author are similar to the anecdotal evidence reported in the literature that documents the efficacy of AAI.

As stated above, the majority of “research” in AAI is anecdotal and lacks empirically-based studies (Chandler, 2005). There are “relatively few substantive studies” on AAI (Beck & Katcher, 1984, p. 414) and most of the research consists of case studies. The majority of studies which are designed to test hypotheses focus on the effects animals have on health and fail to examine more psychological or behavioral therapeutic effects of animals. For example, the presence of animals in therapy has been found to be beneficial to an individual’s health by reducing blood pressure and anxiety (Wilson, 1987, 1991). Unfortunately, the studies which are experimental in nature do not always find the significant therapeutic effects that are reported through case studies (Beck & Katcher, 1984; Chandler, 2005).

While the case studies that have been published have been useful for increasing interest in and illustrating the use of AAI, there is a need for more empirical research into the therapeutic benefits of animals (Wilson & Barker, 2003). More controlled research that expands on clinical findings is thus necessary in order to propel the field of AAI forward (All & Loving, 1999; Chandler, 2005). This can be accomplished by conducting sound empirical studies with adequate controls and well-defined populations being studied. It is also necessary to study more intensely
whether the positive effects of AAI generalize into other contexts and are maintained through time (Kruger & Serpell, 2006).

One hindrance to studies of AAI is the lack of measurement tools which are standardized to indicate change over short time periods (All & Loving, 1999). One way in which researchers have overcome this problem is by using videotaping in order to measure behaviors. For example, Friedmann, Katcher, Thomas, Lynch and Messent (1983) counted the number of responses to verbalizations in order to determine if a therapy animal affected a child’s cardiovascular or heart rate responses. Similarly, Draper, Gerber, and Layng (1990) measured affect (appropriate or inappropriate); communication (inappropriate or appropriate); and movement (approach or avoidance) based on videotapes of AAT sessions. Furthermore, in a study done by Martin and Farnum (2002), children with pervasive developmental disorders were videotaped and their behavior and verbal interactions were coded. Among the areas coded were number of occurrences and duration of interactions. Thus, the available previous research has successfully used the coding of videotaped behaviors in order to measure changes in the behaviors over brief intervals of time.

In summary, there seem to be few empirical studies with adequate scientific control and rigor that examine the effectiveness of AAT or AAI, especially with populations who experience social difficulties, such as individuals with pervasive developmental disabilities and more specifically Asperger’s syndrome. Further, the use of a therapy dog to increase social interactions between an individual and a therapist has received little research interest. Empirical evidence as to how individuals with Asperger’s syndrome adjust and succeed within the college setting is also limited.
Current Study

The current study was a multiple-baseline design that examined the behaviors of college students during an animal-assisted intervention. The present study was based on the available research on the use of therapy animals with individuals with pervasive developmental disorders done by Redefer and Goodman (1989) and Martin and Farnum (2002). The research done by Redefer and Goodman (1989) found children with pervasive developmental disorders in their study engaged in fewer repetitive behaviors and increased their social interactions with a strong interventionist approach by the therapist. Additionally, the current study aimed to expand on the research done by Martin and Farnum (2002) that compared the interactions of children with pervasive developmental disabilities in three experimental conditions - with the presence of a ball, stuffed dog, and live dog. The children in their study engaged more with the live dog than with the other objects. The current study looks at using a therapy animal in a clinical as opposed to experimental setting and compares the interactions of the participants when the therapy dog was present to sessions where he was not.

The current study sought to add to the existing body of research by examining the effects of using a certified therapy dog in an intervention with college students with disabilities. More specifically, the researcher examined whether the use of a therapy animal increased specific positive behaviors while decreasing negative behaviors exhibited by college students with Asperger’s syndrome (AS). The goal of this study was to examine the interaction between the therapy animal and college student with AS using a non-directive therapeutic approach.

It was hypothesized that with the presence of the therapy dog during sessions, college students with AS would increase positive behaviors, including increased verbalizations and
looking towards the consultant, while decreasing negative behaviors, such as repetitive hand
movements, during academic consultation sessions.

More specifically, based on previous AAI research the study attempted to confirm the
following hypotheses:

1. Participants will attend more sessions when the therapy dog is scheduled to be present
   and the session lengths will increase when the dog is present.
2. Participants will engage in fewer repetitive behaviors when the therapy dog is
   present.
3. Participants will partake in more appropriate verbalizations when the therapy dog is
   present.
4. Participants will pay greater attention toward the therapy dog as opposed to the
   consultant, when the therapy dog is present.
Chapter Two

Literature Review

The following literature review explores the historical significance and use of animals for therapeutic purposes. Animal-assisted intervention and therapy are defined and the physical and psychotherapeutic uses of animals are presented. Further, the rationales and potential benefits for the use of AAI/AAT are provided. A brief overview of Asperger’s syndrome as well as the services provided for individuals with Asperger’s follows. Finally, the justification for more studies with individuals with Asperger’s syndrome using therapy animals is made.

Historical Background

Animals have been valued in the lives of people for many centuries. Given the prehistoric cave drawings which depict men sitting around a fire with wolves and the ritual of burying cats with Egyptian rulers (Connor & Miller, 2000), as well as myths and fairy tales that portray animal behaviors in order to communicate the beliefs of people (Levinson, 1978), it is evident that animals have held an important role in the lives of many individuals. The first documented case of animal-assisted therapy occurred in the ninth century A.D. in Gheel, Belgium. Handicapped individuals were allowed to participate in therapy in a family-type setting which included a variety of animals. Anecdotal evidence from this center was seminal in supporting the use of animals in other therapy settings (Boucher & Will, 1992).

With an increased recognition of the value of animals in humans’ lives, a more compassionate view of animals arose at the end of the 17th century (Serpell, 2006). Additionally, during this time, John Locke encouraged the use of animals for developing responsibility and empathy in children (Locke, 1895). This notion of kindness towards animals as well as their usefulness in fostering important life skills for children brought about an increased number of people owning pets (Serpell, 2006).
With the increase in pet ownership also came an increase in animals within other settings. Mental institutions began to incorporate animals for therapeutic purposes late in the 18th century. Epileptics living in a home in Bielefeld, Germany used animals as a component of their therapy program. The benefits of this program have been recognized since 1867 (Boucher & Will, 1992). Unfortunately, despite the apparent benefit of companion animals and growth in the use of animals in therapy, concerns about health and disease eliminated animals from a majority of institutions in the early 20th century (Serpell, 2006).

This decrease in the use of animals in institutions contributed to a lack of quantitative research regarding the value of animals in therapy programs. Furthermore, data that was available regarding the effectiveness of using animals in therapy was mostly qualitative (Boucher & Will, 1992). For example, Levinson (1965) wrote of a client who had difficulty with other therapies, but became engaged with his dog, Jingles. Levinson credits the rapport he developed with the client, as well as the ability to help him with his problems, to the assistance of Jingles in his therapy sessions. Given his success with Jingles, Boris Levinson pushed to gain more quantitative research as to the effectiveness of AAT (Boucher & Will, 1992).

Definitions of Animal-Assisted Interventions

Animals have been used in a variety of settings and may include a trained service dog or the animal of a therapist, client, or volunteer. The use of these animals in therapeutic activities has many different names, including Animal-Facilitated Therapy, Animal-Assisted Therapy, Animal-Assisted Counseling, or Animal-Assisted Interventions. Despite the many names given to the partnership between animals and therapists, it is an intervention that assists the client in improving with the use of empathetic, motivating treatment. These interventions also encompass physical or mental health services that deliberately use the interactions between the therapy
animal and the client, along with the unique characteristics and personality of the animal, to promote change (Chandler, 2005).

More specifically, therapy with animals can be defined as the “use of animals to assist in the care, rehabilitation and treatment of a variety of human conditions, including physical and emotional problems” (Boucher & Will, 1992, p. 11). The Delta Society (1996) further defines AAT as a process in which an animal plays a vital role in assisting the client in reaching goals through the guidance of a qualified professional, a licensed healthcare or human service provider. They distinguish AAT from Animal-Assisted Activities (AAA), which are usually implemented through milieu therapy. Examples of the latter include bringing animals to nursing homes or to a school, with no goals or objectives other than to brighten the day of the individuals coming into contact with the animal (Brickel, 1986). AAI may be used in a variety of settings, some of which include “critical and acute care, rehabilitation, hospice, long-term care, children’s advocacy centers, psychotherapy, social work, and prisons” (Connor & Miller, 2000, p. 21). While all of these settings may incorporate AAT into treatment, some settings may solely implement AAA or AAI (Brickel, 1986).

In contrast to AAA, AAT is a more structured and goal-oriented approach (All & Loving, 1999). In AAT, a therapist is involved and sets goals for the client, incorporates the therapeutic animal into reaching these goals, measures the progress towards these goals, and evaluates the program used to reach the goals. This is unique and separate from AAA due to its focus on goals and objectives and the presence of a qualified professional to assist in the process of reaching defined goals through objectives (Chandler, 2005; Delta Society, 1996). Some goals of therapy may include increasing communication, developing trust, improving motivation, reducing stress
and anxiety, improving self-esteem and self-worth, and improving the ability to express feelings (Connor & Miller, 2000; Gammonley et al., 1997).

In AAT, the animal is typically considered to be a therapeutic adjunct. A variety of animals have been used in AAT including dogs, cats, and horses. Less commonly used therapy animals are rabbits, birds, fish, and hamsters (Chandler, 2001). While the relationship formed between the client and the therapist remains the most important aspect of the therapy, the relationship formed between the client and animal is also considered to be therapeutic. The animal-client relationship provides the client a source of touch, affection, and an avenue for conversation to assist in reaching established goals, while also allowing the individual to feel more comfortable and accepted in the therapy sessions (Levinson, 1984).

Physical and Psychotherapeutic Uses of Animals

Given the variety of animals used, locations where animal therapy is conducted, and the methods employed when implementing AAI, it is difficult to test or define one model of AAI (McCulloch, 1986). For example, in order to assist an individual in increasing their physical abilities, animals may be incorporated into physical rehabilitation programs. When this happens, the individual going through rehabilitation may participate in the care of animals, such as walking, feeding, or brushing, in order to work fine and gross motor muscles. A way in which to use AAT to address an individual’s social, emotional, or cognitive functioning, is through using the animal in psychotherapy. An animal may be used by a psychotherapist for a variety of therapeutic reasons. These include connecting the therapist and client, increasing social interactions and client responses, and providing a consistent source of physical touch to soothe the client (Brickel, 1986).
**Animal-Assisted Therapy Intervention**

While there is currently no standard protocol for performing AAT, Chandler (2005) outlines an initial individual session in her book, *Animal-Assisted Therapy in Counseling*. It is recommended that the client first be introduced to the therapy animal in an open area, before entering the therapy room. This introductory period allows the client and animal to have time and space to become comfortable. When the client is comfortable, it is then appropriate for the therapist to proceed to the therapy room with the client and therapy animal. When first introduced to the animal, the client is given the direction that he or she may begin petting or playing with it at any point during the session. If a therapist is more directive, he or she may allot time during the session for the client to become involved with the animal through activities such as holding, petting, throwing a ball, or having the animal perform tricks.

During the session, it is recommended that the therapist interacts with the animal if the animal initiates contact with the therapist. This is thought to create a more trusting relationship between the therapist and client, as well as encourage interaction between the client and the therapy animal. Throughout the session, using counseling techniques such as summarizing, reflecting, paraphrasing, metaphors, and clarifying are effective at highlighting the interactions and behaviors of the client and the therapy animal. The therapist may also address the client’s feelings by using questions that are framed from the perspective of the therapy animal, such as reflecting on the client’s mood and how the therapy animal is responding to the client’s demeanor. The therapist might also have the client focus on the animal’s behaviors to describe the emotional state the animal may be experiencing. For example, the therapist might mention the way the animal is acting or behaviors it is exhibiting and attribute those to its mood.
While some therapists use more non-directive counseling techniques and activities during the AAT sessions, more structured activities can also be employed. A more structured activity may include having the client compare dogs of different breeds to him or herself and describe similarities between them. These techniques may be beneficial in helping clients to understand more about themselves. Since the therapy animal is considered an adjunct to the therapist, it is ultimately the therapist who determines how to fit the animal into the counseling session in order to facilitate the client’s progress toward his or her goals (Chandler, 2005).

Rationales for the Use of AAI

Theories as to the benefits of animals in the therapy process are numerous, with the majority of the early theories being rooted in the psychoanalytic orientation (Brickel, 1986). One belief as to the therapy animal’s role is to connect the individual with nature (Levinson, 1984). Another belief is simply that the animal brings unique characteristics to the session. Thus the behaviors elicited by the therapy animal provide benefits which would be difficult to obtain if the animal were absent. Animals have also been found to have a calming effect, and when used in therapy may be useful in reducing anxiety for the client (Chandler, 2001; Kruger & Serpell, 2006). Another role for the animal is as a means of social support for the client (Levinson, 1984). That is, a therapy animal may be a vehicle for social interactions by promoting conversations with others. In addition to these theories, there are several other theories that focus on the bond that is formed between client and therapy animal (Brickel, 1986).

Levinson (1984) outlines such a theory, which he called the human-companion animal therapy (H/C-AT). According to this theory, attachment formation and touch are the two characteristics that work either together or separately in order to create a relationship between the human and animal. The formation of an attachment with a specific animal eventually leads to
companionship with other animals. Furthermore, this attachment generalizes into the development of sound human relationships. With children in therapy, a large focus is often on the need to develop a relationship with caregivers and others as the child develops. It is also important to help adolescents and adults in therapy develop these attachments, if they have not already formed. The touch aspect of this theory posits that children are stimulated by touch. Feelings of love and security are elicited as a response to touch, which aids in reducing tension and increasing relaxation. Most relationships between a therapist and client are conversational and leave out this important element of touch. Introducing an animal into therapy creates an avenue for touch to occur in an appropriate and unconditional manner, which creates a more relaxed therapeutic environment. In conclusion, the H/C-AT puts forward that positive changes and increased emotional well-being can be brought about when a companion animal is introduced into a person’s life, through the formation of attachment and touch.

Another related theory that examines the psychological attachment between an individual and animal is referred to as the human-animal bond (Banman, 1995). This human-animal bond can be considered the unique bond that one develops with an animal, which may be due to its ability to provide unconditional care and acceptance. This bond is thought to contribute to the positive benefits that result from having a therapy animal in a session (Dossey, 1997).

