ENGAGEMENT DURING ANIMAL-ASSISTED THERAPY FOR CHILDREN WITH AUTISM SPECTRUM DISORDERS

A DISSERTATION

SUBMITTED TO THE GRADUATE SCHOOL

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

BY

KATLYN D. RICE

DISSERTATION ADVISOR: DR. THERESA KRUCZEK

BALL STATE UNIVERSITY

MUNCIE, INDIANA

JULY 2018

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BALL STATE UNIVERSITY

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ABSTRACT

DISSERTATION: Engagement During Animal-Assisted Therapy for Children with Autism Spectrum Disorders

STUDENT: Katlyn D. Rice

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Animal-assisted therapy (AAT) has acquired a strong gathering of anecdotal evidence, but is presently limited in empirical validation as an effective intervention for children with autism spectrum disorders (ASD). Further, the heterogeneity of symptom patterns inherently present in the ASD diagnosis arguably makes group-level analyses challenging in deciphering true specificity of change from interventions. Therefore, this study sought to implement a multiple subject case study design to provide greater specificity in how AAT potentially impacts levels of engagement for children with ASD during social skills lessons. This study's research questions concerned whether observed levels of engagement would increase as compared to off-task behaviors, whether parents would observe functional social skill improvements, and whether parents would observe symptomatic improvements for children with ASD over the course of the social skills lessons within the summer camp programming. While the results of this study did not specifically confirm any of the predicted trends, it appears AAT may potentially increase passive engagement in children with ASD. Further, there may be a developmental difference in AAT and social skill intervention that requires further empirical validation. This proposed mechanism of passive engagement during social skills lessons can inform future study on how

children with ASD may benefit from the presence of therapy dogs to increase overall skill attainment.

Dedication

To all of the Friskys in the world, and especially our Frisky.

Thank you.

Acknowledgements

First and foremost, I want to thank my mentor, advisor, supervisor, and friend, Dr. Theresa Kruczek, for her unwavering support, guidance, and encouragement throughout my entire doctoral study. You have taught me formally and informally in so many ways, and I feel very privileged to have learned so much from you. I will always appreciate your patience and enthusiasm that has helped me become a child psychologist who is not just well rounded, but also a passionate advocate for our children and profession.

Thank you to my committee members: Drs. Renae Mayes, Molly Tschopp, and Evette Simmons-Reed. Each of you has stretched the limits of my study in the exact ways that I needed to grow. Thank you for your persistence, support, and honesty. I feel lucky to have had such a powerhouse committee.

Thank you to my many family members (including fire brothers and sisters) that have supported me in so many ways. I am so grateful to know I have had so much encouragement in so many directions. In different ways, I have learned from each of you to be a passionate, persistent, enthusiastic, and strong contributor.

Thank you to my life partner, Michael Richards. You really deserve an honorary PhD for your unwavering support, patience, and sacrifice throughout all of these years. You have been there at each stressful milestone, housing move, and graduation. You believed in me even when I was questioning, which has meant more to me than I have words to explain.

And last but definitely not least, I want to thank all of my past, present, and future "kiddos" and families who have taught me along my professional journey. I hope to always remember to find a way to find a reason from each person about how to be a better human. I also

hope to remember to always give a piece of my own humanness to others, and do my part to make the world a better place for all of our future children.

Introduction

Autism spectrum disorder (ASD) is a dimensional neurodevelopmental disorder that is characterized by deficits in social communication and interaction as well as repetitive and restrictive patterns of behavior, interests, and activities that occur across multiple contexts (American Psychiatric Association, 2013). Social interaction is often difficult for individuals with ASD, even for individuals with higher cognitive abilities (Shea & Mesibov, 2005). Individuals with ASD have: neural deficits in social information processing (Damiano, Mazefsky, White, & Dichter, 2014), deficits in facial processing and theory of mind tasks (McPartland, Coffman, & Pelphrey, 2011), atypical prefrontal activation during executive functioning tasks (Philip et al., 2012), and divergent auditory and language stimuli processing (Gomot, Belmonte, Bullmore, Bernard, & Baron-Cohen, 2008), each of which contributes to deficits in social skill performance.

Social skill deficits are a hallmark symptom of ASD (Carter, Davis, Klin, & Volkmar, 2005) and the severity of social skill deficits is a strong predictor of treatment prognosis (Siegel, Vukicevic, Elliot, & Kraemer, 1989). These social skill impairments do not typically improve with development, and in fact, distress in social situations may increase over time (White, Keonig, & Scahill, 2007). Also, these deficits are not typically due to a lack of interest, but rather an inability to decide when to use particular skills (White et al., 2007). Reichow, Steiner, and Volkmar (2012) indicated, "social skills groups are one of the most widely used and recommended treatments to improve social skills of higher functioning individuals with ASD" (p. 30). Specifically, modest gains have been identified for social competence, better friendships, and experiencing less loneliness (Reichow et al., 2012). It is well established that treatment for individuals with ASD requires interventions targeting these core social skill deficits

in order for the treatments to be most effective (Damiano et al., 2014). For this reason, social skills training groups have been labeled an "empirically validated" evidence-based practice for individuals with ASD (Reichow et al., 2012).

However, a single treatment is not always the most efficacious for all individuals with ASD. There is a high heterogeneity of symptoms and a variety of symptom patterns within the diagnosis (Reichow et al., 2012). There are also high rates of comorbidity with other psychological disorders (Damiano et al., 2014) and high rates of genetic variability in ASD (Abrahams & Geschwind, 2008). In addition, there is still much confusion on the etiology and pathophysiology of the disorder (Damiano et al., 2014), thus complicating a thorough understanding of the symptom patterns that treatment programs often seek to improve. Unfortunately, these methodological challenges also complicate research by introducing of a broad array of confounding variables. Some specificity is therefore likely lost when group differences are compared if all diagnostic variables are not adequately captured. The described variability of symptom presentation within the ASD population therefore lends support to case study methodological designs, which provide a rich description of particular symptom patterns and how such patterns interact with and influence clinical intervention effectiveness.

Theoretical Debate

The mechanisms by which social skill interventions effect change for children with autism are not entirely clear and there is a lack of consensus supporting a single theoretical model for intervention. Smith and Iadarola (2015) summarized the latest developments in the field as utilizing frameworks from two main theoretical approaches: applied behavior analysis (ABA) theory and developmental social-pragmatic (DSP) theory. However, there is not agreement for which approach is the most efficacious, as both are often used in isolation as well

as in combination with each other (Smith & Iadarola, 2015). Each approach is briefly reviewed hereafter.

Applied Behavior Analysis

The applied behavior analysis (ABA) model conceptualizes ASD as a learning difficulty, and is grounded in behavioral theory (Smith & Iadarola, 2015). While it is currently commonly associated with autism, ABA has historically been used with individuals with intellectual disability and other behavioral disorders. It can also be applied to other conditions (i.e., traumatic brain injury) that interfere with the learning process (Axelrod, McElrath, & Wine, 2012). This method utilizes operant conditioning methods (i.e., targeting behaviors, distinguishing cues, using pivotal training, etc.) in highly structured systems (Smith & Iadarola, 2015). As a behavioral approach, ABA seeks to collect reliable, objective, and quantifiable data to manage behavior (Crowley-Koch & Van Houten, 2013). Once particular problem behaviors are identified and quantified, a highly structured model is developed for each child in order to improve specific skills that ideally then generalize to other similar skills.

Within the ABA model, there are several specific modes of intervention to teach social skills to children, including functional behavioral assessment (FBA) and pivotal response treatment (PVT), among others. A FBA is a structured procedure used to identify variables that interact with, maintain, and at times perpetuate particular behaviors (Davis et al., 2008). Often, a FBA is used to formulate an objective and measurable behavior intervention plan (BIP) that is used to target particular behaviors and skills as a focus of intervention (Davis et al., 2008). Similarly, PVT is also a behavioral approach that uses naturalistic principles to specifically improve on social communication skill acquisition for people with ASD (Lei & Ventola, 2017). PVT includes repeated behavioral trials of a set of targeted skills (i.e., motivation, self-initiation,

self-management) that are thought to extend to other areas of development and functioning (Lei & Ventola, 2017). Lei and Ventola explain PVT is based on ABA principles, and can be an extension of a more formalized FBA. However, as summarized by White, Keonig, and Scahill (2007), while there is evidence to support implementation of ABA interventions to reduce aggressive behaviors and improve functional communication skills in children with ASD (Hanley, Iwata, & Thompson, 2001; Lovaas, 1987), there is currently not the same level of available empirical support for similar interventions focusing on social skills (Bailey, 2001).

ABA is considered the first line treatment for childhood ASD (Vismara & Rogers, 2010) and can lead to successful treatment gains at the group level of analysis, but there is still consistently large variation in individual gains, which has resulted in controversy over the success of ABA methods (Klintwall, Gillberg, Bölt, & Fernell, 2012). Ingersoll (2010) explains some criticize the ABA model "for a failure to address specific deficits associated with autism and a focus on isolated behaviors, which could lead to difficulty with generalization and maintenance" (p. 37). It is likely these individual differences arise due to the heterogeneity of symptoms within the ASD diagnosis, which are not examined at the group aggregate level. Also, the ABA model addresses specific behaviors, and translation of treatment gains and maintenance to other areas beyond these specific behaviors is often limited. The developmental theoretical framework may better capture the heterogeneity of symptoms within the ASD diagnosis and will be described next.

Developmental Social-Pragmatic

As its name suggests, the developmental social-pragmatic (DSP) model uses a developmental perspective, which recognizes ASD as an inability to engage with others that can lead to a cascade of other communication difficulties (Smith & Iadarola, 2015). The DSP model

uses a developmental and relationship-focused approach to address socio-emotional functioning with observance of the heterogeneity of symptoms associated with ASD (Smith & Iadarola, 2015). This theoretical framework emphasizes the complexity of symptom patterns and seeks to address the skill deficits through a broader lens than ABA models. The DSP model is based on child development research, and seeks to examine the relationship between a child's social-communication development and his or her caregiver's response (Ingersoll, Dvortcsak, Whalen, & Sikora, 2005). The DSP approach proposes a child's language skills develop from strong relationships between the child and a caregiver with an emphasis on communication around emotional experiences and the effective expression of emotion (Ingersoll et al., 2005). Instead of targeting behaviors, the DSP model focuses on the required capacities of development, with skills taught in a sequence that is similar to typical child development (Casenhiser, Shanker, & Stieben, 2013).

DIR Model. A specific DSP model for intervention is the developmental, individual-difference, relationship-based (DIR) model (Greenspan & Wieder, 1999). The DIR model is grounded in developmental theory and utilizes a multidisciplinary framework to build social, emotional, and intellectual abilities in children (Greenspan & Wieder, 2006). It was based on over 50 years of collaborative research from the fields of psychology, medicine, and education (Hess, 2015). Greenspan (2007) has identified the model as a biopsychosocial approach that stems from developmental foundations. According to the Interdisciplinary Council of Development and Learning (ICDL, 2016) webpage, the DIR model is "an interdisciplinary, individualized, whole-child, developmental approach that is broad in both its approach and it's impact, making it more complex to quantify in research."

In general, the DIR model suggests all children must master six functional emotional skills in development, as summarized in Appendix F (Greenspan & Wieder, 2006). This includes the following: 1) self-regulation, 2) attachment and engagement in relationships, 3) two-way purposeful communication, 4) behavioral organization, problem-solving, and internalization, 5) representational capabilities, and 6) representational differentiation (Dionne & Martini, 2001; Greenspan & Wieder, 2006). The ultimate goal of the DIR model is to assist children with reestablishing affective contact with caregivers and to begin to master these proposed six milestones.