Coming from a very different approach, Brickel (1982) hypothesized that learning theory is a basis for the changes due to AAT. When individuals face an anxiety-provoking situation, they often avoid it. In order to extinguish the anxiety, a competing response must be presented with no adverse stimuli. In therapy, positive interactions with the animal can be the competing response in order to create an attention shift for the client. This allows the client to be exposed to the originally anxiety-provoking stimuli with no adverse stimuli following. Eventually this may
lead to extinction or diminished anxiety for the client. Therefore, the therapy animal becomes a
distraction and gives the individual a way to avoid a stressful situation until the anxiety is
diminished enough for the individual to cope with the situation. Thus in AAT, when a therapist
asks a client about a difficult topic that the individual is not yet prepared to talk about, the client
may use the therapy animal as a distraction until his or her anxiety diminishes and he or she is
ready to discuss the topic.

Another learning theory approach to AAT uses animals to teach appropriate behaviors,
such as responsibility or specific skills. For example, the client may be responsible for grooming
the animal. This can help the client learn the appropriate skills for caring for an animal, develop
responsibility, and increase self-efficacy when these skills are acquired. The theory behind this
approach suggests that the relationship with the animal leads to changes in cognitions and
behaviors among clients. For example, using the social process to develop a role for the client as
a caregiver for the animal may lead the client to develop positive behaviors in order to meet the
demands of the caregiver role (Kruger & Serpell, 2006).

As seen above, there are many reasons why therapists choose to use AAT in their
sessions. Some do so just to provide a connection for the individual with nature (Levinson,
1984), while other therapists are interested in using the unique characteristics that animals bring
to the session in their work (Chandler, 2005). The majority of research and interest in using
therapy animals revolves around developing the human-companion animal bond (Dossey, 1997)
and promoting specific behaviors by learning them first with a therapy animal (Kruger & Serpell,
2006).
Potential Benefits of AAI

The use of a therapy animal in sessions provides many potential benefits, including creating a more therapeutic climate for the client. One hypothesis is that the unconditional acceptance and ability to provide comfort, enjoyment, and entertainment by the therapy animal may facilitate a more trusting relationship with the therapist, and thus create a less threatening therapy environment. When the client is able to form a strong relationship with the therapy animal, it may also serve to facilitate a closer relationship between the client and the therapist (Chandler, 2005). In addition, animals have been noted to create a positive perception of individuals who are in the presence of an animal (Kruger & Serpell, 2006). When working with children, the animal may allow the child to become more readily involved in the therapeutic process by dismissing the initial reserve he or she may be feeling. Furthermore, the parent of a child who is beginning therapy may be comforted by the use of the therapy animal and feel less threatened as to the therapist’s relationship with their child (Levinson, 1965).

In support of this, Corson, Corson, Gwynne, and Arnold (1975) found that clients working with dogs were more open with the therapist. Even though it was hypothesized that the client may ignore the therapist in favor of the dog, this did not occur. When first introduced to the therapy dog, the clients did show more interest in the dog, but the dog actually served as a vehicle for developing social interactions between the client and the therapist. It was hypothesized by the researchers that once the relationship formed between the client and therapy animal, social interactions with others would also increase.

The therapy animal may facilitate a bond with the client, which allows the therapy animal to serve as a transitional object for the client. Winnicott (1951, cited in Kruger and Serpell, 2006, p. 30), defined a transitional object as “an item or object, such as a blanket or soft toy, that serves
a comforting function for a child and helps alleviate the normal developmental stress of separation from the primary caregiver.” This is thought to occur by reducing the tension in the early stages of therapy when the client and therapist have not yet established rapport (Kruger & Serpell, 2006). Furthermore, an animal can act as a transitional object for withdrawn or isolated individuals in an effort to increase communication and increase interactions with others (Barba, 1995). The therapy animal is perhaps the best transitional object based on the unconditional care and physical contact the animal provides (Chandler, 2005).

The Corson et al. (1975) study found that clients who participated in animal-assisted therapy became more independent and responsible after the introduction of the dog into therapy. This is related to another suggested benefit of AAT -- increased self-esteem and self-worth. Levinson’s (1978) seminal work found that the way in which an individual cares for his or her animal reflects the way in which he or she interacts with others. This means that when individuals provide nourishment and compassion to an animal they increase their self-concept and self-esteem. A study by Law and Scott (1995) supported Levinson’s work. When an animal care program was implemented in schools and students were responsible for caring for a domestic animal, the researchers found an increase in students’ self-confidence and self-esteem.

Additionally, medical benefits resulting from the physical contact and comforting relationship with the therapy animal have been found (Chandler, 2005). Some researchers have indicated that AAI is beneficial in reducing anxiety (Brickel, 1982). In one study, petting an animal was found to be beneficial in alleviating stress and helping participants feel more accepted and understood (Hoelscher & Garfat, 1993). Individuals participating in Friedmann et al.’s (1983) study had decreased blood pressure and heart rate when they were with an animal. Similarly, Baun, Bergstrom, Langston, and Thomas (1983) found that individuals’ blood
pressure decreased when they pet an animal with which they had established a bond. This research suggests that when an individual is able to form a bond with a therapy animal, he or she may benefit from increased relaxation and decreased blood pressure. However, having a therapy animal present has not always been found to decrease physiological rates (Umbrell, 2004).

While there has been evidence of benefits to the therapeutic relationship between a therapist and client, increased self-esteem for the client, and decreased blood pressure, studies have shown that individuals participating in AAI had also increased attendance and motivation in therapy (Chandler, 2005; Poleshuck, 1997). For example, group participation, among clients in a psychiatric unit, was greater when AAT was offered to clients who typically did not engage in social interactions. This group therapy was beneficial for socially isolated individuals by providing them with assistance in creating social relationships (Holcomb & Meacham, 1989).

Importance of Social Support Interactions

Social Benefits. The health and well-being of individuals has been found to improve through the presence of social supports, and more specifically from forming social relationships (Kruger & Serpell, 2006). Various studies have been conducted which support the use of pets for social benefits. For example, pets have been found to be a significant part of a child’s social network and provide social relationships and support (McNicholas & Collis, 2001). Further, research indicates that pets increase occasions of social interactions and communication with neighbors (Wood, Giles-Corti, & Bulsara, 2005). Dog owners also engaged in more conversations about their dogs, initiated conversations with community members, and had significantly better health in comparison to those who did not own dogs, which may in part be attributed to the physical benefits associated with walking (Rogers, Hart, & Boltz, 2001).
Animals in therapy may assist clients in forming these social relationships, as well as in understanding social interactions and behaviors. There are two ways in which animals may provide this social support and thus increase clients’ social relationships. The first is by aiding them in the development of a close relationship with the animal and therapist, which can then be used as an example for other relationships. Another way the animal increases social support is by providing a model of how to interact with others. Animals may provide social cues and behaviors that assist individuals in understanding social interactions (Kruger & Serpell, 2006).

Development of Relationships. Individuals who have difficulty forming social relationships such as those who are shy, have a low self-esteem or poor communication skills may benefit from developing relationships with an animal (Burgon, 2003). Further, animals may be used to assist with social interactions, create relationships, and expand the social network for those individuals who have a disability, poor coping skills, trouble interacting in social situations, or are socially isolated (Barba, 1995).

Several studies have found that the introduction of a therapy dog may assist in facilitating social interactions. For adolescents with disabilities who may be seen by society as outcasts due to their maladaptive behaviors, the therapy animal may assist in improving the adolescent’s self-image by allowing others to see them as more socially acceptable (Poleshuck, 1997). The presence of a service dog has been found to facilitate social interactions for individuals with disabilities, such as increasing elicitation of greetings and smiles from people in familiar and unfamiliar settings (Mader, Hart & Bergin, 1989; McNicholas & Collis, 2000). Further, individuals with disabilities engaged in more conversations with others when they were accompanied by their dog (Eddy, Hart, & Boltz, 2001; Lane, McNicholas, & Collis, 1998), and had created new friendships as a result of ownership of a dog (Lane et al., 1998). Therefore, the
service dog may serve as a way to overcome rejection from others and increase social interactions (Eddy et al., 2001). The reduced levels of anxiety and arousal in clients in the presence of a therapy animal may assist the client in mediating social interactions with others and forming social supports (Kruger & Serpell, 2006).

The AAI literature has also indicated the use of therapy animals for expanding clients’ social networks. Beck (1985) found clients who initially created a relationship solely with the therapy animal eventually developed a relationship with the therapist and then with others, through the use of the therapy animal. In a study of eight children with learning disabilities and Down’s syndrome who were given seven minutes to interact with a real dog and equal time to interact with an imitation dog, researchers found that when the children interacted with the real dog they were more focused, attentive, and responsive in the session than when an imitation dog was present. They also directed their gaze at the dog longer than they did the other objects (i.e., adult, toys, or imitation dog). The children also engaged more with the therapist and the live dog than with the stuffed dog. The researchers hypothesize that the results, including increased interactions, were a result of the real dog’s lively and energetic characteristics (Limond, Bradshaw, & Cormack, 1997). Thus, dogs may elicit greater social interactions from children.

The development of social supports provides a protection and prevention approach which helps individuals cope with life stressors, especially when the individual is going through life crises or transitions (Cobb, 1976). Students entering college are going through a large transition and most likely do not have social supports in place prior to leaving home. Interacting with therapy animals may be one way to increase social relationships and support for college students (Chandler, 2005).
Learning Social Skills. The therapy animal may also serve as a vehicle for learning appropriate social skills. Interventions with the therapy animal that teach the client socially desirable skills which will be naturally reinforced and maintained after the intervention is over have been found to be beneficial. For instance, when a client works with a therapy animal they are able to use the animals’ behaviors and interactions in order to increase their ability to understand social exchanges (Kruger & Serpell, 2006). Additionally, the animal’s movements, sounds, and facial expressions may help to prepare a child to understand non-verbal cues exhibited by friends and relatives later in life (Levinson, 1978). Furthermore, the values of sincerity, compassion, and affection that appear to be exhibited by animals can be recognized and modeled by children after observing them in a therapy animal. Additional instruction that focuses on such things as the way animals and people communicate and behave can thus be used to further the child’s understanding of these values (Nebbe, 1991).

AAI can be seen as “one example of an innovative program that promotes growth by allowing participants to engage in prosocial behavior that may generalize to other settings” (Kogan, Granger, Fitchett, Helmer, & Young, 1999, p. 119). This has been supported through previous studies which have looked at the impact of exposure to a therapy animal on social behaviors. More prosocial behaviors (Marr et al., 2000) including increased communication and expression of emotions (Poleshuck, 1997), have been found among those who participated in AAT. More specifically, participants exhibited more positive verbal statements and fewer negative verbalizations through working with therapy animals. Further, the social skills learned while working with a therapy dog have generalized to other aspects of the participants’ lives (Granger, Kogan, Fitchett, & Helmer, 1998).
Asperger’s Syndrome

In 1945, Hans Asperger identified and documented cases of what came to be called Asperger’s syndrome. It wasn’t until 1994 that the American Psychiatric Association recognized Asperger’s syndrome in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) (Thierfeld-Brown & Wolf, 2007). According to the *Diagnostic and Statistical Manual of Mental Disorders-IV-TR* (American Psychiatric Association, 2000), the criteria for a diagnosis of Asperger’s syndrome (AS) are:

A. Qualitative impairment in social interaction, as manifested by at least two of the following:

1. marked impairment in the use of multiple nonverbal behaviors such as eye-to eye gaze, facial expression, body postures, and gestures to regulate social interaction
2. failure to develop peer relationships appropriate to developmental level
3. a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest to other people)
4. lack of social or emotional reciprocity

B. Restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:

1. encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity of focus
2. apparently inflexible adherence to specific, nonfunctional routines or rituals
3. stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)
4. persistent preoccupation with parts of objects

(American Psychiatric Association, 2000, p. 84).

Further, these individuals have not had significant delays in language, cognitive development, or adaptive behavior (American Psychiatric Association, 2000).

Given the relatively recent addition of AS to the DSM-IV-TR, there are only tentative estimates as to the prevalence of the disorder. One estimate, by Gillberg (2000), indicates that three to four out of every 1000 children are diagnosed with AS. Since precise data as to the prevalence of AS is not available for the population, it is difficult to estimate the number of college students with AS. This is especially difficult since it is only recently that individuals’ with AS have been attending college. Related, some students with AS who have or are currently attending college are not correctly diagnosed or have not been identified as students with AS (Bedrossian & Pennamon, 2007).

Individuals with AS may struggle when interacting with others due to their deficits in the areas of social, behavioral, academic, motor, and sensory skills (Griffin, Griffin, Fitch, Albera, & Gingras, 2006). Socially, these individuals usually have difficulty interacting with others, understanding other people’s thoughts, perspectives, and interpreting their behaviors (Thierfeld-Brown & Wolf, 2007). Additionally, they may not be aware of and therefore violate others’ personal space (Safran, 2002).

Another area in which individuals’ with AS have difficulty is understanding figurative language. More specifically, these individuals take what others are saying very literally and may not understand sarcasm, jokes, and metaphors. Understanding non-verbal behaviors is often quite difficult for these individuals as well, and they may not be able to read facial expressions or understand gestures (Thierfeld-Brown & Wolf, 2007). Individuals’ with AS commonly have
unusual speech patterns and difficulty regulating their voice volume and tone, causing them to speak in a robotic or monotone manner (Sarfran, 2002). Cognitively, these individuals often process details well, but have difficulty putting these details into a whole, integrating information from a variety of sources, and organizing and planning. Individuals with AS often engage in rigid and restricted behaviors and thought patterns, and have fine and gross motor problems, as well as sensitivity to sensory information. Further, research suggests that individuals with AS have higher levels of depression and anxiety than their non-disabled peers (Thierfeld-Brown & Wolf, 2007).

**Interventions for Students with Asperger’s Syndrome**

Due to the social difficulties students with AS face, assistance with interpersonal skills may be necessary in order for them to be successful outside of the classroom, on the college campus. To better understand social situations, students with AS may benefit from the use of social stories or comic strips. Social stories are visual representations of activities the student engages in, that are used to assist the student in better understanding the world around them (Sarfran, 2002). Colleges may even implement programs that teach explicit social skills, signals and norms for students with AS, even though this is not a legal requirement of colleges (Farrell, 2004).

**Services for College Students with Asperger’s Syndrome**

Frequently, college students who have AS face additional difficulties due to the impact of their disability on their academic performance. There are some programs that assist these students in the transition from high school to college by providing more intensive support. Still, the individual needs of students with AS are vastly different from one another, which makes it difficult for professionals to design encompassing interventions that would assist all students
(Farrell, 2004). When deciding what accommodations are necessary for students who have AS, it is important to recognize that there is not a one-size fits all model, and the students’ impairments, areas of difficulty, and the courses he or she is taking need to be taken into account (Thierfeld-Brown & Wolf, 2007). Students in college who have AS often need additional assistance with the social aspects of college, such as navigating social situations, working in groups, and meeting with professors. Support services provided at college typically fail to address these social problems (Sarfran, 2002).