While there is a need for further empirical validation, the DIR model is currently considered a possibly effective evidence-based practice (Mercer, 2015). The DIR model has been proposed as potentially useful in improving child interpersonal skills, decreasing caregiver stress, and improving parent-child relationships (ICDL, 2016). Overall, the individualized nature of the DIR model is an important strength and allows for greater individual specificity; however, this approach is complex and therefore difficult to study empirically. Additionally, the emphasis of DIR is typically on the infant/toddler caregiver relationship with the goal of establishing a solid foundation for interpersonal relationships. When applied to older children on the autism spectrum, concepts from DIR model must be adapted and integrated. The logic behind this adaptation is that the social and emotional development of children with ASD is delayed and therefore these skills might be comparable to those seen in younger children. Therefore, an adaptation of the DIR model was implemented for this study in an attempt to better address the core features of the individualized developmental progression and symptom patterns of participants.

Engagement

Engagement has been suggested as one of the core features leading to student achievement in the academic setting (Greenwood, Horton, & Utley, 2002). However, academic engagement includes a variety of behaviors and has not been clearly operationalized (Sparapani, Morgan, Reinhardt, Schatschneider, & Wetherby, 2016). The National Research Council (2001) recommended a minimum of 25 hours per week of active academic engagement for children with ASD. Unfortunately, children with ASD face a variety of learning challenges that make academic engagement difficult. Sparapani et al. (2016) summarized the available current literature and categorized these learning challenges as follows: deficits in emotional regulation, deficits in joint attention, deficits in social connectedness, difficulty understanding and initiating nonverbal and verbal communication, and having the presence of restricted and repetitive behaviors. In order to assess these learning challenges, Sparapani et al. developed the classroom measure of active engagement (CMAE), which is an observational measure to evaluate active engagement for students with ASD. The structure of the CMAE includes a 5-factor model of the following dimensions: promoting emotional regulation, classroom participation, social connectedness, initiating communication, and flexibility. However, the CMAE and proposed dimensions of active engagement are very newly developed and are in need of more empirical investigation. Further, more research is required to decipher the most effective methods for increasing academic engagement in children and adolescents with ASD, as well as application of the proposed mechanisms of engagement outside the classroom. The present study will be utilizing the various concepts of engagement as described by Sparapani et al.'s 5-factor model to facilitate social skills development in elementary school aged children with ASD. Further, given that many children with ASD struggle with interpersonal engagement, the current investigation

will explore the use of animal-assisted therapy to serve as a bridge for developing human-to-human social skills.

Animal-Assisted Therapy

There is much anecdotal evidence regarding the effectiveness of animal-assisted therapy (AAT) for individuals with autism, but empirical evidence for this approach is still in its infancy. However, there is an emerging body of evidence to support AAT with ASD (Stewart, Chang, & Rice, 2013). Most current literature identifies AAT as an adjunct approach within the traditional counseling realm. Many different theoretical models of AAT have been suggested, but there is not yet agreement on any one empirically-based framework for AAT (O'Haire, 2010). Most authors agree the human-animal interaction (HAI) model most closely describes the theoretical foundations of AAT (O'Haire, 2010). Within the HAI model, two explanatory models have been developed: the biophilia and social support hypotheses.

Human-Animal Interaction Model

The human-animal interaction (HAI) model is a general theoretical framework that describes the relations between humans and animals in a variety of contexts. Research on HAI began in the 1980s and has been steadily growing (Hosey & Melfi, 2014). The premise of this theory is animals enhance human social support both directly and indirectly (O'Haire, 2010). The basis of the HAI model rests on the belief that humans have a desire to connect with animals on an emotional level, a desire that can present in a variety of ways (Hosey & Melfi, 2014). The theory assumes humans are social creatures and have the capacity to develop and engage in social interactions with other animals, including other humans (Freund et al., 2016). HAI can play a role in improving human health, preventing emotional distress, reducing stress, and

increasing well-being across the lifespan (Freund et al., 2016). Freund et al. suggest HAI has social, emotional, physical, cognitive, and attachment benefits.

Biophilia Hypothesis. The biophilia hypothesis suggests humans are attracted to other living beings for a variety of reasons, mainly evolutionary success and positive reinforcement (O'Haire, 2010). From an evolutionary perspective, our relationship with animals provided protection from predators and increased our survivability. Animals also help us be more efficient in task completion (e.g., work horses and oxen) as well as personal care (e.g., wool for clothing and food). On the other hand, animals can reciprocally benefit from human contact through the acquisition of food, shelter, and care, which further strengthens the human-animal connection. Instinctive animal behaviors can also act as an environmental signal of either safety or danger to us (Wilson, 1984). Further, interaction with animals appears to provide a calming and relaxing effect in people. This feeling motivates further interaction through positive reinforcement (Gullone, 2000). The positive attraction between humans and animals is strengthened by the ability of animals to relieve anxiety during times of stress (Friedmann, 1995). This human attraction to animals is the foundation of the biophilia hypothesis.

Social Support Hypothesis. In addition, the social support hypothesis theorizes animals facilitate social interactions with and between people, thereby reducing loneliness (O'Haire, 2010). This assistance in connecting people with each other is exhibited in a variety of ways (e.g., as a bridge to socialize people attending dog or horse shows, as a conversational starter for individuals going on walks, etc.), but O'Haire suggested animals also provide people with social support through the animal's constant availability, nonjudgmental stance, and unconditional love. In these ways, humans are able to develop unique and supportive relationships with their animals, as well as other humans. Specifically, O'Haire suggested people often form strong

attachments to their pets, even including pets in their families. Research has inferentially supported this theory as cancer patients have identified a decreased sense of loneliness and isolation resulting from engagement with a therapy animal (Muschel, 1984). Beck and Katcher (2003) found interaction with companion animals effectively reduces feelings of isolation and loneliness with elderly populations who may need more social support in the face of losing friends and family members. Norris, Shinew, Chick, and Beck (1999) found pet owners had higher correlations between life satisfaction and perceived health than non-pet owners. In general, the social support hypothesis postulates engagement with animals facilitates positive social interactions (Levinson, 1969).

Animal-Assisted Therapy Theoretical Model for Counseling

Stewart et al. (2013) used grounded theory to identify four themes associated with AAT in the counseling context. First, AAT can facilitate the development of unique skills and competencies to improve clinical outcomes. Participants in the study by Stewart et al. suggested their involvement in AAT connected previously learned skills with more formal training procedures and increased purpose within interventions. These AAT counselors advocated for more rigorous counseling-specific training and registration to ensure professional competence. Second, AAT makes use of a highly developed relationship with the therapy animal. As such AAT requires the counselor to serve as an animal advocate (i.e., protecting the animal from distress and working within the animal's abilities) and interpreter of animal responses (i.e., alerting the therapist to subtle client responses). In this manner, the animal serves as a type of co-therapist. Third, AAT positively impacts the therapeutic process by enhancing therapeutic rapport, strengthening the therapeutic relationship, and grounding the session in the here-and-now. Fourth, Stewart et al. noted AAT enhanced scores on traditional counselor-client

relationships. Use of animals also may provide an opportunity for therapeutic touch, enhance core elements of therapy (i.e., empathy, congruence, unconditional positive regard), strengthen human-animal connection (described by some as a spiritual connection), reduce therapist burnout, and improve wellness (Stewart et al., 2013). Stewart's et al.'s work can provide some guiding principles for the use of AAT in the counseling setting as well as offer some preliminary support for the effectiveness of AAT.

The Current Study

The proposed investigation will integrate and extend the previous literature by using the construct of engagement to evaluate the effect of AAT on social skills development during a summer program for children diagnosed with ASD. This study will also add evidence to support the use of a developmentally adapted DIR framework to better address the individualized needs of participants. It is hypothesized the DIR framework can better address the unique needs and symptom clusters of children with ASD, participating in a summer program, albeit in a limited way. Further, use of a multiple case study design will lend more insight into how each child's unique symptom patterns present, and how they are potentially associated with the interventions and level of engagement. Finally, while there is general evidence-based support for group interventions for those aged between six to 21 with ASD (Reichow et al., 2012), there has still been limited research on what specific aspects of those group interventions are most effective and which mechanisms of delivery are most effective. As such, this study will add empirical evidence for social skills programming for children with ASD in the context of the DIR framework.

Research Questions

The current investigation seeks to extend previous research and test an integrated theoretical model of social skills development using AAT with children on the autism spectrum. The following three research questions are proposed:

1. Does the use of AAT:
    a. Increase overall engagement as compared to off-task behaviors?
    b. Increase active engagement time (AET) as compared to passive engagement time (PET)?
    c. Reduce off-task motor (OFT-M) more than off-task verbal (OFT-V) and off-task passive (OFT-P)?
2. Do the parents of the children diagnosed with ASD participating in a social skills group observe functional social skill improvements, as measured by the Autism Social Skills Profile (ASSP), in their children over the course of the summer camp program?
3. Do the parents of the children diagnosed with ASD participating in a social skills group observe ASD symptom improvements, as measured by the Autism Spectrum Rating Scales (ASRS), in their children over the course of the summer camp program?

Methods

Participants

Campers. The participants for this study were chosen from a summer camp program provided on a Midwestern university campus for approximately 30 children diagnosed with ASD with a variety of functional skills. Ten of the 30 campers were chosen by random selection to participate in the present study. Exclusionary criteria included: female gender, parental figures whose primary language was not English, and severe deficits in child participant's verbal and

adaptive skills. After exclusion criteria were applied, randomization was conducted within each of the three age groups, and the first three children randomly selected for each age group were chosen to participate in this study. A fourth child was added for the youngest group because researchers were unaware of participant functioning level at time of data collection. However, one participant was subsequently excluded from this youngest group (due to low functioning level and poor attendance). After camp completion, one participant had to also be excluded in the middle age group due to limited presence on the video recordings. This left a total of eight participants included in this research study, summarized in Table 1 below. All participants were known to have a range of motor skills, affective skills, verbal abilities, and sensory skills. Parents of participants received a small ($5) gift card compensation for study participation.

Table 1: *Participant Background*

Participant	Age	Grade	Group	Comorbid Diagnosis	Medical History	Race/ Ethnicity	Family Status	Average Family Income
1	8	2	1	NR	NR	Caucasian	Married	$75,000
2	7	1	1	ADHD	Chronic ear infections (tubes x2)	Caucasian	Married	$65,000
3	7	1	1	NR	NR	Caucasian	Single (Mother)	$18,000
4	9	2	2	NR	NR	African American	Single (Mother)	$25,000
5	9	2	2	NR	Mild eczema, seasonal allergies	Caucasian	Married	$47,000
6	11	5	3	ADHD, Kabuki Syndrome	NR	Caucasian	Married	$20,000
7	13	8	3	ADHD	NR	Caucasian	Married	$120,000
8	12	6	3	NR	One Seizure	Caucasian	Married	$100,000

Note: NR = Not Reported

Treatment Team. The treatment team consisted of Clinical Mental Health Counseling and School Counseling masters-degree students, Counseling Psychology doctoral student supervisors, a School Counseling/Counseling Psychology faculty Supervisor, and a therapy dog. The social skills counselors consisted of fourteen Clinical Mental Health Counseling masters-degree students who volunteered to implement the lesson plans throughout the summer camp program as part of their masters-level practicum or internship. A school Counseling masters-degree student served as the program's graduate assistant to help prepare the classroom and lesson materials, as well as assist in collecting data. The three doctoral student supervisors were enrolled in a Counseling Psychology degree program and had a graduate assistantship to provide camp supervision. The participating therapy dog was trained by a licensed psychologist and obtained his certification through the Alliance of Therapy Dogs (www.therapydogs.com). The therapy dog was an 11 year old, mixed breed, medium-sized, male dog of approximately 65 pounds.

Procedures

This study was approved by the Ball State University Institutional Review Board (IRB), which was obtained prior to data collection.

Data Collection Procedures. A variety of information sources were utilized for participant, including: review of background documents (camper charts, diagnostic information, prior testing reports, etc.), pre-/post-test self-report scales completed by the parents of the participants (ASRS, ASSP), and direct behavioral observations of engagement behaviors coded by research assistants using the Behavioral Observation of Students in Schools (BOSS; Shapiro, 2013) observational system of videotaped segments. The background documents provided more in depth, thick descriptions and specific ASD symptom and developmental patterns for the

children chosen for study. The ASRS and ASSP were objective measures which described each child participant's functional behavior and symptom patterns, as described by parents, before and after participation in the camp. Parents of each participant completed the ASSP and ASRS one week before and during the final week of camp. Finally, the BOSS observational coding tracked the participant's level of engagement/non-engagement in lessons during treatment as usual (social skill lessons) and the focused technique (AAT). Specifically, BOSS observational coding identified when and how often campers were engaged versus non-engaged, with specific comparisons of these behaviors.

Video Recording and Coding. Two iPods were set-up in two corners of the social skills room in an attempt to video record the entirety of the sessions. The social skills graduate assistant uploaded the videos to a password-protected computer. When not in use, the password-protected computer and iPods were stored in a lock box that was stored in a secure location in the clinic. Videos were then edited to only include the middle portion of the content of the lesson (excluding the transition segments), totaling 15 minutes of video per child per day. A total of 80, 15-minute videos were included in this study, divided into six weeks. Videos were then re-labeled with non-identifying codes and randomized to ensure video order was masked. Videos were then randomized again within each week, so each research assistant was coding the same videos each week, but in a different order. This double randomization procedure served to reduce potential expectancy bias.

As previously indicated, only the content portion of the social skills lessons were coded in order to compare the level of engagement between treatment as usual and the focused AAT technique. The first week of camp was used as a partial baseline, as this week served to introduce the campers to camp, help the campers learn the social skills theme, assist the campers

in adjusting to the social skills schedule, and establishing rules for the social skills room. The AAT did not begin until week two in order to allow the students to first become adjusted to camp. For weeks two through five, two video segments were chosen per week and included 1) a treatment as usual lesson and 2) the focused AAT lesson. The treatment as usual lesson usually occurred on a Tuesday, but occurred on a Wednesday for Week 4 due to a Monday holiday. This slight adjustment served to ensure the treatment as usual lesson being coded consistently occurred on a non-transition day.

Coders were trained on the BOSS (Shapiro, 2013) system by coding "practice sessions." Session duration was set to 15-minutes to align with the video segments. Interval coding was set to 15 seconds during which coders identified the observed behaviors. This coding procedure is similar to that used by Nicholson, Kehle, Bray, and Van Heest (2010), who measured antecedent physical activity on academic engagement for children diagnosed with ASD.

Previously excluded study participants for each of the three age groups were chosen as the "practice" participants. With guidance from the principal investigator, the research assistants used these sessions to develop 80% inter-rater agreement in their coding procedures for all BOSS categories (i.e., Overall, AET, PET, OFT-M, OFT-V, and OFT-P) prior to coding for data. Inter-rater agreement was calculated separately for each category, since agreement on the "overall" category could be artificially inflated due to a prevalence bias of the "none" code. To establish a baseline level of agreement, research assistants coded three videos individually, then coded as a group with the principal investigator. During this training phase, comparisons were made between the individual and group coding in order to improve recognition and agreement on which observed behaviors constituted coding categories. This pattern was then repeated three times before baseline reliability was established. Finally, the research assistants coded three

more videos individually to ensure consistency in inter-rater reliability had been achieved and sustained.

Next, the two research assistants coded the video recorded sessions in a pre-arraigned and randomized order. Research assistants were instructed to code for a maximum of 45 minutes (three videos) followed by at least a 15-minute break before returning to coding, and cap coding at two hours per coding session. This schedule was designed to reduce coding fatigue. Research assistants coded the videos separately. The principal investigator conducted a weekly reliability assessment and sought feedback from the research assistants throughout coding to ensure continued inter-rater reliability.

There were times when participants left the video-recoding screen (i.e., walking to non-recorded corners of the room, leaving the social skills room to use the Sensory Room, using the tent). In these instances, research assistants were instructed to not code anything, leave the BOSS session running, and resume coding once the participant re-entered the screen. Further, there were times when either the participant's back was to the camera, or only part of his body was in the video frame. In these instances, research assistants were instructed to infer coding when possible. During these instances, inter-rater reliability was later evaluated to determine whether the poor video content significantly effected coding. One participant from the middle age group was excluded from the study because he was absent from the video frame for two of the days used for coding. This left a total of eight participants, three participants in the youngest age group, two in the middle age group, and three in the oldest group.

Treatment Team. The role of the social skills counselors was to carry out lesson plans developed by the doctoral students and faculty supervisor. The role of the doctoral student supervisors was to ensure all campers were engaged, ensure the lesson facilitators adhered to the

DIR model, and to assist in de-escalation techniques if required. Two camp staff were assigned to each age group by camp administrators to accompany the campers to the social skills classroom and support the social skills counselors. The camp staff's role was to assist in keeping campers engaged (i.e., re-focusing disengaged campers back into the lesson), assist with de-escalation techniques if required, provide one-on-one guidance for lower-functioning campers, and radio camp administrators when crisis situations arose.

Prior to the camp, doctoral supervisors participated in preparatory supervision with the School Counseling/Counseling Psychology faculty supervisor for the Camp. All social skills counselors participated in five hours of orientation didactics, which included specific skills training on the following topics: working with children diagnosed with ASD, the DIR model, and camp protocols. This orientation was provided by the doctoral student supervisors and supervised by the faculty supervisor. One of the doctoral supervisors and the faculty supervisor provided a one-hour orientation to the camp staff on the theoretical basis for the social skills group.

Daily supervision with a doctoral supervisor (and at least once a week with the faculty supervisor) was embedded within the camp schedule. There was a "teacher preparation" hour built into the camp schedule and for the social skills class this hour fell between the second and third social skills classes. This hour was used for group supervision each day, led by doctoral student supervisors. Social skill counselor attendance in this group supervision session was mandatory for each camp day worked by social skills counselors. Treatment fidelity to the DIR model was ensured through in-person supervision and weekly group supervision sessions led by the three doctoral students trained in the DIR method. Doctoral supervisors were supervised by

the faculty supervisor, a licensed HSPP psychologist. Supervision of doctoral student supervision occurred approximately one hour for each week of camp.

Camp Structure and Function. To be accepted in the camp, the families of the children had to complete an application. All children were either diagnosed with ASD by a health professional or received educational accommodations for ASD. The children attended camp seven hours each day, five days per week, for a total of five and a half weeks, and all children were separated into three age/functional groups of approximately ten participants each. The groups generally ranged from ages six to eight, eight to ten, and ten to 14. Occasionally, a child might be placed with an age group above or below his chronological age based on functional behaviors. Each age group had five to six core staff assigned to them who travelled with them across activities. The three age groups rotated through a series of one hour lessons in designated content area rooms, including: Social Skills (the focus of this intervention and investigation), Language Arts, Science, Math, and Motor Skills. Additional camp activities included Tutoring, Snack, Lunch, and "Pay Off"/Reinforcement.

Behavior System. The camp used a behavior management, level system with tiered levels of rewards. The camp used various colored tear-away bracelets and markers to reinforce and monitor each camper's progress through the level system. Each level was represented by a certain color. Each camper started each day on level one. Camp counselors awarded participants with "points" for observed positive and target behaviors on these bracelets. Once the camper's bracelet reached 10, the camper then "moved up" a level, again with an associated bracelet color. Progressively higher levels moved the camper into a new and higher/bigger reward tier. At the end of the day, all of the campers attended "Pay Off" where they could "cash

in" their reward bracelets for a fun activity (i.e., swimming, hula hoops, parachutes, LEGO® time) associated with their earned reinforcement level.

Camp Theme. In order to make the camp activities seem less academic, each year the camp is structured around a general theme and each content lesson area is decorated with a specific aspect of the theme. Further, lessons within the content area utilize the theme concepts. Age groups are allowed to choose their own group name in keeping with the year's theme. For example, during the camp year of this study, the theme was Disney Pixar. Each room incorporated decorations and content lesson activities associated with specific Disney Pixar movies. The social skills group used the *Inside Out* (Rivera & Docter, 2015) movie theme for decorations and lesson activities.

Social Skills Lesson Design and Implementation. The social skills group incorporated the behavioral components of the camp's level system with Greenspan's (1997) developmental, individual-difference, relationship-based (DIR) model. The social skills curriculum was broadly differentiated for the various age levels and then further differentiated within each age level to meet a specific child's functional capabilities in terms of affective relationship skills (personal emotional awareness and capacity for empathy), and individual developmental differences (motor, sensory, affective, cognitive, and language) (Greenspan & Wieder, 2006).

The content of the social skills lessons focused on identification of core emotional experiences and developing capacity for emotional regulation through experiential learning, as outlined by Greenspan and Wieder's (2006) DIR model. Lesson titles included: Group Introductions, Teamwork-Building, Sadness, Happiness, Anger and Conflict Resolution, Fear and Anxiety, Relaxation and Coping, Social Support, Getting Along with Others/Bullying, Self-Esteem/Encouragement, All About Manners, Un-birthday Celebration, Preparing for Goodbyes,

Getting Ready for the Future, and Saying Goodbye. Lessons included a combination of psychoeducational and experiential activities designed to teach lesson content and provide an activity in which campers could practice related skills.

Social skills lessons were implemented by treatment teams, which included: three to five masters-level social skills counselors, one masters-level graduate assistant, one doctoral student supervisor, and one camp staff member. Once a week, beginning in the second week, one lesson per week was implemented by the faculty supervisor and therapy dog. Social skills counselors, supervisors, and camp staff remained in the room with the therapy dog and faculty supervisor to help implement the lesson. Additionally, the faculty supervisor was part of the treatment team one to two additional times during the week without the therapy dog.

The sequencing of activities within the social skills class was designed to try to provide an optimal learning environment for children with ASD. Activity sequencing involved using a consistent daily structure and routine. Additionally, room location and visual aids were used to orient and guide the campers through the daily activities and lessons. The schedule of rotating stations was as follows: schedule review (front of classroom), yoga (center of classroom), feeling identification practice (side of classroom), lesson content (center of classroom), social reinforcement (back of classroom), and yoga (center of classroom). Yoga practices were included as bookend activities to facilitate campers in transition to and from lesson activities as well as to help campers develop an additional self-regulation skill. The yoga routine involved a simple sun salutation sequence followed by savasanna and diaphragmatic breathing. The feeling identification practice included facilitating campers in choosing a colored ring that was labeled with visual aides for particular emotion states for the remainder of the lesson, as aligned with the *Inside Out* (Rivera & Docter, 2015) theme (i.e., yellow as happy, red as mad, blue as sad, purple

as fear/anxious, and green as jealous). This activity allowed campers to practice identifying their daily emotional state, verbalize their emotional experience, and practice empathy and communication with peers around feelings. A feelings wheel visual aide with pictorial representations of the emotional states was used with non-verbal campers to allow them to identify and communicate. At the end of each social skills class, two campers per age level were rewarded with social praise and their picture was posted to celebrate their success in class that day. This public recognition was designed to encourage and reinforce positive skill attainment. Camper pictures were displayed for two sequential camp days.

At times, campers needed a safe and less sensory stimulating environment in order to facilitate emotional regulation and self-soothing. There were two options to reduce stimulation in order to facilitate self-regulation. First, campers could work one-on-one with a social skills counselor or camp staff to try to self-regulate within the classroom. Alternatively, campers could leave the classroom to use the "sensory room." This room was separate from the classrooms and included a variety of mechanisms for self-stimulation and sensory reduction. Additionally, the middle-aged group was able to use a pop-up tent in the social skills classroom room for this same purpose. This tent was not used with the youngest group as several of the campers were using it as a task avoidant strategy. The oldest group, on the whole, did not need the tent, as they were better able to verbalize their need to go to the sensory room.