To meet their individual needs, Dillon (2007) proposed a collaborative arrangement for working with college students with AS. This arrangement consists of the college working closely with outside agencies and mentors to provide the necessary level of support to create success. To implement this approach, the college may need to collaborate with other agencies in order to address the student’s clinical needs and provide support for the student while in college. Another avenue by which to address the student’s needs is to provide mentors to assist the student in developing skills in deficit areas. Mentors may help students with AS with group projects or when meeting with professors. Collaboration among the college, outside agency, and mentor may help to address the individual’s needs in relation to his or her courses and assignments, or to arrange for additional accommodations.

Before individuals with AS attend college, their schooling mainly occurs in the general education classroom with the additional support of a one-to-one aide, if necessary. Within the college classroom, professors may accommodate a student with AS by being aware of seating arrangements and having the student sit near a student who may understand his or her needs (Sarfran, 2002). It is also important for the professor to address and control the student’s behavior, keeping in mind that the disability does not excuse inappropriate behavior. Working
with the student to develop strategies to decrease inappropriate behaviors, as well as helping the student monitor and evaluate the attitudes and behaviors of other classmates, is important. Further, it is also important for the professor to help the student manage his or her sensory needs (Thierfeld-Brown & Wolf, 2007). For example, an individual with AS may have a reaction to sensory stimuli, such as sound or light, that other individuals in the class do not; providing a safe place outside of the classroom for the student to go would be beneficial in helping the student avoid disturbing noises and similar stimuli (Sarfran, 2002).

When students are working in groups, the professor may need to structure the group so that the student who has AS is a beneficial member of the group and the other group participants are understanding of the student’s needs. Also, the student may need assistance adhering to the group’s schedule, dividing tasks, and navigating the social aspects of the group process (Thierfeld-Brown & Wolf, 2007). The professor or a teaching assistant could be available in order to correctly interpret the individual’s behaviors and comments or to assist other students in better understanding the student (Sarfran, 2002).

Additional accommodations that may be beneficial for students with AS include providing instruction in a way in which the student may better understand, use of a word processor, testing accommodations, and longer time to work on projects (Sarfran, 2002; Thierfeld-Brown & Wolf, 2007). When students with AS are given exams, they may need assistance following the directions, staying focused on the test, and arranging the test in a separate location, with less distractions. Further, college writing assignments prove difficult for some students with AS and they may require extra assistance, such as using software that allows them to speak into the computer and generate the text as they do so. Also, giving presentations is difficult for students with AS and may need to be set up as one-on-one question and answer
sessions with the professor, videotaped, or made to a smaller group of students (Thierfeld-Brown & Wolf, 2007).

Another accommodation students may benefit from is additional instruction in time management (Farrell, 2004). Time management support would be beneficial for students who frequently are late, miss classes, or have difficulty judging the amount of time it may take to finish assignments (Dillon, 2007). In addition, care needs to be taken when determining residence housing, depending on whether the student may function better on his or her own or with a roommate (Safran, 2002). Also, the student may require help joining clubs or social activities to become involved with others (Thierfeld-Brown & Wolf, 2007).

Animal-Assisted Intervention with Individuals who have Asperger’s Syndrome

No research currently exists as to the benefits of therapy animals on the behaviors of college students with AS. Previous research studies have found a positive impact of a therapy dog with children with pervasive developmental disorders (Martin & Farnum, 2002; Redefer & Goodman, 1989) and more recent research has found a positive effect on the behavior of children with autism in the presence of a robotic dog that acts similar to a real dog (Stanton, Kahn, Severson, Ruckert, & Gill, 2008).

The study using animal-assisted therapy with children with autism done by Redefer and Goodman (1989) included three girls and nine boys, from five to 10 years of age. Three sessions of baseline data were collected in which the children and therapist engaged in play with the toys in the room and with each other, during their individual fifteen minute sessions. During the first six sessions of treatment, the therapist encouraged the child to engage with the therapy dog. The next six sessions consisted of the children participating in games and activities that involved the dog. The videotaped sessions were coded for isolation and social interactions. The results
indicated increased pro-social behaviors and decreased repetitive behaviors common to autism, such as hand-flapping, when the dog was introduced to the therapy sessions. The researchers in this study evaluated the participants’ socially appropriate behaviors after the study ended by repeating the baseline procedures for three sessions immediately following the end of the intervention and one month afterwards. They noted that the socially appropriate behaviors were maintained, compared to baseline, after the study ended. The researchers hypothesized that the therapy dog prepared the children to engage in social interactions and that the characteristics the therapy dog brought to the sessions allowed for increased socially appropriate behaviors.

The study conducted by Martin and Farnum (2002) was with 10 children, from ages three to 13, with pervasive developmental disabilities. The participants in their study spent 15 minutes per week with a nonsocial toy (ball), a stuffed dog, and a live dog in three separate sessions. The researchers recorded their sessions and coded the behaviors to determine the effect of the therapy animal on the children’s behaviors. They found that the children engaged in more hand flapping and for longer periods of time when the real dog was present compared to stuffed dog or ball. The children were also more likely to touch the ball and stuffed dog, and to do so for longer periods of time than the real dog. The children spent less time looking at the therapist when the dog was present, but they looked at the real dog more and for longer amounts of time than they looked at the ball or the stuffed dog. Further, when the real dog was present the children were more likely to laugh, focus on the dog, talk to the dog, and engage in conversation with the therapist regarding the dog. These conversations tended to be more focused, with relevant and meaningful content, and more two-sided than the clients’ typical conversations; however, the children answered questions with less detailed explanations in the real dog condition.
Stanton et al. (2008) conducted a study that compared the interactions of eleven children with autism, between the ages of five and 8, with two robotic dogs. One dog, AIBO, was able to perform social behaviors like real dogs, such as locating a ball and kicking or head butting it. Like a real dog, AIBO could perform socially responsive behaviors such as sitting, lying down, walking, and offering his paw. AIBO was able to indicate “pleasure” by lighting up green and “displeasure” by lighting up red after engaging in interactions. The other dog, Kasha, was a toy dog of similar size and shape to AIBO, was also able to engage in motor movement similar to a real dog such as walking and sitting, but did not respond to interactions from others or the environment. The researchers compared the children’s behaviors with AIBO to their behaviors with Kasha and found that the children spoke more words, engaged in an authentic way (i.e., the child’s body was oriented toward AIBO when requesting it to do something), and had more reciprocal interactions (i.e., trying to give the dog a biscuit) when AIBO was present.
Participants

Participants in this study were four undergraduate students from a four-year university in Western New York. Three of the four students participating in the study were diagnosed with Asperger’s syndrome by a professional prior to coming to college. The fourth student met the diagnostic criteria, as outlined by the *DSM-IV-TR* (2000), for a diagnosis of Asperger’s syndrome, as determined by the researcher, but had a primary diagnosis of Attention Deficit Hyperactivity Disorder. Specific participant characteristics are described in the Results section.

Office of Disability Services

The participants in this study were receiving services through an office of disability services, which provided services for students with a physical, learning, or psychological disability. Based on their particular needs, the participants were eligible for services such as exam accommodations, note-taking services, tutoring, and academic consultation. Academic consultation sessions consisted of the participants reviewing their assignments and academic concerns with a consultant who then assisted them in addressing their academic needs. The academic consultant in this study was a third year school psychology graduate student completing her doctoral coursework who was available to meet weekly, or more often, with the participants. Her role as an academic consultant was variable and dependent on the individual needs of the student, but included meeting with the student; keeping in contact with the student’s parents, professors, and university staff; assisting the student with his or her schedule and coursework; helping the student to remain organized; determining reasonable and appropriate accommodations; assisting in the delivery of services such as tutoring, note-taking, or exam accommodations; and aiding the student with problems that arose in regard to their educational
achievement. Sessions with the academic consultant were limited by school breaks, planning meetings that occurred at the beginning of the semester which differed from typical meetings, and exam weeks during the 16-week semester.

Apparatus

_Therapy dog_. Noah, a Labrador retriever, “worked” at the university where the study was being conducted. Noah qualified as a certified therapy dog under the regulations of the Delta Society’s standards for canine assistants. Noah was purchased from Susquehanna Service Dogs, a program of Keystone Children & Family Services, in 2003, at the age of 2, by funds provided by the family of a university student with AS. Susquehanna Service Dogs trains service dogs for children and adults with disabilities, balance dogs for individuals with physical disabilities, hearing dogs for individuals with hearing disabilities, companion dogs for children with autism, and therapy dogs which assist occupational or physical therapists, psychologists, or social workers who work with individuals with disabilities. Three faculty members of the school psychology department at the university in which the study was conducted attended a comprehensive, intensive training through Susquehanna Service Dogs. Yearly, Noah and the handlers return for a re-certification exam in order for Noah to maintain his certification and be able to work at the university. Noah is trained with basic obedience skills, exceptional manners, and can perform activities such as retrieving items, carrying objects and releasing them on demand, walking next to the therapist or client, and performing simple social interactions, such as giving the client or therapist his paw. In order to use Noah in consultation sessions, the researcher underwent training with one of Noah’s certified handlers. The researcher learned the commands that are used to have Noah perform the aforementioned tasks.
Video equipment. The academic consultant’s office was equipped with a video camera, to allow for recording of the sessions. The camera was a MACE Cam 47C which was wired to a combination TV/VCR. The TV was located in a separate room that allowed a handler to observe the sessions as they were occurring. The TV was also connected to a microphone mixer, the Shure SCM268.

Setting

The room in which the consultation occurred was set up in the same manner during baseline and intervention sessions (see Figure 1). The room was a large office in which there was a table with four chairs. Additionally, there was an upholstered chair in the corner of the room where one of the participants would sometimes sit during the sessions. This chair was closer to the floor and near the rug where Noah would lay.

The room was well lit by two windows, as well as a sun-desk lamp, a side-table lamp, and a three-branch lamp. Florescent lighting was not used during this study. Some research has suggested that under conditions of fluorescent lighting, children with autism may increase their engagement in repetitive, stereotyped behaviors (Coleman, Frankel, Ritvo, & Freeman, 1976; Fenton & Penney, 1985) and the auditory (faint "humming") and visual (rapid "flickering") properties of fluorescent lights may interact with the atypical neurophysiology of children with autism to create abnormal levels of arousal (Ott, 1976).

Measures

Pilot study. Currently, few measures are available for the measurement of the success of AAI or AAT (Chandler, 2005). One published form, The Animal Assisted Therapy – Psychosocial Session Form (AATPS), was created by Chandler (2005) to assess changes in the client from session to session. For purpose of a pilot study, a modified form of this assessment
was created by removing items that did not pertain to the therapy animal or college students with Asperger’s syndrome. However, during the year before the present study when the pilot study was conducted, the modified AATPS was used and revealed that many of the items were subjective and unreliable measures of client behaviors or change. In addition, it proved difficult to describe many client behaviors on the specified ordinal scale (None to Very High). Therefore, it was decided not to use this measure in the present study.

*Attendance and session length.* The sessions were scheduled for 30 minutes but the consultant had blocked out an hour of time to meet with each participant. Most sessions were ended by the consultant after the consultant and participant had reviewed the necessary information. However, at times the participant would engage in conversation with the consultant after they had finished with their work for the session. The researcher tracked of the length of the sessions, defined as the beginning of the first verbalization made by the participant to the end time of the last verbalization made by the participant, and the participants’ session attendance.

*Questionnaires.* During the last session of the study, the participants were asked to fill out two questionnaires. The questionnaires were given at two different points in the session, one at the beginning and one at the end. The first questionnaire asked a set of questions related to the participant’s perceived success in college this semester (see Appendix A). The next questionnaire asked about their experiences with Noah (see Appendix B).

*Coding of videotaped sessions.*

Two of the available studies that studied the effects of AAT on individuals with pervasive developmental disorders used coding of behaviors to indicate change (Martin & Farnum, 2002; Redefer & Goodman, 1989). Since there are few psychometric instruments available for measuring client changes in AAT, and single-subject research designs often assess specific
behaviors to measure change (Kazdin, 1982), operationally-defined behaviors were coded across sessions. However, the focus of the present study required the development of a new coding system rather than the use of a system from a previous study.

Consistent with the research done by Limond et al. (1997), which recommended videotaping and then coding the behaviors, all sessions, beginning with the baseline, were videotaped. The videotapes were then transferred onto DVD and copied for graduate students to observe and code for a number of behaviors, in order to note changes in these behaviors over time.

Variables. The number of occurrences and duration of the following behaviors were coded:

1. Attention toward the consultant was defined as when the student’s head was pointed toward the consultant in a manner that looked, to the best extent possible with the videotaping abilities of the camera apparatus, like the student was looking at the consultant for a period of five seconds or longer. If the student looked away from the consultant for longer than five seconds and then looked back towards the consultant, it was coded as a separate event. However, if the student looked away from the consultant for less than five seconds, it was coded as one event. Both the number of times the participant looked toward the consultant and the amount of time the participant spent looking at the consultant were calculated.

2. Attention toward Noah was defined as when the student’s head was pointed toward Noah in a manner that looked, to the best extent possible with the videotaping abilities of the camera apparatus, like the student was looking at Noah. If the student looked away from Noah for longer than five seconds and then looked back towards
Noah, it was coded as a separate event. However, if the student looked away from Noah for less than five seconds, it was coded as one event. Also, direction of attention toward Noah was coded when the student was petting or engaging in an interaction with Noah for longer than five seconds. Both the number of times the participant looked toward Noah and the amount of time the participant spent looking at Noah were calculated.

3. Appropriate verbalizations were defined as the student talking about information pertinent to the conversation of the session, including talking about himself/herself, the dog, or academics. Appropriate verbalizations included the student providing an appropriate response to the consultant’s verbal or nonverbal cues, including if the student provided a relevant answer to a question the consultant posed during the session. Also, if the student asked a question or made a statement that was relevant to the session, and required a response from the consultant it was coded as an appropriate verbalization. If the student changed the topic, related to what was going on in the session (including reactions to Noah), this was coded as an appropriate verbalization. Appropriate verbalizations did not include when the student was talking about material unrelated to the topic at hand. A response that was given in one to fifteen words (or less than five seconds) was coded as two seconds in duration. The number of appropriate verbalizations, as well as the duration of time the participant was verbalizing appropriately, were calculated.