AAT Social Skills Lesson. As described above, one day per week, beginning with the second week, the social skills class utilized a trained therapy dog for AAT. The therapy dog's owner, a licensed psychologist and the faculty supervisor for the camp, accompanied the therapy dog for all AAT lessons. The therapy dog joined the group the second week of the camp in order to establish a baseline for skill development in week one. This schedule also provided

opportunity for the campers to build group cohesion, adjust to camp, and develop some self-regulation skills before interacting with the therapy dog. The AAT lesson days were scheduled in the middle of the week (a non-transition day). Broadly, the content for AAT lessons involved the following goals: developing physical and emotional self-control, developing greater awareness of verbal and non-verbal communication cues, and identifying core needs of animals and humans through discussion of Maslow's (1948) hierarchy of needs. To attain such goals, each AAT the lesson utilized a combination of psychoeducation regarding the previously described content, practice engaging with the dog, and practice building on engagement skills by working from dog-human to human-human interactions to improve skill translation.

Measures

Autism Social Skills Profile. The Autism Social Skills Profile (ASSP) is an instrument that measures functional social skills in children and adolescents with ASD ages six to 17 (Bellini & Hopf, 2007). The ASSP was developed to evaluate social skill development rather than to be used for diagnostic decision-making, like most other available scales. While further validation is needed, initial psychometric assessment of the ASSP supports its reliability (internal consistency and test-retest reliability) and validity (concurrent) (Bellini & Hopf, 2007). A parent, teacher, or other adult who is familiar with the child can complete the ASSP. It has 65 items, and takes about 15-20 minutes to complete. Scoring includes a summation (after reverse scoring for a few items) for the Total Score, as well as three factors: social reciprocity, social participation/avoidance, and detrimental social behaviors. Score calculations also involve reverse scoring for 12 items (changes conversation to fit self-interests, misinterprets intentions of others, makes inappropriate comments, engages in solitary interests and hobbies, ends conversations abruptly, fails to read cues to terminate conversations, exhibits fear or anxiety

regarding social interactions, experiences negative peer interactions, engages in socially inappropriate behaviors, exhibits poor timing with social interactions, is manipulated by peers, and engages in solitary activities in the presence of peers). The total score of the instrument is the most reliable (Cronbach's alpha = 0.926, test-retest reliability of 0.904), followed by the social reciprocity factor (Cronbach's alpha = 0.921, test-retest reliability of 0.89), the social participation/avoidance factor (Cronbach's alpha = 0.891, test-retest reliability of 0.86), and finally the detrimental social behaviors factor (Cronbach's alpha = 0.848, test-retest reliability of 0.84) (Bellini & Hopf, 2007). Bellini and Hopf assessed concurrent validity by comparing children whose parents identified they had at least one friend to children who were identified as not having at least one friend. Resolutely, children with at least one identified friend scored significantly higher on the ASSP than children without a friend. While the authors note this provides preliminary evidence for concurrent validity of the ASSP, they suggest further research on concurrent validity and reliability across ASSP informants be better established.

Autism Spectrum Rating Scales. The Autism Spectrum Rating Scales (ASRS) measures symptom patterns and provides a variety of treatment scales for intervention (Goldstein & Naglieri, 2009). The ASRS is available in two forms: ages two to five years and ages six to 18 years (form used in this study). The ASRS has 71 items and can be completed in approximately 20 minutes by parents, teachers, or other caregivers in a child's life. Scoring procedures are outlined in the ASRS manual (Goldstein & Naglieri, 2009). Results provide differentiation on a total of four scales: Total Score, ASRS (Social/Communication, Unusual Behaviors, and Self-Regulation), DSM-5, and Treatment. The Total Score reveals the overall degree of ASD behaviors demonstrated by the child, and is equally derived from the three ASRS Scale sections (Social/Communication, Unusual Behaviors, and Self-Regulation). The DSM-5

Scale consists of the following subscales: Peer Socialization, Adult Socialization, Social/Emotional Reciprocity, Atypical Language/Stereotypy, Behavioral Rigidity, Sensory Sensitivity, and Attention. The ASRS normative sample included a 2,560 non-clinical sample from across the United States, with even proportions of age and gender and sample characteristics comparable to the 2000 US Census report (Goldstein & Naglieri, 2009).

The ASRS has been assessed for reliability (internal consistency, test-retest, score stability, and interrater reliability and consistency) and validity (content, criterion-related, and construct) (Goldstein & Naglieri, 2009). For the six to 18 years form across parent and teacher ratings, the Cronbach's alpha for ASRS total score was 0.97, between 0.92 and 0.95 for the ASRS Scales, between 0.95 and 0.97 for the DSM-V Scale, and between 0.73 and 0.92 for the Treatment Scales (Goldstein & Naglieri, 2009). The corrected *r* for the test-retest reliability for the six to 18 years form for both parent and teachers ratings was as follows: between 0.78 and 0.92 for Total Score, between 0.72 and 0.93 for the ASRS Scales, between 0.78 and 0.91 for the DSM-V Scale, and between 0.70 and 0.92 for the Treatment Scales (Goldstein & Nagileri, 2009). Across all scales for the parent ratings of the six to 19 year forms, the inter-rater reliability and consistency ranged between 0.73 and 0.92, with over 90% of the differences within one standard deviation for the majority of the scales (Goldstein & Naglieri, 2009). Content validity reflected seven content items (socialization, social and emotional reciprocity, language stereotypes, behavioral rigidity, sensory sensitivity, attention, and self-regulation), which are similarly reflected in symptom patterns within the DSM-5 and other rating/interview scales such as the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, & Risi, 1999) and the Autism Diagnostic Interview, Revised (ADI-R; Rutter, LeCouteur, & Lord, 2003) (Goldstein & Naglieri, 2009). Criterion-related validity was established through a

comparison of ratings of children with ASD, children in the general population, and children with other clinical diagnoses. Goldstein and Naglieri note group membership had a significant main effect for each scale and each form. Specifically, the ASD group scored higher on all domains than the general population, with large effect sizes (Cohen's *d*s > 0.80). As compared to other clinical diagnostic groups, the ASD group also scored significantly higher on all domains for the parent form, with large effects (mean *d* = 1.36) (Goldstein & Naglieri, 2009). When specifically compared to an ADHD group, the ASD group demonstrated significantly higher scores on all scores except for Self-Regulation and Attention scales with large effect sizes (mean *d* = 1.01). The ASRS also can accurately differentiate ASD from the general population with a 90.1% classification rate, as measured through discriminant function analysis (Golstein & Naglieri, 2009). Finally, construct validity was identified through exploratory factor analysis, which identified a three-factor model for the six to 18 years parent version, involving the Social/Communication, Unusual Behaviors, and Self-Regulation (Goldstein & Naglieri, 2009). Goldstein and Naglieri argued that the scale structure generalizes across demographic groups and is correlated with scores on other commonly used ASD measures.

Behavioral Observation of Students in Schools. The Behavioral Observation of Students in Schools (BOSS; Shapiro, 2013) is a software program that provides an electronic mechanism to record student engagement behaviors in an academic environment. It is an application downloadable on either iOS or Android systems and tracks active, passive, and off-task behaviors. The BOSS program includes interactive, changeable buttons that can be set to code a variety of specific student engagement behaviors. Time intervals can also be customized to facilitate efficiency of data collection. The standard categories of the BOSS program (Shapiro, 2004), are as follows: active engagement (AET, when the participant is actively

attending to the assigned work), passive engagement (PET, when the participant is listening to the teacher/peer), off-task verbal (OFT-V, any audible verbalizations that are not permitted and/or are not related to an assigned academic task), off-task motor (OFT-M, any instance of motor activity that is not directly associated with an assigned academic task), and off-task passive (OFT-P, times when a student is passively not attending to an assigned academic activity for a period of at least three consecutive seconds). AET and PET are collected through momentary time sampling, while off-task behaviors are collected through partial-interval time sampling.

A few slight additions to the standard BOSS categories were made for use with this population due to some discrepancy and uncertainty during practice coding sessions. These more specific operalizations served to better adapt the BOSS categories for use with children with autism. The following behaviors were added to better operationalize the AET category for use with the autism population: walking to the assigned task as requested, giving a verbal response to a prompt/lesson request as an attempt to answer (even if content spoken was tangentially related), laughing at a related joke, and crafting as requested. One addition was made for PET to include behaviors where the participant was looking down, but facing the instructor, while sitting quietly. One slight modification was made on the OFT-M category's description of fidgeting to also include "inappropriate touch" of assigned manipulatives (i.e., stuffed animal during lesson). No modifications were required for the OFT-V or OFT-P categories.

A peer-coding interval is automatically set in the standard BOSS program to occur every fifth interval, originally created as a type of control. Due to the nature of this experimental design and the known heterogeneity of symptoms in children with autism, this peer-coding

interval was not used for this study. Because the interval could not be removed from the BOSS application, research assistants were instructed to not code anything during these intervals.

Design

A multiple subject case study design was used to describe the engagement trends of the eight identified participants. A case study design was chosen both due to sample size constraints of the camp (N = 30) and also to better addresses the heterogeneity of symptoms displayed across individuals with ASD (Reichow et al., 2012). There is significant heterogeneity in the manifestation of social and communication skills impairment within this diagnostic group. Group comparisons are unable to sufficiently account for this symptom variability and as such the case study design allows for better insight and in-depth analysis of the specific impact and efficacy of the interventions.

Data Analysis

The order of analysis was as follows. The background information from each participant's camp file was first compiled to describe how each participant's abilities and symptom patterns presented at the start of camp. This information was combined with the available psychological and medical reports and/or Individual Educational Plans (IEP) present within each camper's file to describe a detailed history of the participant's diagnostic and educational history. Next, total and subscale scores for the ASRS and ASSP were calculated for each participant at pre- and post-test. Third, the BOSS behavior ratings were downloaded for each child, and engagement levels were analyzed.

The BOSS inter-rater reliability data was calculated in two ways. Initially, as suggested by Nicholson et al. (2010), inter-observer agreement for all BOSS coding sequences was calculated by dividing the number of intervals both observers recorded the same behaviors by the

number of agreements plus the number of disagreements, then multiplying the resultant number by 100. However, this method constitutes a percentage of agreement which does not take into account agreements expected by chance, and therefore can overestimate the true level of agreement (Hallgren, 2012). Cohen's (1960) kappa could be used to assess inter-rater reliability, however, because some categories of the BOSS coding could either be never or seldom coded in a single video, Hallgren explains this type of dataset creates a prevalence problem when using Cohen's kappa. Therefore, a follow up analysis was conducted using Byrt, Bishop, and Carlin's (1993) prevalence-adjusted bias-adjusted kappa (PABAK) method to estimate inter-rater reliability. This approach was utilized in order to reduce overestimation due to chance while also minimizing the effect of rater bias and observation prevalence into the estimate. Both inter-observer agreement and PABAK statistics were calculated for each video recording as a comparison.

Inferential statistics typically used with groups of participants are not considered valid methods of analysis for case study designs (Silva, Correia, Lima, Magalhães, & de Sousa, 2011; Todman & Dugard, 1999). Therefore, a trend analysis was utilized to describe each of the participants. The analytic strategy of pattern matching, as suggested by Yin (2003), was used to compare an empirically based pattern with the predicted one, as suggested by the research questions of this study. The engagement data from the BOSS (Shapiro, 2013) program was used to compare each participant's engagement behaviors during the focused AAT sessions versus social skills treatment as usual sessions. Each participant's engagement behaviors were graphically plotted to visually compare the focused AAT sessions and social skills treatment as usual sessions for each week of camp. Further, Nicholson et al. (2010) suggested using Busk and Serlin's (1992) method to identify effect size (ES) values for each of the engagement

behaviors for each child. The authors calculated ES by finding the difference between the baseline mean and mean treatment phase, then dividing the resultant by the standard deviation of the baseline phase. In this way, the ES can be compared for the focused AAT technique and social skills treatment-as-usual sessions, as well as for the total engaged time, active engaged time, passive engaged time, and non-engaged time (i.e., off-task verbal, off-task motor, and off-task passive). A table comparing the mean and ES for each of the described variables was made to also compare each of the eight participants (as similarly displayed by Nicholson et al.) across the two treatment interventions. This method provided comparisons to address research question one.