4. Repetitive behaviors were defined as non-functional behaviors in which the student visibly, to the best extent possible, engages in an activity with his or her hands for five or more seconds during the session. While these were different for each student,
some behaviors which might be coded for being repetitive include picking of skin, cracking of knuckles, or touching of objects on the desk. The number of repetitive behaviors, as well as the amount of session time the participant engaged in repetitive behaviors, were recorded.

5. The length of the session was defined as the length of the entire session, beginning with the first word uttered by either client, and ending with the last word uttered by the client.

**Coding Procedures.** School psychology graduate students were recruited to code the DVDs. A series of three training sessions lasting approximately four hours occurred prior to coding of the recorded sessions and an inter-rater reliability of ninety percent was established.

At the beginning of the first training session, the coders read and signed a confidentiality agreement. The researcher then read and reviewed the operational definitions of the variables of interest to the coders and demonstrated examples of the behaviors (see Appendix C). After the coders understood the variables and had no more questions, the researcher explained the coding forms and how they should be filled out. The forms were developed by the researcher to measure the number of occurrences and duration of behaviors exhibited by the student during the academic consultation sessions, including the direction of attention the student paid to the consultant (see Appendix D) and the therapy dog (see Appendix E), appropriate verbalizations made by the student (see Appendix F), as well as repetitive behaviors in which the student engaged (see Appendix G). The researcher gave the coders a sample and showed them how to record the occurrences of the behavior and then calculate the number of occurrences and duration of the behaviors.
After the coders were familiar with the forms they were required to fill out, they watched a DVD that was developed for training purposes in which a confederate interacted with Noah. The researcher then practiced coding the identified behaviors with the coders, watching the DVD four separate times to pay specific attention to each behavior being recorded. The first time, the coders looked for the amount of time the confederate looked toward the consultant. The second time, they looked at the confederate’s attention toward Noah. The third time their focus was on listening and recording the confederate’s appropriate verbalizations. The last time they recorded the occurrence of repetitive behaviors by the confederate in the session. For all behaviors, each time the behavior occurred the coders indicated the beginning and ending time of the behavior. If a verbalization lasted for less than five seconds, only the beginning time of the verbalization was recorded. At the closure of the first training session, the coders were given two practice DVDs, one representative of a baseline session and one of an intervention session, in which Noah was present. The coders were asked to practice coding the behaviors and return the following week.

During the second training session, the coders reviewed with the researcher the number of occurrences and duration of time the confederate’s attention was toward the consultant and toward Noah in the practice sessions. The researcher then reviewed the operational definitions for appropriate verbalizations and repetitive behaviors and provided the coders with examples from the training videos. The coders were then asked to look again at the coding of the behaviors that were reviewed and return the following week.

The last training session consisted of a review of the coding of appropriate verbalizations and repetitive behaviors for the practice DVD’s. The coders and researchers reviewed all of the behaviors and reached an inter-rater reliability of above 90% for all behaviors. Also, during this
session, the researcher instructed the coders about how to fill out the inter-rater reliability form (see Appendix H) after they have completed the review of the coded behaviors.

The coders were then given the actual session DVD’s to watch and code independently using the forms that the researcher had developed. Each session was coded independently by two coders. After the coders completed coding the DVD’s, they met with the other coder and reviewed the discrepancies in their coding of the events. They reviewed the tapes together until they agreed on the occurrence of the event (within 2 seconds), with 90% reliability. After they agreed on the time the events occurred, they calculated the duration of the event by subtracting the time the event began from the time the event ended. They also counted the number of occurrences of the event that they had agreed upon. Their agreement was recorded, including the overall number of occurrences and duration of the behaviors as well as any additional comments regarding the coding of the session, on the inter-rater reliability form. All of the coders were naïve to the specific experimental questions. The graduate students who conducted the coding were monetarily compensated for their time.

Procedures

Informed consent. Specific students who appeared suited for this intervention were recruited by the main researcher, who was an academic consultant at the office of disability services. Potential participants were asked if they liked dogs and if they were interested in participating in the study. Participants were told about the study, including the use of the therapy dog, and asked to sign a consent form to participate. All participants chose to participate, but if they had decided to stop at any point, the remaining services they were receiving would have continued unchanged.
**Design.** A multiple-baseline design with operationally-defined variables was employed in order to gain experimental control, given the small number of participants in the study. Multiple-baseline designs - designs in which treatment variables are introduced across behaviors, settings, or subjects in temporal order - have been used in research for over 40 years. Multiple-baseline designs across subjects expose participants to the same environmental conditions, with the treatment variable being introduced to participants sequentially after a baseline period. The baseline period for subsequent participants lengthens as the treatment variable is being introduced sequentially. A benefit of multiple-baseline designs is that they allow for the measurement of several identified behaviors concurrently (Barlow, Nock, & Hersen, 2009). When implementing a multiple-baseline design, the participants in the study serve as the control for their behavior and possible extraneous variables, which allows the researcher to evaluate the effect of the treatment on the behavior (Morgan & Morgan, 2001).

In order to obtain the minimum data points necessary for analysis (Horner et al., 2005), Noah was introduced into sessions after the participant had completed at least three baseline sessions with the consultant. Further, before Noah was introduced into the next participant’s sessions, at least three intervention sessions occurred. So, as an example, participant one would have three baseline sessions and three intervention sessions. During this time, the weeks that participant one was participating in baseline and intervention sessions, participant two would have had six baseline sessions. After participant one had completed the three baseline and three intervention sessions, the intervention sessions would begin for participant two and both participant one and two would have Noah present in their sessions. The study took place over 21 sessions and each participant had at least three baseline and three intervention sessions (see Appendix I). The participants met with their academic consultant at the office of disability
services on a weekly basis, or twice per week, for approximately 15 to 45 minutes. During this meeting time, the participants discussed their academic progress, concerns or questions regarding academics, and pertinent issues relating to their functioning at college.

**Baseline.** During baseline there were no changes in typical meetings. The participants and consultants performed typical activities, such as discussing classes, assessing academic needs, and working on time management and study strategies. The therapy dog, Noah, was not present during these sessions.

**Intervention.** Two of Noah’s handlers took turns bringing Noah to the office of disability services to work with the participants. Two of the participants were scheduled for Tuesdays while the other two participants were scheduled to attend their consultation sessions on Thursdays in order to reduce stress and fatigue in Noah that could occur during lengthy sessions. The meetings were scheduled for a half-hour with an hour in between for Noah to rest before the next session. The participants typically did not interact with the handlers, as Noah was present in the consultation room prior to the sessions’ beginning. On rare occasions, the participants briefly ran into the handler and Noah prior to entering the academic consultant’s office.

During intervention sessions, Noah was already in the room prior to the participant entering. When Noah was first introduced to the participant, an approximation of the following was stated.

To the participant: “Noah is here. You can play with him, pet him, or just let him be. You just can’t hurt him.”

To Noah: “Watch me.” Then, “Say hello” (consultant points to participant). Noah would then go to the participant and look at him or her. At the beginning of the remaining AAT
sessions, the consultant told the participant, “Noah is here with us again,” or did not say anything about Noah being present.

The consultant did not initiate any activities with Noah or direct the participants. However, the consultant did follow up on comments, behaviors, or questions initiated by the participants. At times, the consultant remarked on Noah’s behaviors.

**Analysis**

*Visual inspection of graphed data.* While in many research domains inferential statistics are used as the primary means of identifying effects, when research is conducted using single subject experimental designs the primary mean is visual inspection of the graphed data. “Visual analysis is one of the oldest forms of data analysis” which allows the viewer to examine and compare sets of information, usually in the form of a graph. The viewers can then conclude information about the data and form hypotheses based on the visual inspection of the data (Parsonson & Baer, 1992, p. 15). Single-subject researchers have preferred visual inspection because it recognizes robust effects. Visual inspection methods are typically more sensitive to large treatment effects, most likely reducing Type 1 errors, treatments that are ineffective being interpreted as effective (Scruggs, Mastropieri, & Regan, 2006). Using visual inspection should “provide unequivocal evidence of an independent variable’s effect and that such an effect should be visible to the naked eye” (Morgan & Morgan, 2001, p. 121).” As Baer (1977) remarked, this approach is more conservative with respect to Type 1 errors than most statistical approaches: "In the individual-subject paradigm, the probability of Type 1 errors is not known with any precision, but it is clearly much smaller than 0.05" (p. 169). Thus, visual inspection reduces the risk of detecting a real, but clinically unimportant effect.
Baer (1977) has questioned whether effects that can be seen only with special statistical assistance can create clinically meaningful outcomes in a given individual. This is consistent with the general view that clinical progress often means improving functioning to the extent that an individual's fit into a sociocultural context is enhanced. That is, for many disorders (including those involving aberrant behavior, such as AS), an individual is not really "better" until others perceive him or her that way. Behaviors assessed using single-subject research design are targeted for a particular reason, usually because they are of social or clinical significance (Barlow, Nock, & Hersen, 2009). Therefore, using visual inspection of graphed data illustrates when large effects of treatments impact behavior in a noticeable manner.

As Baer (1977) and Michael (1974) have observed, in research areas where little reliable knowledge has been established (and most domains in which human behavior is studied qualify), it makes sense to draw attention to the largest, most robust effects, as these are likely to have the most pronounced implications for both theory and application. In the presence of the evidence-based practice movement, which emphasizes that treatments that create little change are wasteful, it has been important to establish research that provides evidence for effective treatments (Morgan & Morgan, 2001). Visual inspection of graphed data provides a scientific evaluation of data that provides a vehicle for detecting clinical meaningful effects.

Based on the above, the coded behaviors in this study were displayed in a graph. The graphs were created in accordance with recommendations by single subject researchers, with the observed behavior being documented on the ordinate, y-axis, and the session date on the abscissa, x-axis (Scruggs, Mastropieri, & Regan, 2006). Microsoft Excel ® was used in order to create the multiple-baseline experimental design graphs (per Carr & Burkholder, 1998; Hillman, & Miller, 2004).
Chapter Four

Results

Results are discussed in the following sequence. First, descriptive information about the participants is presented and the length of their sessions, rate of attendance, and questionnaire responses are examined. Next, data analysis involved an in-depth examination of the variables being analyzed, including engagement in repetitive behaviors, appropriate verbalizations made, attention paid toward the consultant, and attention paid toward Noah during the sessions. Each variable has eight corresponding graphic displays of the data points for the participants:

1. Percentage of Session – these multiple-baseline graphs display the percentage of the session the target behavior occurred across participants.

2. Percentage of Session with Trendlines - these multiple-baseline graphs display the percentage of the session the target behavior occurred with trendlines included for both the baseline and intervention sessions for each participant.

3. Percentage of Session with Baseline Mean Extended – these multiple baseline graphs display the percentage of the session the target behavior occurred with the area that represents the mean of the baseline sessions, including one standard deviation above and below the mean, extended in a rectangular box through the intervention session for each participant.

4. Percentage of Session with (1 Standard Deviation) Error - these multiple baseline graphs display the percentage of the session the target behavior occurred with the shaded area representing the mean, including one standard deviation above and below the mean, for both the baseline and intervention sessions for each participant. Also included on these graphs are the calculated means for the baseline and intervention sessions.
5. Number of Occurrences - these multiple-baseline graphs display the number of times the target behavior occurred during the session across participants.

6. Number of Occurrences with Trendlines - these multiple-baseline graphs display the number of times the target behavior occurred during the session with trendlines included for both the baseline and intervention sessions for each participant.

7. Number of Occurrences with Baseline Mean Extended - these multiple-baseline graphs display the number of times the target behavior occurred during the session with the area that represents the mean of the baseline sessions, including one standard deviation above and below the mean, extended in a rectangular box through the intervention session for each participant.

8. Number of Occurrences with (1 Standard Deviation) Error - these multiple-baseline graphs display the number of times the target behavior occurred with the shaded area representing the mean, including one standard deviation above and below the mean, for both the baseline and intervention sessions for each participant. Also included on these graphs are the calculated means for the baseline and intervention sessions.

Each participant's data is examined and presented in a table and then overall intervention effects are discussed. Finally, the integrity of the experimental design is reviewed.

**Descriptive Participant Data**

*Jordan.* Jordan (pseudonyms are used for all participants) was a 19-year-old sophomore male who had been receiving services at the office of disability services for two years. Jordan took advantage of all services offered by the office of disability services, including separate location for exams, note-takers, tutors, and consultation sessions, but was sporadic in using these
services (see Table 1). His sporadic use of services is evident when examining his rate of attendance at consultation sessions. Out of a possible 45 meetings that were scheduled, Jordan attended 24 of those meetings. Noah was present at 11 of the sessions that Jordan attended. Jordan’s regular attendance rate was 53%, which means that he would attend approximately one-half of the scheduled sessions. His attendance at sessions when he knew Noah was going to be present was 69%, which was a 16% increase in attendance when Noah was present as compared to regularly scheduled sessions. Often Jordan would e-mail and indicate he was not coming because he had too much work to do, or he would oversleep for the meetings. In regard to his use of the other academic services, he would sign up for the services (e.g., note-takers), and then not use the services (e.g., pick up the notes). The average length of Jordan’s sessions, when Noah was not present was 28 minutes and 37 seconds. When Noah was present, Jordan’s sessions averaged 24 minutes and 6 seconds.

Jordan’s failure to successfully use the supports offered may have been reflected in Jordan’s grades. Jordan had been on academic probation since his second semester freshman year, and at the beginning of his sophomore year he was placed on extended academic probation. While his academics suffered, he did begin to make more friends and socialize more during his second academic year at the university, which he indicated through his survey responses. He responded that he participated more in social activities and had more friends during the spring semester compared to the fall semester. Despite making more friends, Jordan had difficulty with social situations at college. More specifically, he often engaged in activities his roommate encouraged him to, but which were not appropriate or would make him stand out negatively in a group. For example, his roommate had told him to throw food in the dining hall in order to gain social acceptance. Jordan did and was reprimanded by the dining hall staff for doing so.
Living at the university caused Jordan to be away from his cats with which he had developed a close bond. While his dad (who was not his custodial parent) had a dog, Jordan did not feel as close with his dad’s dog. When asked about whether he liked dogs, he replied that he was undecided. Despite his interest in cats, he seemed to enjoy when Noah was present and would sometimes sit in the chair that was closer to the ground in order to interact more with Noah.

In response to the survey given at the end of the semester, Jordan responded “disagree” to the statement, “Noah was a distraction to have in the room during my meetings.” Jordan responded “undecided” to the following statements, “I like dogs,” “Having Noah in my sessions increased my likelihood of attending my meetings,” “Having Noah made me more excited to come to my meetings,” and “I preferred working alone with my consultant.” Jordan responded “agree” to the following statements, “I enjoyed working with Noah,” “I think having Noah there during my meetings was helpful,” and “I think having Noah was a good addition” (see Figure 2).

During the pilot study, Jordan used his participation in the study for extra credit for a psychology class he was taking. In the write-up of the research he was participating in, Jordan wrote that his favorite thing to do with Noah was to throw the ball and have him catch it. Not once did Jordan do this with Noah; however when asked further about this, Jordan expressed that this is what he thought he should do with Noah because throwing a ball to a dog is what he believed people to do when interacting with a dog. This is typical of individuals with AS; they may indicate what they should do based on an understanding of the social world that they have read about or watched on television, but this does not necessarily translate into their direct actions. Because of his write-up and the lack of assessment as to how to interact with a dog, it is unclear whether Jordan knew how to interact with Noah in a meaningful way.
In the fall semester, Jordan took 16 credit hours and had a grade point average of 2.29. In the spring, Jordan attempted 14 credit hours but withdrew from one class which resulted in him having a 10 credit hour course load and a 1.86 grade point average. In response to a survey about the overall semester he worked with Noah, he answered “undecided” to the statements, “I did better this semester than I did last semester,” “My grades improved this semester,” and “This semester was just like last semester.” He responded “agree” to the statements “I made more friends this semester,” and “I studied more this semester.” He responded “strongly agree” to these statements, “I spent more time with other people this semester,” and “I participated in more social activities this semester” (see Figure 3).

_Eve._ Eve was an 18-year-old female who began attending the university in the fall of 2007 and started receiving services at that time (see Table 1). She indicated during one of the initial sessions with the academic consultant her sadness over missing her two dogs and cat at home. She had regularly scheduled consultation meetings, but had a difficult time attending when meetings were held in the morning, as she would oversleep. Also, when things were going well, she did not see a need to attend. Instead, she would come in or contact the consultant when she was having particular difficulty, was ill, or needed academic support to consult with her teachers.

The average length of Eve’s sessions, when Noah was not present, was 28 minutes and 2 seconds. When Noah was present, Eve’s sessions averaged 35 minutes and 34 seconds. Out of a possible 26 meetings that were scheduled, Eve attended 11 of those meetings. Eve only attended three baseline sessions prior to Noah attending her sessions, although six were scheduled. Noah was present at 6 of the sessions that Eve attended. When Eve knew that Noah was going to be present, she attended 50% of those meetings, compared to 42% of regularly scheduled sessions
in which Eve knew that Noah was not going to be present. While her sessions increased in length by more than seven minutes when Noah was present, it is difficult to decipher if this was strictly due to the presence of Noah. Eve’s meeting time had changed to a time in which she had class before and would come to the session immediately following class. Also, she did not have a class after the consultation session, which was a change from the previous semester, so she did not have to leave the consultation sessions to get to class. Further, during the second semester she had more difficulty with a particular class that required her to meet with the consultant more often.

In response to the survey given at the end of the semester, Eve responded “disagree” to the statement “Noah was a distraction to have in the room during my meetings” and “I preferred working alone with my consultant.” Eve responded “undecided” to the following statements, “Having Noah in my sessions increased my likelihood of attending my meetings” and “Having Noah made me more excited to come to my meetings.” Eve responded “agree” to the following statements, “I like dogs,” “I enjoyed working with Noah,” “I think having Noah there during my meetings was helpful,” and “I think having Noah was a good addition” (see Figure 3).

Eve took 16 credit hours in the fall semester and had a grade point average of 3.45. In the spring semester she took 13 credit hours and had a 3.33 grade point average. In response to a survey about the overall semester she worked with Noah, she answered “disagree” to the statement “This semester was just like last semester.” Eve responded “undecided” to the statements, “I did better this semester than I did last semester,” “My grades improved this semester,” and “I studied more this semester.” She responded “agree” to the statements “I made more friends this semester,” “I spent more time with other people this semester,” and “I participated in more social activities this semester” (see Figure 2).
*Benjamin.* Benjamin was a 20-year-old sophomore who had been enrolled at the university for two years and had been working with the same academic consultant at the office of disability services during this entire time (see Table 1). He had continued difficulty with mental health problems, more specifically seasonal affective disorder and depression. As a result, each semester at the university he had to take incompletes due to medical leaves. He took classes at his local community college over the summer to make up introductory core coursework.

Benjamin would attend sessions regularly until a problem occurred or he was having personal problems, and then his attendance would stop. This was a signal to the consultant to check in with his counselor at the counseling center. Often during these times, he was undergoing a depressive episode and would not attend class, counseling sessions, or consultation meetings. In fact, the first session in which Noah was introduced into his sessions was the first time that Benjamin had attended his scheduled consultation meeting after missing several weeks. During this session, Benjamin was lethargic, disconnected, and disclosed that he had been thinking of hurting himself. As a result, his counselor from the counseling center came to the consultation meeting to walk him to the counseling center and ensure that he was not a harm to himself.

The average length of Benjamin’s sessions, when Noah was not present was 10 minutes and 37 seconds. When Noah was present, Benjamin’s sessions averaged 23 minutes and 14 seconds. Given this is a mean, and the first session in which Noah was present during Benjamin’s consultation meetings was when Benjamin stayed with the consultant until the counselor could pick him up and take him to her office, the mean session length is not representative of his typical sessions. Out of a possible 31 meetings that were scheduled, Benjamin attended 21 of those meetings. Noah was present at 4 of the sessions that Benjamin
attended. When Benjamin knew that Noah was going to be present, he attended 50% of the time, compared to 67% of regularly scheduled sessions in which Noah was not scheduled to be present. Once again, this may not be the result of Noah but may have more to do with the co-morbid mental health conditions that Benjamin was experiencing. Benjamin recognized that the semester in which Noah was present at his sessions was difficult for him, in terms of “depression” and “bad grades.”

In response to a survey given at the end of the semester, Benjamin responded “disagree” to the statement “Noah was a distraction to have in the room during my meetings” and “I preferred working alone with my consultant.” Benjamin responded “agree” to the following statements, “I like dogs,” “I enjoyed working with Noah,” “I think having Noah there during my meetings was helpful,” “Having Noah in my sessions increased my likelihood of attending my meetings,” “I think having Noah was a good addition,” and “Having Noah made me more excited to come to my meetings.” When asked to respond to the “best thing about Noah,” Benjamin wrote “I don't see my pets during the school year, so it was nice to see an animal again” (see Figure 3).

Benjamin took 16 credit hours in the fall semester and ended the semester with a grade point average of 3.66. In the spring semester, Benjamin attempted 18 credit hours. He passed 14 of those credit hours, taking one class (four credits) as incomplete, and had a spring semester grade point average of 2.35. In response to a survey about the overall semester he worked with Noah, he answered “strongly disagree” to the statements, “I did better this semester than I did last semester,” “My grades improved this semester,” and “This semester was just like last semester.” He responded “Agree” to the statements “I made more friends this semester,” “I spent more time with other people this semester,” “I studied more this semester,” and “I
participated in more social activities this semester.” When asked to write the “worst things” about the semester, Benjamin wrote “bad grades, depression” (see Figure 2).

_Gabriel._ Gabriel was an 18-year-old freshman male who had been diagnosed with ADHD (see Table 1). While not diagnosed with AS, Gabriel met the diagnostic criteria and was currently seeking support for medication management and therapy from community professionals to assist him with the difficulties he was experiencing at college. Through the office of disability services, Gabriel took advantage of consultation meetings and was offered additional services, such as note-taking and tutoring services, but did not use these with any regularity. Gabriel had difficulty organizing his assignments and understanding the requirements of long-term projects. As a result, he often did not turn in his assignments on a weekly basis and would end up rushed at the end of the semester in an attempt to complete semester-long projects.

Gabriel attended all of his meetings, regardless of Noah being present; his sessions were approximately 2 minutes longer when Noah was there. The average length of Gabriel’s sessions, when Noah was not present was 25 minutes and 22 seconds. When Noah was present, Gabriel’s sessions averaged 27 minutes and 46 seconds. Out of a possible 27 meetings that were scheduled Gabriel attended 100% of those meetings. Noah was present at 4 of the sessions that Gabriel attended.

In response to a survey given at the end of the semester, Gabriel responded “strongly disagree” to the statement “Noah was a distraction to have in the room during my meetings.” He responded “disagree” to the statements, “I think having Noah there during my meetings was helpful” and “Having Noah in my sessions increased my likelihood of attending my meetings.” Gabriel replied “undecided” to the statements “Having Noah made me more excited to come to my meetings” and “I preferred working alone with my consultant.” Gabriel responded “strongly
agree” to the following statements, “I like dogs,” “I enjoyed working with Noah,” and “I think having Noah was a good addition.” When asked to respond to the “best thing about Noah,” Gabriel wrote “he's fuzzy and kind.” Gabriel wrote that the worst thing about working with Noah was “he didn't get to do much.” He indicated that the things he would change about having Noah at the sessions included “it would be nice if he could interact more because I honestly don't know what he could do for me” (see Figure 3).

Gabriel’s grade point average was a 1.96 in the fall semester. He had attempted to take 15 credit hours but had failed six credit hours, therefore passing nine credit hours. In the spring semester, Gabriel attempted an 18 credit course load but withdrew from a four-credit class and ended the semester with 14 credits and a grade point average of 2.42. In response to a survey about the overall semester he worked with Noah, he answered “strongly disagree” to the statements, “This semester was just like last semester” and “I studied more this semester.” Gabriel was undecided in response to the statement “I participated in more social activities this semester.” He responded “agree” to the statements “My grades improved this semester” and “I spent more time with other people this semester.” Finally, he indicated “strongly agree” for the statements “I did better this semester than I did last semester” and “I made more friends this semester.” When asked to write the “worst things” about the semester, Gabriel wrote “I didn't do as well as I could have” (see Figure 2).
Table 1

*Characteristics of Participants*

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<th>Jordan</th>
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<th>Benjamin</th>
<th>Gabriel</th>
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Table 1 (continued)

**Characteristics of Participants**

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Note. Names have been changed to preserve anonymity.
Visual Inspection of Graphed Data

Each variable was analyzed based on the graphic presentation of the data for both the number of occurrences and the percentage of sessions the behavior occurred. The results are examined by the behavior being measured for each participant with a description of the overall effect of the presence of the therapy dog on the behavior of all the participants following.

In order to systematically evaluate the graphs visually, the researcher considered the fundamental variables involved in the visual inspection of graphs. Based upon previous research and writings that examined the visual inspection of graphs (Cooper, Heron, & Heward, 2007; Gibson & Ottenbacher, 1988; Parsonson & Baer, 1992) each graph was analyzed and determined to produce clinically relevant results if the following criteria were met:

1. *Stability through baseline and intervention periods (Stability)*. Each participant and group’s data was analyzed to assess the degree of variability during the baseline and intervention periods.

2. *Clear change in trend from baseline to intervention period in a clinically relevant direction (Trend)*. Each participant and group’s data was analyzed for a shift in the trend line, or the line of best fit for the data points. Clinically relevant effects are those that are large enough to recognize through visual inspection.

3. *Clear change in mean level from baseline to intervention period in a clinically relevant direction (Mean)*. Each participant and group’s data was analyzed for a shift in the mean level of the data points, referring to the change in the mean performance of the participant from the baseline to intervention period. Clinically relevant effects are those that are large enough to recognize through visual inspection. The mean score of the graphs are represented on the graph.
4. *Minimal treatment points that overlap with baseline data points (Overlap).* Each participant’s data was analyzed in regard to the amount of data points that overlapped between the baseline and intervention periods.

For each variable that was measured, the criteria were evaluated and described within a table. If all criteria were met for each participant, the researcher would conclude that the presence of the therapy dog had a clinically relevant impact for that variable.

*Repetitive Behaviors*

Repetitive behaviors were defined as non-functional behaviors in which the participant visibly engaged in an activity with his or her hands repetitively for five or more seconds. Using the criteria developed to analyze the data, the researcher examined Figure 4 through Figure 11 and described the results of the percentage of session that repetitive behaviors occurred in Table 2 and number of repetitive behaviors that occurred in the session in Table 3.
Table 2

*Description of the Visual Analysis for the Percentage of Session Repetitive Behaviors Occurred*

<table>
<thead>
<tr>
<th></th>
<th>Jordan</th>
<th>Eve</th>
<th>Benjamin</th>
<th>Gabriel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td>Variable&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Variable&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Variable</td>
<td>Variable</td>
</tr>
<tr>
<td><strong>Stability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td>Variable</td>
<td>Variable</td>
<td>Variable</td>
<td>Variable</td>
</tr>
<tr>
<td><strong>Trend</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Baseline</strong></td>
<td>Decrease&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Gradual Increase&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Gradual Decrease</td>
<td>Gradual Decrease</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td>Gradual Increase&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Gradual Increase&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Zero Trend</td>
<td>Decrease&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>No Change</td>
<td>Slight Increase&lt;sup&gt;b&lt;/sup&gt;</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td><strong>Overlap</strong></td>
<td>Considerable</td>
<td>Considerable</td>
<td>Considerable</td>
<td>Considerable</td>
</tr>
</tbody>
</table>

<sup>a</sup>Not enough data points for thorough analysis. <sup>b</sup>Results were not in a clinically relevant direction.
Table 3

*Description of Visual Analysis for the Frequency of Occurrences for Repetitive Behaviors*

<table>
<thead>
<tr>
<th></th>
<th>Jordan</th>
<th>Eve</th>
<th>Benjamin</th>
<th>Gabriel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td>Variable^a</td>
<td>Variable^a</td>
<td>Highly Variable</td>
<td>Highly Variable</td>
</tr>
<tr>
<td><strong>Stability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td>Highly Variable</td>
<td>Variable^a</td>
<td>Variable^a</td>
<td>Variable^a</td>
</tr>
<tr>
<td><strong>Trend</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Baseline</strong></td>
<td>Decrease^a</td>
<td>Zero Trend^a</td>
<td>Gradual Decrease</td>
<td>Gradual Decrease</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td>Gradual Increase^b</td>
<td>Increase^b</td>
<td>Slight Decrease^a</td>
<td>Decrease^a</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>Slight Increase^b</td>
<td>Slight Increase^b</td>
<td>Slight Decrease</td>
<td>Slight Increase^b</td>
</tr>
<tr>
<td><strong>Overlap</strong></td>
<td>Some</td>
<td>Some</td>
<td>Considerable</td>
<td>Considerable</td>
</tr>
</tbody>
</table>

^aNot enough data points for thorough analysis. ^bResults were not in a clinically relevant direction.