Next, comparisons through trend analyses were made between pre-test and post-test ASRS and ASSP scores following the intervention, to address research questions two and three. The observed patterns were compared to determine the effect of symptom presentation with levels of engagement in the two treatments. Finally, a trend analysis was conducted with the inclusion of developmental considerations by assessing ASRS outcomes between each of the three age groups. These analyses served to describe how different symptom presentations impact and interact with engagement during a social skills group intervention, as well as the engagement during AAT.

Results

Results of this study included a total of eight participants. Table 1 summarizes the brief background data for each participant. Overall results for each of the behavior rating scales (i.e., ASSP, ASRS) completed by the participant's parents will be described first. Next, inter-rater reliability statistics and effect size (ES) calculations will be compared for the BOSS coding sequences. This will then be followed by individual participant results on each of the behavior

rating scales and BOSS coding sequences. Finally, general trends between participants and age groups will be described.

ASSP Results

Data analyses were first compared on the behavior rating scales completed by the research participant parents. Pre- and post-test scores were calculated following manual guidelines for each scale. Results of the ASSP are described below as a description of functional social skill improvements.

Total Score and the three subscale scores (Social Reciprocity, Social Participation/Avoidance, and Detrimental Social Behaviors) were calculated for each participant using the scoring procedures outlined by Bellini and Hopf (2007). Interestingly, participants 2, 3, and 6 demonstrated positive improvement in Total Score from pre-test to post-test, while participants 1, 4, 5, 7, and 8 demonstrated reduced Total Score values. Subscale analyses revealed only slight (one to two point) differences for all participants except participants 5 (10 point decrease) and 7 (seven point decrease) on Social Reciprocity. Similarly, the Social Participation/Avoidance subscale revealed only slight change (one to two points) for all participants except participant 4 (7 point decrease). Detrimental Social Behavior scores all were within two point values between pre-test and post-test for all eight participants. Results of the functional differences on the ASSP for each participant are displayed below in Tables 2 to 9.

Table 2: *Participant 1 ASSP*

	Pre-Test	Post-Test
Total Score	**126**	**124**
Social Reciprocity	58	56
Social Participation/Avoidance	33	32
Detrimental Social Behaviors	26	28

Table 3: *Participant 2 ASSP*

	Pre-Test	Post-Test
Total Score	**86**	**90**
Social Reciprocity	33	34
Social Participation/Avoidance	24	25
Detrimental Social Behaviors	21	22

Table 4: *Participant 3 ASSP*

	Pre-Test	Post-Test
Total Score	**114**	**120**
Social Reciprocity	51	53
Social Participation/Avoidance	31	35
Detrimental Social Behaviors	24	23

Table 5: *Participant 4 ASSP*

	Pre-Test	Post-Test
Total Score	**112**	**107**
Social Reciprocity	44	45
Social Participation/Avoidance	34	27
Detrimental Social Behaviors	25	26

Table 6: *Participant 5 ASSP*

	Pre-Test	Post-Test
Total Score	**128**	**117**
Social Reciprocity	67	57
Social Participation/Avoidance	27	26
Detrimental Social Behaviors	26	27

Table 7: *Participant 6 ASSP*

	Pre-Test	Post-Test
Total Score	**107**	**111**
Social Reciprocity	48	47
Social Participation/Avoidance	31	33
Detrimental Social Behaviors	21	22

Table 8: *Participant 7 ASSP*

	Pre-Test	Post-Test
Total Score	**110**	**104**
Social Reciprocity	54	47
Social Participation/Avoidance	26	25
Detrimental Social Behaviors	23	25

Table 9: *Participant 8 ASSP*

	Pre-Test	Post-Test
Total Score	**109**	**106**
Social Reciprocity	49	47
Social Participation/Avoidance	26	27
Detrimental Social Behaviors	25	25

ASRS Results

Parental pre- and post-test rating scores on the Autism Spectrum Rating Scales (ASRS) were then calculated using the DSM-5 Update (Goldstein & Naglieri, 2009). A Total Score, DSM-5 Scale and the following subscales were calculated for each administration: Social Communication, Unusual Behaviors, Self-Regulation, Peer Socialization, Adult Socialization, Social/Emotional Reciprocity, Atypical Language, Stereotypy, Behavioral Rigidity, Sensory Sensitivity, and Attention. ASRS results for each participant are outlined in Tables 10 to 17. Results revealed some decrease in symptom severity from pre-test to post-test for most participants, but many decreases were typically within the 95% confidence interval for pre-test scores. However, it is important to note that while pre/post-test scale scores per se fell within the 95% confidence interval, the clinical elevation categories within which the pre/post scales was often different and reflected a decrease in ASD symptom levels. In fact, at times, post-test ratings decreased from a clinical level to the average/non-clinical range. Individual participant results for each category will be described later for individual difference considerations.

Table 10: *Participant 1 ASRS*

Domain	*Pre-Test* **T-Score (CI)**	**% Rank**	**Category**	*Post-Test* **T-Score (CI)**	**% Rank**	**Category**
Social Communication	63 (58-67)	90	Slightly Elevated	53 (49-57)	62	Average
Unusual Behaviors	67 (62-70)	96	Elevated	61 (56-65)	86	Slightly Elevated
Self-Regulation	62 (56-70)	88	Slightly Elevated	56 (50-61)	73	Average
Total Score	**66 (62-69)**	**95**	**Elevated**	**58 (55-61)**	**79**	**Average**
DSM-5 Scale	**66 (62-69)**	**95**	**Elevated**	**59 (55-62)**	**82**	**Average**
Peer Socialization	67 (58-70)	96	Elevated	58 (51-63)	79	Average
Adult Socialization	56 (55-71)	73	Average	52 (43-60)	58	Average
Social/Emotional Reciprocity	62 (46-63)	88	Slightly Elevated	51 (45-57)	54	Average
Atypical Language	71 (55-67)	98	Very Elevated	64 (54-69)	92	Slightly Elevated
Stereotypy	68 (60-75)	96	Elevated	60 (50-66)	84	Slightly Elevated
Behavioral Rigidity	66 (56-72)	95	Elevated	57 (51-62)	76	Average
Sensory Sensitivity	59 (59-70)	82	Average	53 (45-60)	62	Average
Attention	63 (50-65)	90	Slightly Elevated	57 (51-62)	76	Average

Note: CI = 95% Confidence Interval; % Rank = Percentile Rank; Green = Improvement; Yellow = No Change; Red = Worsening

Table 11: *Participant 2 ASRS*

Domain	*Pre-Test* **T-Score (CI)**	**% Rank**	**Category**	*Post-Test* **T-Score (CI)**	**% Rank**	**Category**
Social Communication	75 (69-78)	99	Very Elevated	73 (68-76)	99	Very Elevated
Unusual Behaviors	73 (68-76)	99	Very Elevated	72 (67-75)	99	Very Elevated
Self-Regulation	74 (67-77)	99	Very Elevated	69 (62-73)	97	Elevated
Total Score	**79 (75-81)**	**99**	**Very Elevated**	**76 (72-78)**	**99**	**Very Elevated**
DSM-5 Scale	**79 (74-82)**	**99**	**Very Elevated**	**74 (69-77)**	**99**	**Very Elevated**
Peer Socialization	71 (66-74)	98	Very Elevated	69 (60-73)	97	Elevated
Adult Socialization	74 (60-77)	99	Very Elevated	66 (54-71)	95	Elevated
Social/Emotional Reciprocity	77 (68-80)	99	Very Elevated	71 (63-75)	98	Very Elevated
Atypical Language	73 (62-76)	99	Very Elevated	71 (60-75)	98	Very Elevated
Stereotypy	60 (60-66)	84	Slightly Elevated	60 (50-66)	84	Slightly Elevated
Behavioral Rigidity	76 (68-79)	99	Very Elevated	72 (64-76)	99	Very Elevated
Sensory Sensitivity	84 (70-85)	99	Very Elevated	80 (67-92)	99	Very Elevated
Attention	70 (63-74)	98	Very Elevated	69 (62-73)	97	Elevated

Note: CI = 95% Confidence Interval; % Rank = Percentile Rank; Green = Improvement; Yellow = No Change; Red = Worsening

Table 12: *Participant 3 ASRS*

Domain	*Pre-Test* T-Score (CI)	*Pre-Test* % Rank	*Pre-Test* Category	*Post-Test* T-Score (CI)	*Post-Test* % Rank	*Post-Test* Category
Social Communication	66 (61-69)	95	Elevated	65 (60-69)	93	Elevated
Unusual Behaviors	66 (61-69)	95	Elevated	64 (59-68)	92	Slightly Elevated
Self-Regulation	62 (56-66)	88	Slightly Elevated	65 (58-69)	93	Elevated
Total Score	**66 (62-69)**	**66**	**Elevated**	**66 (62-69)**	**95**	**Elevated**
DSM-5 Scale	**68 (63-71)**	**68**	**Elevated**	**67 (63-70)**	**96**	**Elevated**
Peer Socialization	65 (57-70)	65	Elevated	66 (58-70)	95	Elevated
Adult Socialization	64 (53-69)	64	Slightly Elevated	70 (57-74)	98	Very Elevated
Social/Emotional Reciprocity	70 (62-74)	70	Very Elevated	68 (60-72)	96	Elevated
Atypical Language	66 (56-71)	66	Elevated	66 (56-71)	95	Elevated
Stereotypy	62 (52-67)	62	Slightly Elevated	62 (51-67)	88	Slightly Elevated
Behavioral Rigidity	68 (61-72)	68	Elevated	66 (59-70)	95	Elevated
Sensory Sensitivity	61 (51-67)	61	Slightly Elevated	59 (50-69)	82	Average
Attention	61 (54-66)	61	Slightly Elevated	63 (56-68)	90	Slightly Elevated

Note: CI = 95% Confidence Interval; % Rank = Percentile Rank; Green = Improvement; Yellow = No Change; Red = Worsening

Table 13: *Participant 4 ASRS*

Domain	*Pre-Test* **T-Score (CI)**	**% Rank**	**Category**	*Post-Test* **T-Score (CI)**	**% Rank**	**Category**
Social Communication	63 (58-67)	90	Slightly Elevated	68 (63-71)	96	Elevated
Unusual Behaviors	72 (67-75)	99	Very Elevated	70 (65-73)	70	Very Elevated
Self-Regulation	68 (61-72)	96	Elevated	68 (61-72)	68	Elevated
Total Score	**71 (67-72)**	**98**	**Very Elevated**	**72 (68-75)**	**72**	**Very Elevated**
DSM-5 Scale	**71 (66-74)**	**98**	**Very Elevated**	**61 (57-64)**	**61**	**Slightly Elevated**
Peer Socialization	61 (53-66)	86	Slightly Elevated	69 (60-73)	69	Elevated
Adult Socialization	70 (57-74)	98	Very Elevated	72 (59-75)	72	Very Elevated
Social/Emotional Reciprocity	66 (58-70)	95	Elevated	66 (58-70)	66	Elevated
Atypical Language	72 (61-76)	99	Very Elevated	74 (63-77)	74	Very Elevated
Stereotypy	68 (56-72)	96	Elevated	68 (56-77)	68	Elevated
Behavioral Rigidity	72 (64-76)	99	Very Elevated	71 (64-75)	71	Very Elevated
Sensory Sensitivity	75 (63-78)	99	Very Elevated	77 (65-80)	77	Very Elevated
Attention	68 (61-72)	96	Elevated	66 (59-70)	66	Elevated

Note: CI = 95% Confidence Interval; % Rank = Percentile Rank; Green = Improvement; Yellow = No Change; Red = Worsening