*Overall Effect.* Overall, the presence of Noah in the consultation sessions did not decrease the percentage of sessions during which the participants engaged in repetitive behaviors. In addition, the number of times the participants engaged in repetitive behaviors did not decrease for all participants. For two of the participants, Jordan and Eve, the occurrence of repetitive behaviors and the percentage of session in which they occurred increased during the intervention session. Since ideally repetitive behaviors would decrease with the presence of the therapy dog, these increases in behaviors are not in a clinically relevant direction. Also, since the repetitive behaviors neither decreased nor increased for all of the participants, it can be said that the intervention did not create a change.
Appropriate Verbalizations

Appropriate Verbalizations were counted when the participant talked about information pertinent to the conversation of the session, including talking about himself/herself, the dog, or academics. These also included the participant providing an appropriate response to the consultant’s verbal or nonverbal cues, including if the participant provided a relevant answer to a question the consultant posed during the session. Also, if the participant asked a question or made a statement that was relevant to the session and required a response from the consultant, it was coded as an appropriate verbalization. If the participant changed the topic related to what was going on in the session (including reactions to Noah), this was also coded as an appropriate verbalization. Appropriate verbalizations did not include when the participant was talking about material unrelated to the topic at hand. A response that was given in one to fifteen words (or less than five seconds) was coded as occurring for two seconds. Figures 12 through 19 were used to visually analyze the data using the predetermined criteria. The description of the resulting visual analysis for the percentage of the session that appropriate verbalizations occurred are presented in Table 4 while the analysis of the number of appropriate verbalizations that occurred in the sessions are displayed in Table 5.
Table 4

*Description of Visual Analysis for the Percentage of Session Appropriate Verbalizations Occurred*

<table>
<thead>
<tr>
<th></th>
<th>Jordan</th>
<th>Eve</th>
<th>Benjamin</th>
<th>Gabriel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td>Stable&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Slightly Variable&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Variable</td>
<td>Stable</td>
</tr>
<tr>
<td><strong>Stability</strong></td>
<td>Slightly Variable</td>
<td>Stable</td>
<td>Variable&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Stable&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td>Slightly Variable</td>
<td>Stable</td>
<td>Variable&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Stable&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Trend</strong></td>
<td>Zero Trend</td>
<td>Gradual Increase&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Zero Trend</td>
<td>Zero Trend</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td>Very Slight Decrease</td>
<td>Gradual Decrease&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Decrease&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>Decrease&lt;sup&gt;a,b&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>Slight Decrease&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Slight Increase</td>
<td>Slight Decrease&lt;sup&gt;b&lt;/sup&gt;</td>
<td>No Change</td>
</tr>
<tr>
<td><strong>Overlap</strong></td>
<td>Some</td>
<td>Considerable</td>
<td>Considerable</td>
<td>Considerable</td>
</tr>
</tbody>
</table>

<sup>a</sup>Not enough data points for thorough analysis. <sup>b</sup>Results were not in a clinically relevant direction.
Table 5

*Description of Visual Analysis for the Frequency of Occurrences of Appropriate Verbalizations*

<table>
<thead>
<tr>
<th></th>
<th>Jordan</th>
<th>Eve</th>
<th>Benjamin</th>
<th>Gabriel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Stable(^a)</td>
<td>Stable(^a)</td>
<td>Relatively Stable</td>
<td>Stable</td>
</tr>
<tr>
<td>Stability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>Stable</td>
<td>Stable</td>
<td>Variable(^a)</td>
<td>Slightly Variable(^a)</td>
</tr>
<tr>
<td>Trend</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>Slight Increase(^a)</td>
<td>Increase(^a)</td>
<td>Zero Trend</td>
<td>Zero Trend</td>
</tr>
<tr>
<td>Intervention</td>
<td>Zero Trend</td>
<td>Zero Trend</td>
<td>Slight Decrease(^a)</td>
<td>Decrease(^a)</td>
</tr>
<tr>
<td>Mean</td>
<td>Slight Increase</td>
<td>Slight Decrease(^b)</td>
<td>Decrease(^b)</td>
<td>No Change</td>
</tr>
<tr>
<td>Overlap</td>
<td>Some</td>
<td>Slight(^b)</td>
<td>Considerable</td>
<td>Considerable</td>
</tr>
</tbody>
</table>

\(^a\)Not enough data points for thorough analysis. \(^b\)Results were not in a clinically relevant direction.

**Overall Effect.** The presence of Noah in the consultation sessions, overall, did not increase nor decrease the number of participants’ appropriate verbalizations or percentage of session time they engaged in appropriate verbalizations. For Gabriel, appropriate verbalizations increased the first session that Noah was present but this was not consistent across participants. It would be an important clinical finding if the number of appropriate verbalizations increased or the percentage of time the participants engaged in appropriate verbalizations when Noah was present during the sessions increased for all participants; however, this did not occur.
Attention Toward Consultant

Attention toward the consultant was defined as when the participant’s head was pointed toward the consultant in a manner that looked, to the best extent possible with the videotaping abilities of the camera apparatus, like the participant was looking at the consultant for a period of five seconds or longer. When counting number of occurrences, if the participant looked away from the consultant for longer than five seconds it was coded as a separate occurrence. However, if the participant looked away from the consultant for less than five seconds it was still counted as one occurrence. Figures 20 through 23 represent the percentage of the session the participant looked toward the consultant; the results for the visual analysis of these figures are presented in Table 6. The data for the amount of times the participant looked toward the consultant are presented in Figures 24 through 27 and the criteria for visual analysis of these figures are described in Table 7.
Table 6

*Description of Visual Analysis for the Percentage of Session Attention was Paid toward the Consultant*

<table>
<thead>
<tr>
<th></th>
<th>Jordan</th>
<th>Eve</th>
<th>Benjamin</th>
<th>Gabriel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>Stable</td>
<td>Slightly Variable&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Variable</td>
<td>Variable</td>
</tr>
<tr>
<td>Intervention</td>
<td>Variable</td>
<td>Relatively Stable</td>
<td>Variable&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Variable&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Trend</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>Zero Trend</td>
<td>Decrease&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Slight Increase</td>
<td>Slight Decrease</td>
</tr>
<tr>
<td>Intervention</td>
<td>Slight Decrease&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Zero Trend</td>
<td>Slight Decrease&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>Decrease&lt;sup&gt;a,b&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slight Decrease&lt;sup&gt;b&lt;/sup&gt;</td>
<td>No Change</td>
<td>Decrease&lt;sup&gt;b&lt;/sup&gt;</td>
<td>No Change</td>
</tr>
<tr>
<td><strong>Overlap</strong></td>
<td>Slight</td>
<td>Considerable</td>
<td>Some</td>
<td>Considerable</td>
</tr>
</tbody>
</table>

<sup>a</sup>Not enough data points for thorough analysis.<br><sup>b</sup>Results were not in a clinically relevant direction.
Table 7

*Description of Visual Analysis for the Frequency of Occurrences Participant Looked toward the Consultant*

<table>
<thead>
<tr>
<th></th>
<th>Jordan</th>
<th>Eve</th>
<th>Benjamin</th>
<th>Gabriel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>Variable&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Stable&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Slightly Variable</td>
<td>Variable</td>
</tr>
<tr>
<td><strong>Trend</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>Increase&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Zero Trend</td>
<td>Decrease</td>
<td>Increase</td>
</tr>
<tr>
<td>Intervention</td>
<td>Slight Increase</td>
<td>Slight Decrease&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Slight Increase</td>
<td>Decrease&lt;sup&gt;a,b&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No Change</td>
<td>No Change</td>
<td>Increase</td>
<td>No Change</td>
</tr>
<tr>
<td><strong>Overlap</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Some</td>
<td>Considerable</td>
<td>Considerable</td>
<td>Considerable</td>
</tr>
</tbody>
</table>

<sup>a</sup>Not enough data points for thorough analysis.  <sup>b</sup>Results were not in a clinically relevant direction.

*Overall Effect.* The presence of Noah in the consultation sessions, overall, did not increase nor decrease the number of times or percentage of session time the participants looked at the consultant. There was variable attention toward the consultant in both conditions and no consistent change in the attention toward the consultant across the participants.

*Attention Toward Noah*

Attention toward Noah was defined as when the participant’s head was pointed toward Noah in a manner that looked, to the best extent possible with the videotaping abilities of the camera apparatus, like the participant was looking at Noah. If the participant looked away from
Noah for longer than five seconds and then looked back towards Noah, the coders recorded two separate occurrences. However, if the participant looked away from Noah for less than five seconds, it was coded as one occurrence. Also, direction of attention toward Noah was coded when the participant was petting or engaging in an interaction with Noah for longer than five seconds. Since Noah was not present during baseline sessions, there is no comparison between the baseline session and intervention sessions for this variable.

Figures 28 through 30 graphically present the percentage of the session the participants looked toward Noah with the results of the visual analysis of the graphs presented in Table 8. The data for the amount of times the participants looked toward Noah are presented graphically in Figures 31 through 33. The visual analysis of these graphs are presented in Table 9.

Table 8

<table>
<thead>
<tr>
<th></th>
<th>Jordan</th>
<th>Eve</th>
<th>Benjamin</th>
<th>Gabriel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability</td>
<td>Slightly Variable</td>
<td>Slightly Variable</td>
<td>Relatively Stable$^a$</td>
<td>Stable$^a$</td>
</tr>
<tr>
<td>Trend</td>
<td>Zero Trend</td>
<td>Slight Decrease</td>
<td>Decrease$^a$</td>
<td>Decrease$^a$</td>
</tr>
</tbody>
</table>

$^a$Not enough data points for thorough analysis.
Table 9

Description of Visual Analysis for the Frequency of Occurrences Participant Looked toward Noah

<table>
<thead>
<tr>
<th></th>
<th>Jordan</th>
<th>Eve</th>
<th>Benjamin</th>
<th>Gabriel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability</td>
<td>Variable</td>
<td>Slightly Variable</td>
<td>Variable&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Variable&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Trend</td>
<td>Slight Increase</td>
<td>Slight Decrease</td>
<td>Decrease</td>
<td>Increase&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>Not enough data points for thorough analysis. <sup>b</sup>Skewed by variable data.

*Overall Effect.* The visual analysis of the graphed data indicated that when Noah was present the attention the participants paid toward him was relatively stable.

*Joint Attention.* Figure 34 is a scatter plot that more closely examines the percentage of time the participants paid attention toward Noah and the consultant. Each of the participants sessions that included Noah are represented by a marker unique to that participant. The ordinate indicates percentage of time that the participant paid toward Noah and the abscissa indicates the percentage of time that the participant paid attention toward the consultant in the session. The marker indicates the amount of time that the participant paid attention toward Noah in the session. This scatterplot was created to examine the degree of correlation between the attention the participant paid toward Noah and the attention the participant paid toward the consultant. If the pattern of markers had been primarily in the upper right hand corner, it would indicate a positive correlation between the amount of attention paid toward the consultant and Noah. If the markers fell in the lower right hand corner it would suggest a negative correlation between the attention of the participant toward the consultant and Noah. Since no pattern emerged with the markers, the percentage of attention the participant paid toward the consultant is not correlated with the percentage of time the participant paid toward Noah. Overall, the consultants tended to pay more attention to the consultant than to Noah.
Participant Results

Jordan. Both the percentage of sessions in which Jordan engaged in repetitive behaviors, along with the number of occurrences of these behaviors, remained relatively stable from the baseline to intervention periods. While there may have been some outlying data points that would at first glance look as though the number of behaviors increased, the data points in both baseline and intervention phases centered around the mean and overlapped considerably. Similarly, Jordan’s appropriate verbalizations centered around the mean and had many data points that overlapped during baseline and intervention periods. Once again, the presence of an outlier made it appear as though there was a decrease in Jordan’s appropriate verbalizations. However, this one data point is clearly an outlier and the remainder of the data points do center around the mean. Jordan’s attention toward the consultant looked the most variable of all the behaviors measured, and it is evident upon visual inspection of the data that the intervention centered around the mean and was similar to baseline sessions, with an outlier creating the illusion there was a decrease in the attention Jordan paid toward the consultant. Moreover, Jordan’s attention toward Noah remained stable throughout the intervention period.

Eve. Analysis of Eve’s behaviors in response to the presence of Noah was made difficult by her inconsistent attendance and failure to show up for meetings, which limited the number of data points. Eve had the minimal three baseline sessions prior to Noah being introduced into her sessions. Eve had five sessions with Noah and one session in which Noah was not present after baseline, providing only nine sessions. In regard to her engagement in repetitive behaviors, the graphs typically center around the mean during the baseline and intervention periods, with many of the data points overlapping. Eve’s appropriate verbalizations were more stable, and similarly, remained centered around the mean and overlapped considerably in both baseline and
intervention periods. Similarly, Eve’s mean attention toward the consultant did not change when
Noah was introduced in the sessions and there was significant overlap between her baseline and
intervention data points. Since Eve looked toward the consultant for the majority of the sessions,
her frequency counts are low, but her percentage of time is high. Eve’s overall attention toward
Noah was relatively stable as well.

**Benjamin.** Benjamin seemed to reach a stable baseline, prior to Noah being introduced
into his sessions. His repetitive behaviors remained stable, centering around a mean for both
baseline and intervention periods, with no shift seen. It may look as though the number of
repetitive behaviors decreased; however, the two outlying data points during baseline make it
seem as though this is the case even though his data points center around the mean. This can be
said of Benjamin’s appropriate verbalizations as well. It would seem as though his appropriate
verbalizations may have decreased during intervention, but they do center around the mean from
the baseline period when more closely examined. One area in which there was a mean shift in
Benjamin’s data from baseline to intervention period was the percentage of the session he
attended to the consultant. That is, while his behavior was variable in regard to his attention
toward consultant, an overall decrease in his attention was noted. Benjamin’s attention toward
Noah seemed to center around the mean.

**Gabriel.** Gabriel’s consistent attendance at meetings allowed for a stable baseline to be
reached prior to Noah attending sessions. The percentage of the session Gabriel engaged in
repetitive behaviors was consistent from baseline to intervention period, centering around the
mean and overlapping between the two periods. The rate of occurrence of repetitive behaviors
looked more variable, but still centered around the mean. Similar results were found in regard to
appropriate verbalizations. Gabriel’s appropriate verbalizations were consistent from baseline to
intervention periods for both the percentage of the session he engaged in appropriate verbalizations and the rate of verbalizations. The percentage of session in which Gabriel looked toward the consultant remained stable from the baseline to intervention period. It looks as though the number of times Gabriel looked toward the consultant increased during the baseline period. However, given the length of the baseline period, he did reach stability and that was similar to his attention toward the consultant during the intervention period. His attention toward Noah remained consistent, in regard to the percentage of the session. He did seem to have one session in which he attended to Noah more times than the other sessions, but the time that he spent looking at Noah was consistent with the percentage of time he spent looking at Noah during other sessions. Therefore, the third session in which Gabriel seems to be looking more towards Noah can be assumed to be an outlier.

**Integrity of the Experimental Design**

This study sought to add to the scientific research into the effects of therapy animals on the behaviors of college students with AS. Given the lack of qualitative research with empirical validity (Wilson, 1991), this study was developed to fill the gap and begin to provide research in this area. In order to review the integrity of the study, the researcher analyzed the study using Horner et al.’s (2005) *Quality Indicators and Criteria for Determining Whether a Study Meets the Acceptable Methodological Rigor Needed to be a Credible Example of Single-Subject Research*. The chart developed by Horner et al. (2005, p. 174) was turned into a checklist. What follows is the adapted checklist and a brief description of the criteria that were and were not fulfilled, but are required in order to fulfill the requirements of single-subject research.
Description of Participants and Settings

✓ Participants were described with sufficient detail to allow others to select individuals with similar characteristics (e.g., age, gender, disability, diagnosis).

✓ The process for selecting participants was described with replicable precision.

✓ Critical features of the physical setting were described with sufficient precision to allow replication.

Dependent Variable

✓ Dependent variables were described with operational precision.

✓ Each dependent variable was measured with a procedure that generates a quantifiable index.

✓ Measurement of the dependent variable was valid and described with replicable precision.

✓ Dependent variables were measured repeatedly over time.

✓ Data was collected on the reliability of interobserver agreement associated with each dependent variable, and IOA levels meet minimal standards (e.g., IOA = 80%; Kappa = 60%).

Independent Variable

✓ Independent variable was described with reliable precision.

✓ Independent variable was systematically manipulated and under the control of the experimenter.

✓ Overt measurement of the fidelity of implementation for the independent variable is highly desirable.
While the research took place in a clinical setting that could have included many extraneous variables, to the best extent possible the study was implemented with fidelity and sought to eliminate confounds.

**Baseline**

✓ The majority of single-subject research studies will include a baseline phase that provides repeated measurement of a dependent variable and establishes a pattern of responding that can be used to predict the pattern of future performance, if introduction or manipulation of the independent variable did not occur.

✓ Baseline conditions were described with replicable precision.

A baseline period of at least three sessions was conducted prior to Noah being introduced into sessions with the participants. Each session was videotaped and then coded for the dependent variables identified. Since the research took place in a university with a set academic year, the limited time required the participants to have three baseline sessions in order for all participants to be able to have an opportunity to have Noah present in their sessions. As a result, the participants did not always reach a pattern of stability but Noah was introduced into their sessions based on the predetermined timeline.

**Experimental Control/Internal Validity**

✓ The design provided at least three demonstrations of experimental effect at three different points in time.

✓ The design controlled for common threats to internal validity (e.g., permits elimination of rival hypotheses).

✓ The results document a pattern that demonstrates experimental control.
External Validity

✓ Experimental effects are replicated across participants, settings, or materials to establish external validity.

This is a preliminary study as to the effects of a therapy animal on the behaviors of college students with AS. It will be important for future research to replicate this study to establish external validity.

Social Validity

✓ The dependent variables are socially important.

✓ The magnitudes of change in the dependent variable resulting from the intervention are socially important.

✓ Implementation of the independent variable are practical and cost effective.

✓ Social validity is enhanced by implementation of the independent variable over extended time periods, by typical intervention agents, in typical physical and social contexts.

Using a therapy animal presents a host of difficulties that at times may prove not to be practical or cost-effective. The researcher in this study was not a trained handler, therefore the handlers had to bring Noah to each session and watch to ensure that Noah was okay throughout. This was a considerable amount of time that was dedicated by the handlers and is not thought to be practical nor cost effective for most researchers. It is recommended that the researcher conducting the therapy become a trained handler to eliminate some of this difficulty.
Chapter Five
Discussion

This study sought to add to the current animal-assisted intervention research by examining the presence a therapy dog had on the behaviors of college students with Asperger’s syndrome and extending previous research (e.g., Martin & Farnum, 2002; Redefer & Goodman, 1989) to an applied clinical setting. Previous studies have focused on young children with autism spectrum disorders and used the presence of distracter objects to examine the behaviors of the children during intervention sessions. This study is the first known study to examine whether an animal-assisted intervention was effective for reducing certain target behaviors (i.e., repetitive behaviors) of college students with Asperger’s syndrome while increasing other prosocial behaviors (i.e., appropriate verbalizations, attention toward consultant). The researcher also sought to examine the effect the therapy dog had on consultation session length and attendance.

Hypotheses

The length of the consultation session increased for all participants ranging from an increase of two minutes to over ten minutes. One hypothesis for the increase in session time was that the participants enjoyed having Noah in their sessions, which they self-reported in questionnaires, and wanted to spend more time with him. While all the participants enjoyed Noah’s presence, their interactions with Noah within the sessions were very different. Prior to beginning the intervention each participant had different experiences with animals that may have contributed to their different interactions with the therapy dog. Some participants enjoyed petting Noah, while others enjoyed having him perform socially responsive behaviors, such as giving his paw. Other participants did not interact with Noah beyond the initial session in which he was introduced. While the increase in session length may be the result of the presence of Noah, it may also be attributed to external variables, such as a different semester schedule which no
longer restricted their meeting times or an increased need for consultation due to academic issues.

In addition to an increase in session length, three out of four of the participants attended more sessions when they knew that Noah was going to be present. Once again, confounding variables, such as a need for more consultation, must be considered for improved session attendance.

While the session lengths and attendance at sessions did improve from the baseline to intervention period, the visual inspection of the graphed data did not reveal hypothesized changes in the participants’ behavior. Visual analysis of graphed data detects large clinically relevant effects. Noah did not appear to have a large enough effect to be observed through visual inspection of the participants’ repetitive behaviors, appropriate verbalizations, or attention toward the consultant. Further, there was no correlation between the percentage of time that participants spent looking toward the consultant and Noah.

**Current Findings in Comparison to Related Research**

Previous research on animal-assisted therapy interventions with individuals with autism spectrum disorders has lacked scientific control. Additionally, they have been conducted in experimental conditions as opposed to clinical settings. Therefore, the results of previous studies may need to be interpreted with caution. For example, in the study conducted by Redefer and Goodman (1989), the research protocol required the therapist to interact progressively more with the child throughout the intervention and encourage more interactions between the child and the therapy dog. The researchers then coded for isolated or self-stimulatory play and social interactions with the therapist or dog. Given the research protocol, which **encouraged** more social interactions on the part of the child than in the baseline sessions when the child was not
required to interact with the therapist, it is not surprising that the children increased their social interactions from baseline to intervention. The progression of directions that occurred throughout the study would have naturally led to more social interactions and less isolation, simply by study design. So, while the researchers found that the children engaged in more socially appropriate activities in this study, it may not be the result of the therapy dog but rather the protocol that was followed.

*Analysis of Current Study*

Despite the increase in prosocial behaviors and interactions that was observed in previous studies, the current study did not find behavioral changes in the participants when Noah was present. There are many reasons why this may be the case. First, this study took place in a clinical setting. The previous studies were designed to examine the interactions of individuals under experimental conditions. Within this study, the only difference in sessions from baseline to intervention involved the presence of the therapy dog, whereas previous studies included changes in protocol and interactions with the therapy dog. The methodological rigor of this study allowed for the minimization of construct confounds by exposing the participants to the same environment with only the key ingredient, Noah, as the treatment component. The participants in the study served as the controls for their behavior and possible extraneous variables, which allowed for the evaluation of the effect of Noah on the targeted behaviors.

In this study, the interactions between the individual and the dog were not encouraged nor the primary focus of the sessions. The reviewed research of previous animal-assisted intervention studies that involved individuals with autism spectrum disorders used protocols that encouraged interactions between the child and the dog, including questions and games to play with the child and dog. Given that previous research had not examined the unstructured presence
of the therapy dog on interactions with individuals with developmental disabilities, this was an important first step.

Also, all of the animal-assisted intervention research with individuals with pervasive developmental disabilities has been with children. This is the first time this intervention has been used with college students. Since adults with disabilities may have more stable behaviors and ways of interacting, one hypothesis for why this study did not find clinically relevant changes is that the behaviors of these adults are more resistant to change since they have been reinforced longer, making them stronger. The participants may also have had previous social skills training to increase their ability to attend to individuals they are talking to or behavioral therapy to reduce their repetitive behaviors. Thus, they may already be functioning closer to their maximum skill level than younger children.

Finally, while many of the children in previous studies had diagnoses of autism or pervasive developmental disabilities, the participants in this study were diagnosed with Asperger’s syndrome. While Asperger’s syndrome falls under the umbrella of pervasive developmental disabilities, there are different diagnostic criteria than for individuals with autism. For example, for a diagnosis of AS the individual must not have impaired speech. Therefore, the individuals in this study may have a better ability to engage in appropriate verbalizations than those children with autism.

*Research Implications*

Studies with scientific control and rigor are needed to propel the field of animal-assisted intervention forward. Results from previous studies are hard to generalize due to their lack of control and methodological flaws. The current study can be used as a model for designing future studies that examine animal-assisted interventions in clinical settings and models the use of
Horner et al.’s (2005) *Quality Indicators and Criteria for Determining Whether a Study Meets the Acceptable Methodological Rigor Needed to be a Credible Example of Single-Subject Research* which can be applied to future single-subject research. Since most animal-assisted intervention research is done with small sample sizes, single-subject research designs may be desirable for evaluating the effectiveness of animal-assisted interventions.

Given that this study did not find an effect on behaviors of college-students with Asperger’s syndrome with a non-directed therapy approach, future research should be conducted using a more structured approach with this population. By definition, individuals with developmental delays have delays in their development which often include social skills and understanding of social play. So, it is possible that the children in previous studies and these college students may not have known how to engage with or “play” with the dog. One of the participants anecdotally reported to the researcher during a consultation session that he did not know how to play with a dog. More structured approaches would require the clinician to involve the therapy dog more directly in the sessions. This could involve having the participant do a specific activity with the dog during each session or having the researcher actively involve the dog in the sessions based upon the participant’s reaction to the dog or current topic of discussion.

Future research should replicate and extend the current study by examining how the presence of a therapy dog affects the social interaction behaviors of children with pervasive developmental disabilities in a clinical setting. Similar to this study, future research should be designed to observe changes in individual’s behavior when a dog is present and when the dog is not present in the sessions. Future research should evaluate the attractiveness and interest that the dog may provide that may elicit novel effects for the participant. Further, evaluating the reactions to a therapy dog over a longer period of time would allow researchers to examine whether the
novel effects that the therapy dog brings to the session created changes in the participant’s behavior.

Previous research procedures are better classified as animal-assisted interventions and while these have provided insight into the interactions of a dog on individuals with autism or other disabilities they have yet to examine the use of animal-assisted therapy, in its true definition-- a targeted intervention designed to assist an individual in reaching his or her targeted goals in therapy. Rather, the research to-date has explored animal-assisted interventions using research protocols and not actual therapy. Future research should examine the effects of animal-assisted therapy on the behaviors of individuals with autism spectrum disorders.

Currently there are researchers who have begun to develop measures to assess the effectiveness of animal-assisted therapy such as the Template for Guiding and Evaluating Animal-Assisted Therapy (Velde, 2005) and Animal-Assisted Therapy: Therapy Effectiveness Evaluation (Glacken and Lawrence, 2005). These tools should be included in future research to begin to evaluate their effectiveness and develop a standardized assessment for evaluating animal-assisted therapy.

Limitations

While this study was designed with scientific control and rigor, the clinical setting in which it was conducted in caused some limitations. Ideally, when conducting single-subject research, a stable baseline is reached prior to the implementation of the intervention. With the limited number of weeks in the semester, the researcher used the absolute minimum of three baseline sessions as criterion for beginning the intervention and having Noah join the sessions. This caused there to be a limited number of data points collected for each individual, making analysis of the data more difficult. Collecting more data points would have allowed for a stable
baseline to be reached for all of the participants prior to the intervention stage. Because of the
time-limited nature of this design that allowed for limited data points, it was difficult to form
conclusions based on the data for some participants.

At the time the study was being conducted, measures did not exist that objectively
evaluated the effect of the presence of the therapy dog. Coding the data was a time and person-
-intensive process that may not be practical to employ in everyday practice or replicate.

Conclusions

The purpose of this study was to determine whether the presence of a therapy dog would
increase appropriate verbalizations and attention toward the consultant and decrease repetitive
behaviors for four college-students with Asperger’s syndrome. The participants in this study
increased the length of their sessions and attendance when Noah was present. However, the
participants did not increase prosocial behaviors (i.e., attention toward the consultant,
appropriate verbalizations) nor decrease repetitive behaviors when Noah was in the sessions.
While these results are not consistent with previous research, the current study was a
methodologically rigorous study. This study did not evaluate animal-assisted therapy, so the use
of a therapy animal as a therapeutic agent in goal-directed therapy with individuals with autism
spectrum disorders still needs to be examined. It is the hope that this study encourages more
research into the effects of animals in therapeutic interventions.
References


Chandler, C. (2001). Animal-assisted therapy in counseling and school settings. ERIC Digest Clearinghouse on Counseling and Student Services, Greensboro, NC ED459404