Table 14: *Participant 5 ASRS*

Domain	*Pre-Test* **T-Score (CI)**	**% Rank**	**Category**	*Post-Test* **T-Score (CI)**	**% Rank**	**Category**
Social Communication	57 (52-61)	76	Average	62 (57-66)	88	Slightly Elevated
Unusual Behaviors	72 (67-75)	99	Very Elevated	71 (66-74)	98	Very Elevated
Self-Regulation	64 (58-68)	92	Slightly Elevated	64 (58-68)	92	Slightly Elevated
Total Score	**66 (62-69)**	**95**	**Elevated**	**67 (63-70)**	**96**	**Elevated**
DSM-5 Scale	**70 (65-73)**	**98**	**Very Elevated**	**69 (64-72)**	**97**	**Elevated**
Peer Socialization	65 (57-70)	93	Elevated	68 (59-72)	96	Elevated
Adult Socialization	68 (56-72)	96	Elevated	62 (51-67)	88	Slightly Elevated
Social/Emotional Reciprocity	61 (54-66)	86	Slightly Elevated	64 (57-69)	92	Slightly Elevated
Atypical Language	71 (60-75)	98	Very Elevated	72 (61-76)	99	Very Elevated
Stereotypy	62 (52-67)	88	Slightly Elevated	64 (53-69)	92	Slightly Elevated
Behavioral Rigidity	79 (71-82)	99	Very Elevated	71 (64-75)	98	Very Elevated
Sensory Sensitivity	77 (65-80)	99	Very Elevated	69 (58-73)	97	Elevated
Attention	60 (53-65)	84	Slightly Elevated	64 (57-68)	92	Slightly Elevated

Note: CI = 95% Confidence Interval; % Rank = Percentile Rank; Green = Improvement; Yellow = No Change; Red = Worsening

Table 15: *Participant 6 ASRS*

	Pre-Test			*Post-Test*		
Domain	**T-Score (CI)**	**% Rank**	**Category**	**T-Score (CI)**	**% Rank**	**Category**
Social Communication	70 (65-73)	98	Very Elevated	63 (58-67)	90	Slightly Elevated
Unusual Behaviors	66 (61-69)	95	Elevated	64 (59-68)	92	Slightly Elevated
Self-Regulation	64 (58-68)	92	Slightly Elevated	60 (54-65)	84	Slightly Elevated
Total Score	**69 (65-72)**	**97**	**Elevated**	**64 (60-67)**	**92**	**Slightly Elevated**
DSM-5 Scale	**68 (63-71)**	**96**	**Elevated**	**65 (61-68)**	**93**	**Elevated**
Peer Socialization	69 (60-73)	97	Elevated	66 (58-70)	95	Elevated
Adult Socialization	68 (56-72)	96	Elevated	64 (53-69)	92	Slightly Elevated
Social/Emotional Reciprocity	70 (62-74)	98	Very Elevated	66 (58-70)	95	Elevated
Atypical Language	71 (60-75)	98	Very Elevated	69 (59-73)	97	Elevated
Stereotypy	58 (48-64)	79	Average	56 (47-63)	73	Average
Behavioral Rigidity	62 (55-67)	88	Slightly Elevated	64 (57-68)	92	Slightly Elevated
Sensory Sensitivity	67 (56-72)	96	Elevated	56 (47-63)	73	Average
Attention	80 (53-65)	84	Slightly Elevated	61 (54-66)	86	Slightly Elevated

Note: CI = 95% Confidence Interval; % Rank = Percentile Rank; Green = Improvement; Yellow = No Change; Red = Worsening

Table 16: *Participant 7 ASRS*

Domain	*Pre-Test* **T-Score (CI)**	**% Rank**	**Category**	*Post-Test* **T-Score (CI)**	**% Rank**	**Category**
Social Communication	63 (58-67)	90	Slightly Elevated	65 (60-69)	93	Elevated
Unusual Behaviors	64 (59-68)	92	Slightly Elevated	68 (63-71)	96	Elevated
Self-Regulation	64 (58-68)	92	Slightly Elevated	68 (61-72)	96	Elevated
Total Score	**66 (62-68)**	**95**	**Elevated**	**71 (67-74)**	**98**	**Very Elevated**
DSM-5 Scale	**66 (62-69)**	**95**	**Elevated**	**71 (66-74)**	**98**	**Very Elevated**
Peer Socialization	73 (64-77)	99	Very Elevated	75 (66-78)	99	Very Elevated
Adult Socialization	71 (58-74)	98	Very Elevated	69 (56-73)	97	Elevated
Social/Emotional Reciprocity	63 (56-68)	90	Slightly Elevated	66 (58-70)	95	Elevated
Atypical Language	53 (45-60)	62	Average	58 (49-64)	79	Average
Stereotypy	59 (49-65)	82	Average	61 (51-67)	86	Slightly Elevated
Behavioral Rigidity	71 (64-75)	98	Very Elevated	79 (71-82)	99	Very Elevated
Sensory Sensitivity	59 (50-65)	82	Average	63 (53-68)	90	Slightly Elevated
Attention	60 (53-65)	84	Slightly Elevated	67 (60-71)	96	Elevated

Note: CI = 95% Confidence Interval; % Rank = Percentile Rank; Green = Improvement; Yellow = No Change; Red = Worsening

Table 17: *Participant 8 ASRS*

Domain	*Pre-Test* **T-Score (CI)**	**% Rank**	**Category**	*Post-Test* **T-Score (CI)**	**% Rank**	**Category**
Social Communication	64 (59-68)	92	Slightly Elevated	64 (59-68)	92	Slightly Elevated
Unusual Behaviors	69 (64-72)	97	Elevated	70 (65-73)	98	Very Elevated
Self-Regulation	63 (57-67)	90	Slightly Elevated	65 (58-69)	93	Elevated
Total Score	**69 (65-72)**	**97**	**Elevated**	**70 (66-73)**	**98**	**Very Elevated**
DSM-5 Scale	**72 (67-75)**	**99**	**Very Elevated**	**72 (67-75)**	**99**	**Very Elevated**
Peer Socialization	67 (59-71)	96	Elevated	71 (62-75)	98	Very Elevated
Adult Socialization	69 (56-73)	97	Elevated	69 (56-73)	97	Elevated
Social/Emotional Reciprocity	64 (57-69)	92	Slightly Elevated	62 (55-67)	88	Slightly Elevated
Atypical Language	72 (61-76)	99	Very Elevated	75 (63-78)	99	Very Elevated
Stereotypy	65 (54-70)	93	Elevated	66 (55-71)	95	Elevated
Behavioral Rigidity	71 (64-75)	98	Very Elevated	73 (56-77)	99	Very Elevated
Sensory Sensitivity	63 (53-68)	90	Slightly Elevated	57 (48-63)	76	Average
Attention	59 (53-64)	82	Average	64 (57-68)	92	Slightly Elevated

Note: CI = 95% Confidence Interval; % Rank = Percentile Rank; Green = Improvement; Yellow = No Change; Red = Worsening

BOSS Results

Next, the observational data on engagement level from the BOSS program was analyzed for each participant. As described, the BOSS data was downloaded for each participant for each of the two research assistants. Inter-rater reliability was established prior to further interpretation. Analyses were conducted on the Overall level, as well as the five domains of engagement (i.e., AET, PET, OFT-M, OFT-P, OFT-V).

Inter-rater reliability statistics were evaluated for each coding pair. First, inter-observer agreements were calculated for each video using a percent agreement calculation. However, as mentioned, percent agreement statistics do not adequately remove the probability of error, so prevalence-adjusted bias-adjusted kappa (PABAK) values were also calculated for each video as a comparison. In general, greater reliability difference was observed in the inter-observer calculations, fitting the described conceptual argument against percent agreement calculations. However, across both statistics, the passive engagement (PET) category consistently displayed the largest amount of variability between coders, followed by the off-task passive (OFT-P) categories, for all participants. Results of both inter-rater reliability statistics for each participant are displayed in Tables 18 to 33, but only PABAK values were interpreted for each participant due to their proposed greater accuracy.

Table 18: *Inter-Observer Agreements for Participant 1*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	87	78.33	80	96.67	86.67	93.33
Week 1 Thursday	82.67	73.33	73.33	90	81.67	95
Week 2 Tuesday	79.33*	85	83.33	70	73.33	85
Week 2 Thursday	87.33	85	70	86.67	98.33	96.67
Week 3 Tuesday	86.33	81.67	76.67	91.67	83.33	98.33
Week 3 Thursday	80.67	78.33	71.67	96.67	76.67	80
Week 4 Tuesday	80	78.33	70	86.67	76.67	88.33
Week 4 Wednesday	88	91.67	80	90	83.33	95
Week 5 Tuesday	92	86.67	88.33	98.33	95	91.67
Week 5 Thursday	78.67*	75	61.67**	95	65**	96.67

**Below 70% agreement (individual categories)
*Below 80% agreement (overall)
Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal

Table 19: *Participant 1 PABAK Agreements*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	0.74	0.57	0.6	0.93	0.73	0.87
Week 1 Thursday	0.65	0.47	0.47	0.8	0.63	0.9
Week 2 Tuesday	0.59	0.7	0.67	0.4	0.47	0.7
Week 2 Thursday	0.75	0.7	0.4	0.73	0.97	0.93
Week 3 Tuesday	0.73	0.63	0.53	0.83	0.67	0.97
Week 3 Thursday	0.61	0.57	0.43	0.93	0.53	0.6
Week 4 Tuesday	0.6	0.57	0.4	0.73	0.53	0.77
Week 4 Wednesday	0.76	0.83	0.6	0.8	0.67	0.9
Week 5 Tuesday	0.84	0.73	0.77	0.97	0.9	0.83
Week 5 Thursday	0.57	0.5	0.23	0.9	0.3	0.93

Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal; Red = slight agreement (0.00-0.2); Orange = fair agreement (0.21-0.40); Yellow = moderate agreement (0.41-0.60); Green = substantial agreement (0.61-0.80); Blue = almost perfect or perfect agreement (0.81-1.0)

Table 20: *Inter-Observer Agreements for Participant 2*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	85.03	83.33	75	85	86.67	92.3
Week 1 Thursday	88.67	76.67	85	90	91.67	100
Week 2 Tuesday	80.67	81.67	68.33**	76.67	81.67	95
Week 2 Thursday	84	76.67	86.67	80	93.33	83.33
Week 3 Tuesday	88.67	80	76.67	96.67	91.67	98.33
Week 3 Thursday	85.43	78.33	74.19	85	91.67	98.33
Week 4 Tuesday	81.38	80	58.33**	96.67	70	100
Week 4 Wednesday	90.33	81.67	85	88.33	100	96.67
Week 5 Tuesday	90.67	83.33	85	95	90	100
Week 5 Thursday	77.67*	75	71.67	73.33	76.67	91.67

**Below 70% agreement (individual categories)
*Below 80% agreement (overall)
Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal

Table 21: *Participant 2 PABAK Agreements*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	0.67	0.67	0.5	0.7	0.73	0.73
Week 1 Thursday	0.77	0.53	0.7	0.8	0.83	1
Week 2 Tuesday	0.61	0.63	0.37	0.53	0.63	0.9
Week 2 Thursday	0.68	0.53	0.73	0.6	0.87	0.67
Week 3 Tuesday	0.77	0.6	0.53	0.93	0.83	0.97
Week 3 Thursday	0.72	0.57	0.53	0.7	0.83	0.97
Week 4 Tuesday	0.57	0.6	0.17	0.93	0.17	1
Week 4 Wednesday	0.81	0.63	0.7	0.77	1	0.93
Week 5 Tuesday	0.81	0.67	0.7	0.9	0.8	1
Week 5 Thursday	0.55	0.5	0.43	0.47	0.53	0.83

Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal; Red = slight agreement (0.00-0.2); Orange = fair agreement (0.21-0.40); Yellow = moderate agreement (0.41-0.60); Green = substantial agreement (0.61-0.80); Blue = almost perfect or perfect agreement (0.81-1.0)