Figure 1. Set-up of the office where consultation sessions occurred.
Figure 2. This figure shows the results of a questionnaire given to the participants at the conclusion of the study. The ordinate indicates the participants’ response on a 5 point scale ranging from Strongly Disagree (1) to Strongly Agree (5) and the abscissa shows the response of a participant. The columns depict the participants’ response on a 5 point scale ranging from Strongly Disagree (1) to Strongly Agree (5). Each column depicts the response of a participant. The top row represents the response of participant four, the second row depicts the response for participant three, the third row depicts the responses for participant two, and the bottom row depicts the response for participant one.
Figure 3. This figure shows the results of a questionnaire given to the participants at the conclusion of the study. The ordinate indicates the question and the abscissa shows the participants’ response on a 5 point scale ranging from Strongly Disagree (1) to Strongly Agree (5). Each row depicts the response of a participant. The top row represents the response of participant four, the second row depicts the response for participant three, the third row depicts the responses for participant two, and the bottom row depicts the response for participant one.
Figure 4. This figure represents the percentage of the session the participants engaged in repetitive behaviors during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention.
Figure 5. This figure represents the percentage of the session the participants engaged in repetitive behaviors during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. Trend lines, calculated using linear regression, were added for both the baseline and intervention conditions for all participants.
Figure 6. This figure represents the percentage of the session the participants engaged in repetitive behaviors during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The mean, plus or minus one standard deviation, for the baseline was calculated and a box was drawn through the baseline and extended into the intervention condition to show what the baseline mean would look like if it was extended into the intervention.
Figure 7. This figure represents the percentage of the session the participants engaged in repetitive behaviors during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The shaded area to the left of the dashed line represents one standard deviation from the mean of the baseline data while the shaded area to the right of the dashed line represents one standard deviation from the mean for the intervention data. The means for the baseline and intervention sessions are included above the shaded areas.
Figure 8. This figure represents the number of times the participants engaged in repetitive behaviors during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention.
Figure 9. This figure represents the number of times the participants engaged in repetitive behaviors during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. Trend lines, calculated using linear regression, were added for both the baseline and intervention conditions for all participants.
Figure 10. This figure represents the number of times the participants engaged in repetitive behaviors during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The mean, plus or minus one standard deviation, for the baseline was calculated and a box was drawn through the baseline and extended into the intervention condition to show what the baseline mean would look like if it was extended into the intervention.
Figure 11. This figure represents the number of times the participants engaged in repetitive behaviors during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The shaded area to the left of the dashed line represents one standard deviation from the mean of the baseline data while the shaded area to the right of the dashed line represents one standard deviation from the mean for the intervention data. The means for the baseline and intervention sessions are included above the shaded areas.
Figure 12. This figure represents the percentage of the session the participants engaged appropriate verbalizations during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention.
Figure 13. This figure represents the percentage of the session the participants engaged appropriate verbalizations during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. Trend lines, calculated using linear regression, were added for both the baseline and intervention conditions for all participants.
Figure 14. This figure represents the percentage of the session the participants engaged appropriate verbalizations during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The mean, plus or minus one standard deviation, for the baseline was calculated and a box was drawn through the baseline and extended into the intervention condition to show what the baseline mean would look like if it was extended into the intervention.
Figure 15. This figure represents the percentage of the session the participants engaged appropriate verbalizations during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The shaded area to the left of the dashed line represents one standard deviation from the mean of the baseline data while the shaded area to the right of the dashed line represents one standard deviation from the mean for the intervention data. The means for the baseline and intervention sessions are included above the shaded areas.
Figure 16. This figure represents the number of times the participants engaged in appropriate verbalizations during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention.
Figure 17. This figure represents the number of times the participants engaged in appropriate verbalizations during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. Trend lines, calculated using linear regression, were added for both the baseline and intervention conditions for all participants.
Figure 18. This figure represents the number of times the participants engaged in appropriate verbalizations during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The mean, plus or minus one standard deviation, for the baseline was calculated and a box was drawn through the baseline and extended into the intervention condition to show what the baseline mean would look like if it was extended into the intervention.
Figure 19. This figure represents the number of times the participants engaged in appropriate verbalizations during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The shaded area to the left of the dashed line represents one standard deviation from the mean of the baseline data while the shaded area to the right of the dashed line represents one standard deviation from the mean for the intervention data. The means for the baseline and intervention sessions are included above the shaded areas.
Figure 20. This figure represents the percentage of the session the participants paid attention toward the consultant during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention.
Figure 21. This figure represents the percentage of the session the participants paid attention toward the consultant during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. Trend lines, calculated using linear regression, were added for both the baseline and intervention conditions for all participants.
Figure 22. This figure represents the percentage of the session the participants paid attention toward the consultant during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The mean, plus or minus one standard deviation, for the baseline was calculated and a box was drawn through the baseline and extended into the intervention condition to show what the baseline mean would look like if it was extended into the intervention.
Figure 23. This figure represents the percentage of the session the participants paid attention toward the consultant during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The shaded area to the left of the dashed line represents one standard deviation from the mean of the baseline data while the shaded area to the right of the dashed line represents one standard deviation from the mean for the intervention data. The means for the baseline and intervention sessions are included above the shaded areas.
Figure 24. This figure represents the number of times the participants paid attention toward the consultant during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention.
Figure 25. This figure represents the number of times the participants paid attention toward the consultant during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. Trend lines, calculated using linear regression, were added for both the baseline and intervention conditions for all participants.
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Figure 27. This figure represents the number of times the participants paid attention toward the consultant during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The shaded area to the left of the dashed line represents one standard deviation from the mean of the baseline data while the shaded area to the right of the dashed line represents one standard deviation from the mean for the intervention data. The means for the baseline and intervention sessions are included above the shaded areas.
Figure 28. This figure represents the percentage of the session the participants paid attention toward Noah during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention.
Figure 29. This figure represents the percentage of the session the participants paid attention toward Noah during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. Trend lines, calculated using linear regression, were added for both the baseline and intervention conditions for all participants.
Figure 3. This figure represents the percentage of the session the participants paid attention toward Noah during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. The shaded area to the right of the dashed line represents one standard deviation from the mean for the intervention data. Included above the shaded area is the mean for the intervention period.
Figure 31. This figure represents the number of times the participants paid attention toward Noah during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention.
Figure 3. This figure represents the number of times the participants paid attention toward Noah during baseline and intervention conditions. The four graphs represent the data for the four participants. The ordinate for each set of axes indicates the percentage of the session that the behaviors occurred and the abscissa shows the date the session occurred. The data points represented by the circles represent the sessions that occurred during the baseline. The data points represented by the squares represent the sessions that occurred during the intervention, when Noah was present. The data points represented by triangles represent meetings that occurred during the intervention phase in which Noah was not present. The dashed line denotes the phase change from baseline to the intervention. Trend lines, calculated using linear regression, were added for both the baseline and intervention conditions for all participants.
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Figure 34. This figure represents the percentage of the session the participant paid attention to the consultant and the percentage of the session the participant paid attention toward Noah for the intervention sessions. Each participant’s sessions are represented by a different marker which indicates the percentage of time the participant paid toward the consultant and the percentage of time the participant paid toward Noah for that particular session. Jordan’s sessions are represented by a diamond, Eve’s sessions are represented by a square, Benjamin’s sessions are represented by a triangle, and Gabriel’s sessions are represented by crosses.
## Appendix A

### Questionnaire about Semester Satisfaction

Please use the following scale to rate the following statements:

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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Undecided</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statement</th>
<th>Rating</th>
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<tbody>
<tr>
<td>I did better this semester than I did last semester.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I made more friends this semester.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>My grades improved this semester.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>This semester was just like last semester.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I spent more time with other people this semester.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I studied more this semester.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I participated in more social activities this semester.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>The best thing about this semester was:</td>
<td></td>
</tr>
<tr>
<td>The worst thing about this semester was:</td>
<td></td>
</tr>
<tr>
<td>Things I would change about my consultant meetings:</td>
<td></td>
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</tbody>
</table>
Appendix B

Questionnaire about Presence of Noah in Consultation Sessions

Please use the following scale to rate your feelings on the following statements:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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</table>

I like dogs.  
I enjoyed working with Noah.  
I think having Noah there during my meetings was helpful.  
Noah was a distraction to have in the room during my meetings.  
Having Noah in my sessions increased my likelihood of attending my meetings.  
I think having Noah was a good addition.  
Having Noah made me more excited to come to my meetings.  
I preferred working alone with my consultant.  

The best thing about working with Noah was:  

The worst thing about working with Noah was:  

Things I would change when having Noah in meetings:
Appendix C

Operational Definitions of Terms

**Attention toward Consultant** is defined as when the student’s head is pointed toward the consultant in a manner that looks, to the best extent possible with the videotaping abilities of the camera apparatus, like the student is looking at the consultant for a period of five seconds or longer. If the student looks away from the consultant for longer than five seconds and then looks back towards the consultant, it is coded as a separate event. However, if the student looks away from the consultant for less than five seconds, it is coded as one event.

**Attention toward Noah** is defined as when the student’s head is pointed toward Noah in a manner that looks, to the best extent possible with the videotaping abilities of the camera apparatus, like the student is looking at Noah. If the student looks away from Noah for longer than five seconds and then looks back towards Noah, it is coded as a separate event. However, if the student looks away from Noah for less than five seconds, it is coded as one event. Also, direction of attention toward Noah will be coded when the student is petting or engaging in an interaction with Noah for longer than five seconds.

**Appropriate Verbalizations** are defined as the student talking about information pertinent to the conversation of the session, including talking about himself/herself, the dog, or academics. Appropriate verbalizations include the student providing an appropriate response to the consultant’s verbal or nonverbal cues, including if the student provided a relevant answer to a question the consultant posed during the session. Also, if the student asks a question or makes a statement that is relevant to the session, and requires a response from the consultant it will be coded as an appropriate verbalization. If the student changes the topic, related to what is going on in the session (including reactions to Noah) this will be coded as an appropriate verbalization. Appropriate verbalizations do not include when the student is talking about material unrelated to the topic at hand. A response that is given in one to fifteen words (or less than five seconds) will be coded as two seconds.

**Repetitive Behaviors** are defined as non-functional behaviors in which the student visibly, to the best extent possible, engages in an activity with his or her hands for five or more seconds during the session. While these will be different for each student, some behaviors which might be coded for being repetitive include picking of skin, cracking of knuckles, or touching of objects on the desk.

**Length of Session** is defined as the length of the entire session, beginning with the first word uttered by either the therapist or the client, and ending with the last word uttered by either the therapist or the client.
Appendix D

Frequency/Duration of Attention toward Consultant Recording Sheet

Rater Name: _______________________________  Date:________________________
Participant #: ________  Disc #: ________  Copy #: ________
Name of Session: ____________________________

Please record the beginning and ending times of when the student’s attention is toward the consultant, defined as when the student’s head is pointed toward the consultant in a manner that looks, to the best extent possible with the videotaping abilities of the camera apparatus, like the student is looking at the consultant for a period of five seconds or longer. If the student looks away from the consultant for longer than five seconds and then looks back towards the consultant, it is coded as a separate event. However, if the student looks away from the consultant for less than five seconds, it is coded as one event.

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Duration Total: _______ min. _______ sec.  Frequency Total: __________________
Appendix E

Frequency/Duration of Attention toward Noah Recording Sheet

Rater Name: _______________________________ Date: _______________________________

Participant #: ________ Disc #: ________ Copy #: _________

Name of Session: _______________________________

Please record the beginning and ending times of when the student’s attention is towards Noah, defined as when the student’s head is pointed toward Noah in a manner that looks, to the best extent possible with the videotaping abilities of the camera apparatus, like the student is looking at Noah. If the student looks away from Noah for longer than five seconds and then looks back towards Noah, it is coded as a separate event. However, if the student looks away from Noah for less than five seconds, it is coded as one event. Also, direction of attention toward Noah will be coded when the student is petting or engaging in an interaction with Noah for longer than five seconds.

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Duration Total: _____ min. _____ sec.  Frequency Total: ________________
Appendix F

Frequency/Duration of Appropriate Verbalizations Recording Sheet

Rater Name: ____________________________ Date: __________________________

Participant #: ___________ Disc #: ________ Copy #: __________

Name of Session: __________________________

Please record the beginning and ending times of appropriate verbalizations, defined as the student talking about information pertinent to the conversation of the session, including talking about himself/herself, the dog, or academics. Appropriate verbalizations include the student providing an appropriate response to the consultant’s verbal or nonverbal cues, including if the student provided a relevant answer to a question the consultant posed during the session. Also, if the student asks a question or makes a statement that is relevant to the session, and requires a response from the consultant it will be coded as an appropriate verbalization. If the student changes the topic, related to what is going on in the session (including reactions to Noah) this will be coded as an appropriate verbalization. Appropriate verbalizations do not include when the student is talking about material unrelated to the topic at hand. A response that is given in one to fifteen words (or less than five seconds) will be coded as two seconds.

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Duration Total: _______ min. ______ sec.  
Frequency Total: ________________  
Beginning of Session: _______________  
End of Session: _______________  
Total Length of Session: ________________ minutes ________________ seconds
Appendix G  
Frequency/Duration of Repetitive Behaviors Recording Sheet

Rater Name: _______________________________ Date: _______________________________

Participant #: ________  Disc #: ________  Copy #: ________

Name of Session: _______________________________

Please record the beginning and ending times of repetitive behaviors, defined as non-functional behaviors in which the student visibly, to the best extent possible, engages in an activity with his or her hands for five or more seconds during the session. While these will be different for each student, some behaviors which might be coded for being repetitive include picking of skin, cracking of knuckles, or touching of objects on the desk.

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Duration Total: _______ min. ______ sec.  Frequency Total: _________________
Appendix H

Inter-Rater Recording Form

Raters Names: __________________________________________________________

Participant #: ________ Disc #: ________ Name of Session: ___________________

Date:______________ Time Took to Reach Agreement: ________________

Please calculate the agreed upon total number of occurrences (frequency) of the specific behavior throughout the session and total length of time the behavior occurred (duration).

Direction of Attention toward Consultant:
- Frequency: _________
- Duration: _______min. ______ sec.
- Comments:

Direction of Attention toward Noah:
- Frequency: _________
- Duration: _______min. ______ sec.
- Comments:

Appropriate Verbalizations:
- Frequency: _________
- Duration: _______min. ______ sec.
- Comments:

Repetitive Behaviors:
- Frequency: _________
- Duration: _______min. ______ sec.
- Comments:

Rater Initials/Name: ___________________________ ___________________________
## Study Timeline

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<thead>
<tr>
<th>Date</th>
<th>Jordan</th>
<th>Eve</th>
<th>Benjamin</th>
<th>Gabriel</th>
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</table>
Suzanne E. Engel

Certifications:
School Psychologist
Certification Area: School Psychology September 2009
Public School Teacher
Permanent Certification Area: Pre Kindergarten, Kindergarten, and Grades 1-6 September 2008
Public School Teacher
Permanent Certification Area: Special Education September 2008

Select Professional Experiences:
Graduate Fellowship
University of Rochester of Medical Center, Strong Center for Developmental Disabilities, Rochester, New York 2009-present
Pre-Doctoral Internship
Illinois State University, Psychological Services Center, Normal, Illinois 2008-2009
Teacher
Webster Central School District, Webster, New York 2004-2005
Academic Consultant
Alfred University, Alfred, New York 2006 - 2008
Preschool Teacher
Monroe County BOCES #1, Fairport, New York Summers 2004-2007
Graduate Clinician

Select Professional Publications:

Select Conference Presentation:

Grant Funding:
Lea R. Powell Institute for Children and Families April 2008
Fund costs related to dissertation. Funded amount: $500
The Margaret L. Wendt Foundation April 2008
Software and technology to support college students with disabilities.
Funded amount: $27,188 to Alfred University

Select Award/Recognition:
Lea R. Powell Honors Award 2009