Table 22: *Inter-Observer Agreements for Participant 3*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	87.67	83.33	85	71.67	98.33	100
Week 1 Thursday	83.67	80	78.33	75	90	95
Week 2 Tuesday	87.67	85	78.33	86.67	91.67	96.67
Week 2 Thursday	85	70	78.33	93.33	100	83.33
Week 3 Tuesday	94.67	95	96.67	93.33	91.67	96.67
Week 3 Thursday	79.33*	65**	61.67**	81.67	95	93.33
Week 4 Tuesday	87.33	93.33	75	81.67	86.67	100
Week 4 Wednesday	90.67	78.33	80	96.67	98.33	100
Week 5 Tuesday	96.67	93.33	95	95	100	100
Week 5 Thursday	86.33	83.33	75	93.33	81.67	98.33

**Below 70% agreement (individual categories)
*Below 80% agreement (overall)
Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal

Table 23: *Participant 3 PABAK Agreements*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	0.75	0.67	0.7	0.43	0.97	1
Week 1 Thursday	0.67	0.6	0.56	0.5	0.8	0.9
Week 2 Tuesday	0.75	0.7	0.57	0.73	0.83	0.93
Week 2 Thursday	0.7	0.4	0.67	0.87	1	0.67
Week 3 Tuesday	0.89	0.9	0.93	0.87	0.83	0.93
Week 3 Thursday	0.59	0.3	0.23	0.63	0.9	0.87
Week 4 Tuesday	0.75	0.87	0.5	0.63	0.73	1
Week 4 Wednesday	0.81	0.57	0.6	0.93	0.97	1
Week 5 Tuesday	0.93	0.87	0.9	0.9	1	1
Week 5 Thursday	0.73	0.67	0.5	0.87	0.63	0.97

Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal; Red = slight agreement (0.00-0.2); Orange = fair agreement (0.21-0.40); Yellow = moderate agreement (0.41-0.60); Green = substantial agreement (0.61-0.80); Blue = almost perfect or perfect agreement (0.81-1.0)

Table 24: *Inter-Observer Agreements for Participant 4*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	91.67	85	83.33	98.33	91.67	100
Week 1 Thursday	82	88.33	66.67**	90	65**	100
Week 2 Tuesday	87.67	85	80	93.33	80	100
Week 2 Thursday	97.33	100	100	100	86.67	100
Week 3 Tuesday	91.67	86.67	81.67	100	90	100
Week 3 Thursday	93.33	95	86.67	98.33	86.67	100
Week 4 Tuesday	87.5	80	72.72	91.67	96	100
Week 4 Wednesday	92	91.67	90	98.33	80	100
Week 5 Tuesday	81.33	88.33	61.67**	98.33	58.33**	100
Week 5 Thursday	76.33*	86.67	65**	73.33	56.67**	100

**Below 70% agreement (individual categories)
*Below 80% agreement (overall)
Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal

Table 25: *Participant 4 PABAK Agreements*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	0.83	0.7	0.67	0.97	0.83	1
Week 1 Thursday	0.64	0.77	0.33	0.8	0.3	1
Week 2 Tuesday	0.75	0.7	0.6	0.87	0.6	1
Week 2 Thursday	0.95	1	1	1	0.733	1
Week 3 Tuesday	0.83	0.73	0.63	1	0.8	1
Week 3 Thursday	0.87	0.9	0.73	0.97	0.73	1
Week 4 Tuesday	0.73	0.6	0.6	0.83	0.6	1
Week 4 Wednesday	0.84	0.83	0.8	0.97	0.6	1
Week 5 Tuesday	0.63	0.77	0.23	0.97	0.17	1
Week 5 Thursday	0.53	0.73	0.3	0.47	0.13	1

Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal; Red = slight agreement (0.00-0.2); Orange = fair agreement (0.21-0.40); Yellow = moderate agreement (0.41-0.60); Green = substantial agreement (0.61-0.80); Blue = almost perfect or perfect agreement (0.81-1.0)

Table 26: *Inter-Observer Agreements for Participant 5*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	90.33	81.67	83.33	98.33	96.67	91.67
Week 1 Thursday	85.67	76.67	71.67	96.67	90	93.33
Week 2 Tuesday	88.33	91.67	86.67	90	75	98.33
Week 2 Thursday	91.67	83.33	83.33	96.67	98.33	96.67
Week 3 Tuesday	94	96.67	86.67	98.33	98.33	100
Week 3 Thursday	86.33	85	85	81.67	82.67	98.33
Week 4 Tuesday	87	76.67	71.67	91.67	98.33	96.67
Week 4 Wednesday	88.67	81.67	81.67	86.67	96.67	96.67
Week 5 Tuesday	86.33	81.67	80	86.67	86.67	96.67
Week 5 Thursday	81.33	78.33	73.33	85	76.67	93.33

**Below 70% agreement (individual categories)
*Below 80% agreement (overall)
Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal

Table 27: *Participant 5 PABAK Agreements*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	0.81	0.63	0.67	0.97	0.93	0.83
Week 1 Thursday	0.71	0.53	0.43	0.93	0.8	0.87
Week 2 Tuesday	0.77	0.83	0.73	0.8	0.5	0.97
Week 2 Thursday	0.83	0.67	0.67	0.93	0.97	0.93
Week 3 Tuesday	0.88	0.73	0.73	0.97	0.97	1
Week 3 Thursday	0.73	0.7	0.7	0.63	0.63	0.97
Week 4 Tuesday	0.74	0.53	0.43	0.83	0.97	0.93
Week 4 Wednesday	0.77	0.63	0.63	0.73	0.93	0.93
Week 5 Tuesday	0.73	0.63	0.6	0.73	0.73	0.93
Week 5 Thursday	0.63	0.57	0.47	0.7	0.53	0.87

Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal; Red = slight agreement (0.00-0.2); Orange = fair agreement (0.21-0.40); Yellow = moderate agreement (0.41-0.60); Green = substantial agreement (0.61-0.80); Blue = almost perfect or perfect agreement (0.81-1.0)

Table 28: *Inter-Observer Agreements for Participant 6*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	94.33	91.67	93.33	95	96.67	95
Week 1 Thursday	92.33	90	86.67	96.67	96.67	91.67
Week 2 Tuesday	78*	81.67	80	66.67**	70	91.67
Week 2 Thursday	93.67	90	88.33	93.33	96.67	100
Week 3 Tuesday	89	85	78.33	100	85	96.67
Week 3 Thursday	91	88.33	86.67	91.67	93.33	95
Week 4 Tuesday	85	78.33	75	98.33	86.67	86.67
Week 4 Wednesday	90	88.33	75	91.67	95	100
Week 5 Tuesday	82.67	73.33	88.33	83.33	88.33	80
Week 5 Thursday	87.33	78.33	86.67	88.33	100	83.33

**Below 70% agreement (individual categories)
*Below 80% agreement (overall)
Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal

Table 29: *Participant 6 PABAK Agreements*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	0.89	0.83	0.87	0.9	0.93	0.9
Week 1 Thursday	0.85	0.8	0.73	0.93	0.93	0.83
Week 2 Tuesday	0.56	0.63	0.6	0.33	0.4	0.83
Week 2 Thursday	0.87	0.8	0.77	0.87	0.93	1
Week 3 Tuesday	0.78	0.7	0.57	1	0.7	0.93
Week 3 Thursday	0.82	0.77	0.73	0.83	0.87	0.9
Week 4 Tuesday	0.72	0.83	0.5	0.67	0.73	0.87
Week 4 Wednesday	0.8	0.77	0.5	0.83	0.9	1
Week 5 Tuesday	0.65	0.47	0.77	0.67	0.77	0.6
Week 5 Thursday	0.75	0.57	0.73	0.77	1	0.67

Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal; Red = slight agreement (0.00-0.2); Orange = fair agreement (0.21-0.40); Yellow = moderate agreement (0.41-0.60); Green = substantial agreement (0.61-0.80); Blue = almost perfect or perfect agreement (0.81-1.0)

Table 30: *Inter-Observer Agreements for Participant 7*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	70.33*	73.33	53.33**	100	33.33**	91.67
Week 1 Thursday	91.33	86.67	86.67	98.33	95	90
Week 2 Tuesday	93.33	86.67	88.33	100	96.67	95
Week 2 Thursday	88	83.33	81.67	91.67	98.33	85
Week 3 Tuesday	91.33	86.67	93.33	95	98.33	83.33
Week 3 Thursday	87	80	76.67	90	98.33	90
Week 4 Tuesday	86	91.67	75	83.33	86.67	93.33
Week 4 Wednesday	94.33	95	93.33	90	95	98.33
Week 5 Tuesday	94.67	88.33	88.33	98.33	100	98.33
Week 5 Thursday	83	70	73.33	73.33	98.33	100

**Below 70% agreement (individual categories)
*Below 80% agreement (overall)
Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal

Table 31: *Participant 7 PABAK Agreements*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	0.89	0.83	0.87	0.9	0.93	0.9
Week 1 Thursday	0.83	0.73	0.73	0.97	0.9	0.8
Week 2 Tuesday	0.87	0.73	0.77	1	0.93	0.9
Week 2 Thursday	0.76	0.67	0.63	0.83	0.97	0.7
Week 3 Tuesday	0.83	0.73	0.87	0.9	0.97	0.67
Week 3 Thursday	0.74	0.6	0.53	0.8	0.97	0.8
Week 4 Tuesday	0.7	0.57	0.5	0.97	0.73	0.73
Week 4 Wednesday	0.89	0.9	0.87	0.8	0.9	0.97
Week 5 Tuesday	0.89	0.77	0.77	0.97	1	0.97
Week 5 Thursday	0.66	0.4	0.47	0.47	0.97	1

Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal; Red = slight agreement (0.00-0.2); Orange = fair agreement (0.21-0.40); Yellow = moderate agreement (0.41-0.60); Green = substantial agreement (0.61-0.80); Blue = almost perfect or perfect agreement (0.81-1.0)

Table 32: *Inter-Observer Agreements for Participant 8*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	86.67	86.67	81.67	91.67	93.33	80
Week 1 Thursday	91.67	91.67	86.67	93.33	88.33	98.33
Week 2 Tuesday	85	86.67	75	96.67	71.67	95
Week 2 Thursday	89.31	88.33	86.67	100	83.33	90
Week 3 Tuesday	78.33*	86.67	56.67**	91.67	61.67**	95
Week 3 Thursday	86.67	91.67	80	91.67	73.33	96.67
Week 4 Tuesday	80	88.33	75	85	65**	86.67
Week 4 Wednesday	86.67	90	76.67	98.33	83.33	85
Week 5 Tuesday	85.67	86.67	83.33	96.67	83.33	78.33
Week 5 Thursday	85	81.67	81.67	86.67	81.67	93.33

**Below 70% agreement (individual categories)
*Below 80% agreement (overall)
Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal

Table 33: *Participant 8 PABAK Agreements*

	Overall	AET	PET	OFT-M	OFT-P	OFT-V
Week 1 Tuesday	0.73	0.73	0.63	0.83	0.87	0.6
Week 1 Thursday	0.83	0.83	0.73	0.87	0.77	0.97
Week 2 Tuesday	0.7	0.73	0.5	0.93	0.43	0.9
Week 2 Thursday	0.73	0.77	0.73	0.67	0.67	0.8
Week 3 Tuesday	0.57	0.73	0.13	0.83	0.23	0.9
Week 3 Thursday	0.73	0.83	0.6	0.83	0.47	0.93
Week 4 Tuesday	0.6	0.77	0.5	0.7	0.3	0.73
Week 4 Wednesday	0.73	0.8	0.53	0.97	0.67	0.7
Week 5 Tuesday	0.71	0.73	0.67	0.93	0.67	0.57
Week 5 Thursday	0.7	0.63	0.63	0.73	0.63	0.87

Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal; Red = slight agreement (0.00-0.2); Orange = fair agreement (0.21-0.40); Yellow = moderate agreement (0.41-0.60); Green = substantial agreement (0.61-0.80); Blue = almost perfect or perfect agreement (0.81-1.0)

In order to identify whether differences were observed between the focused AAT technique and social skills treatment-as-usual interventions, effect sizes (ES) calculations were made as similarly used by Nicholson et al. (2010) following Busk and Serlin's (1992) methodology. Cohen guidelines as described by Thompson (2007) were as follows: small effect

0.0 to 0.3, medium effect 0.3 to 0.6, and large effect 0.6 and larger. For interpretation, negative ES values for positive behaviors (active engagement and passive engagement) and positive ES values for negative behaviors (off-task motor, off-task passive, and off-task verbal) signal significant increases in the behavior during the intervention as compared the baseline phases. ES calculations for the first (Table 34) and second (Table 35) coders are presented below. In general, the first coder displayed relatively greater standard deviation across all participants and engagement categories, as compared to the second coder, for the baseline observations. Further, both raters generally observed an increase in positive behaviors and decrease in negative behaviors for both interventions, as compared to baseline data, with a few exceptions.

Table 34: *ES Calculations for First Coder*

Participant	AET	PET	OFT-M	OFT-P	OFT-V
			Baseline Mean *(SD)*		
1	42.7 (10.3)	46.9 (19.2)	10.4 (3.0)	19.8 (1.5)	7.3 (4.4)
2	28.1 (7.4)	43.76 (17.7)	21.9 (1.5)	15.6 (4.4)	2.1 (0.0)
3	38.5 (7.4)	52.1 (8.8)	38.5 (10.3)	10.4 (3.0)	3.1 (4.4)
4	24.0 (1.47)	50.0 (17.7)	11.5 (13.3)	27.1 (23.6)	0.0 (0.0)
5	36.5 (16.2)	43.8 (26.5)	12.5 (2.9)	8.3 (5.9)	8.3 (3.0)
6	31.3 (17.7)	56.3 (32.4)	8.3 (11.8)	7.3 (1.5)	8.3 (3.0)
7	25.0 (20.6)	29.2 (38.3)	2.1 (3.0)	44.8 (54.5)	6.3 (5.9)
8	26.0 (7.4)	66.7 (8.8)	15.6 (10.3)	14.6 (8.8)	15.6 (19.2)
			Focused AAT Treatment Mean (ES)		
1	30.2 (1.2)	46.9 (0.0)	21.4 (-3.7)	24.0 (-2.8)	10.9 (-0.8)
2	31.8 (-0.5)	53.1 (-0.5)	21.9 (0.0)	12.5 (0.7)	8.9 (0.0)
3	33.9 (0.6)	56.3 (-0.5)	11.5 (2.6)	7.8 (0.9)	6.3 (-0.7)
4	14.6 (6.4)	69.8 (-1.1)	11.5 (0.0)	26.0 (0.0)	0.0 (0.0)
5	21.4 (0.9)	65.6 (-0.8)	6.8 (2.0)	15.6 (-1.2)	4.2 (1.4)
6	33.9 (-0.2)	56.3 (0.0)	13.0 (-0.4)	6.3 (0.7)	6.3 (0.7)
7	51.6 (-1.3)	44.8 (-0.4)	16.7 (-5.0)	3.1 (0.8)	7.8 (-0.3)
8	27.6 (-0.2)	55.2 (1.3)	15.1 (0.1)	32.8 (-2.1)	17.2 (-0.1)
			Social Skills Treatment-As-Usual Mean (ES)		
1	41.7 (0.1)	26.6 (1.1)	15.6 (-1.8)	31.3 (-7.8)	12.5 (-1.2)
2	42.2 (-1.9)	31.8 (0.7)	15.1 (4.6)	19.3 (-0.8)	1.6 (0.0)
3	50.5 (-1.6)	33.3 (2.1)	13.0 (2.5)	7.3 (1.1)	1.6 (0.4)
4	33.9 (-6.7)	47.4 (0.2)	7.81 (0.3)	28.1 (-0.0)	0.0 (0.0)
5	53.7 (-1.1)	30.7 (0.5)	17.7 (-1.8)	9.9 (-0.3)	2.1 (2.1)
6	34.9 (-0.2)	32.3 (0.7)	24.0 (-1.3)	24.5 (-11.7)	17.2 (-3.0)
7	68.8 (-2.2)	27.1 (0.1)	3.7 (-0.5)	4.2 (0.7)	9.9 (-0.6)
8	34.4 (-1.1)	18.8 (5.4)	18.2 (-0.3)	44.3 (-3.4)	24.5 (-0.5)

Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal; SD = Standard Deviation; ES = Effect Size

Table 35: *ES Calculations for Second Coder*

Participant	AET	PET	OFT-M	OFT-P	OFT-V
			Baseline Mean *(SD)*		
1	60.4 (0.0)	34.4 (7.4)	6.3 (8.8)	6.3 (2.9)	5.2 (1.5)
2	46.9 (1.5)	47.9 (3.0)	22.9 (0.0)	9.4 (4.4)	1.0 (1.5)
3	55.2 (19.2)	41.7 (14.7)	13.5 (1.5)	3.1 (4.4)	0.0 (0.0)
4	34.4 (4.4)	58.3 (11.8)	6.3 (8.8)	0.0 (0.0)	0.0 (0.0)
5	50.0 (0.0)	36.5 (16.2)	9.4 (4.4)	0.0 (0.0)	1.0 (1.5)
6	34.4 (16.2)	58.3 (23.6)	7.3 (4.4)	3.1 (1.5)	2.1 (3.0)
7	47.9 (5.9)	52.1 (5.9)	3.1 (4.4)	0.0 (0.0)	11.5 (4.4)
8	22.9 (11.8)	76.1 (13.3)	10.4 (5.9)	5.2 (7.4)	8.3 (11.8)
			Focused AAT Treatment Mean (ES)		
1	43.8 (0.0)	54.2 (-2.7)	19.3 (-1.5)	0.0 (2.1)	3.1 (1.4)
2	52.1 (-3.5)	47.9 (0.0)	19.3 (0.0)	0.5 (2.0)	0.5 (0.4)
3	53.7 (0.1)	46.4 (-0.3)	6.8 (4.6)	0.0 (0.7)	1.6 (0.0)
4	20.8 (3.1)	78.1 (-1.7)	3.1 (0.5)	4.0 (0.0)	0.0 (0.0)
5	40.6 (0.0)	58.3 (-1.4)	15.1 (-1.3)	3.1 (0.0)	0.5 (0.4)
6	44.8 (-0.6)	54.2 (0.2)	14.6 (-1.7)	3.7 (-0.4)	0.5 (0.5)
7	70.3 (-3.8)	29.7 (3.8)	10.9 (-1.8)	0.0 (0.0)	1.6 (2.2)
8	31.3 (-0.7)	70.0 (0.5)	12.0 (-0.3)	14.6 (-1.3)	14.6 (-0.5)
			Social Skills Treatment-As-Usual Mean (ES)		
1	50.5 (0.0)	36.5 (-0.3)	17.7 (-1.3)	18.8 (-4.3)	9.4 (-2.8)
2	58.3 (-7.8)	36.5 (3.9)	6.3 (0.0)	2.1 (1.7)	2.6 (-1.1)
3	59.9 (-0.2)	27.1 (1.0)	12.0 (1.1)	6.3 (-0.7)	0.5 (0.0)
4	33.9 (0.1)	66.2 (-0.7)	5.7 (0.1)	7.8 (0.0)	0.0 (0.0)
5	58.9 (0.0)	34.4 (0.1)	12.5 (-0.7)	10.9 (0.0)	0.5 (0.4)
6	51.6 (-1.1)	42.2 (0.7)	16.7 (-2.1)	8.3 (-3.5)	7.3 (-1.8)
7	81.3 (-5.7)	18.2 (5.8)	3.1 (0.0)	3.7 (0.0)	10.9 (0.1)
8	41.2 (-1.6)	44.3 (2.4)	20.3 (-1.7)	9.9 (-0.6)	22.9 (-1.2)

Note: AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-P = Off-Task Passive; OFT-V = Off-Task Verbal; SD = Standard Deviation; ES = Effect Size

Participant Results

This next section will serve as a more detail-rich description of each participant's individual results, following the described case study methodology. First, a background description based on the available information in each participant's camp files will be described. Next, the parent behavioral rating scales will be interpreted. Following, BOSS results will be presented graphically and in discussion to the previously presented ES calculations. Finally, between-subjects results will be presented as an overall comparison.

Participant 1. The first participant was an 8-year old Caucasian 2nd grader who had also participated in camp the year prior to data collection. He reportedly did not have any comorbid diagnoses, known past or present medical concerns, or medication interventions. Participant 1 was in the youngest age group in camp. Participant 1 was diagnosed with ASD at the age of 3 by a neuropsychologist. Participant 1 was adopted and lived with 1 sibling (biological half-brother) and adoptive parents (married). Participant 1 was reportedly removed from his biological mother's home due to reports of alleged failure to thrive. His family's approximate annual household income was around $75,000 and both of his parents obtained some college education. Participant 1 participated in speech therapy twice a week at school, and attended a therapeutic riding program once a week with his family. Participant 1 reportedly had never received ABA services.

Current problem behaviors identified by Participant 1's parents included wandering and darting or running away. Participant 1 reportedly was verbally communicative without any adaptive equipment. His parents reported auditory sensory issues, including extreme agitation to loud sounds such as balloons popping or fireworks. He reportedly wore headphones often, or put

his hands to his ears to reduce sensory overload. His parents denied witnessing self-stimulatory behaviors.

In school, Participant 1 was in a mainstream classroom with a one-on-one aid. His latest Individualized Education Plan (IEP) revealed particular strength in reading, a pleasant demeanor, displayed excitement for learning, responded well to routines, responded well to positive reinforcement, and responded well to timers. He reportedly read well but had inconsistent reading comprehension scores. Participant 1's teacher noted he was inconsistent in spelling, struggled with math, and often became frustrated with his work. Participant 1 often reportedly struggled with personal space and boundary issues. The previous school year, Participant 1 was in a general education classroom with aid support, but used a resource room for high-stakes testing and a distraction-free room as required. His latest IEP goals were as follows: follow one-step directions with 100% accuracy in language, respect the personal space of peers and adults at school by maintaining an arm's length of distance during school interactions, and calculate the sums and differences with 100% accuracy when given a mixed set of 10 one-digit addition and subtraction problems. Participant 1's school was also reportedly providing the following accommodations: using first-then statements, use of sensory activities during instruction/work time, providing positive reinforcement for work completion, considering sensitivity to noise when engaging in auditory activities, use of a timer for work, attend occupational therapy for 20 minutes per week for gross motor development, and modified assignments to allow Participant 1 to have success independently.

Participant 1's camp file included his neuropsychological evaluation when Participant 1 was 3 years old. Testing data revealed Participant 1 was referred for testing due to concerns regarding ASD symptoms from a speech therapist. At this time, Participant 1 did not like to play

with other children, preferred to play alone, did not interact with others when they were around, and did not like to be held or comforted. Participant 1 reportedly made repetitive/stereotyped movements with his hands about five times each day. He was often bothered by large crowds and became upset by loud noises. He presented with restricted interests, and could become hyper-focused on topics of interest. Participant 1 reportedly had difficulty adjusting to changes in routine and had "temper tantrums" multiple times each day. He reportedly had no medical history of seizures, strokes, head injuries, or history of inpatient or outpatient psychological services. Participant 1's biological father was reportedly "severely mentally ill" and "mildly retarded" and his biological mother potentially exhibited some psychosis. Participant 1 had no known legal issues or toxic exposure history. Testing results revealed Participant 1 was non-compliant with verbal tasks and exhibited a significant language delay. His cognitive skills were reportedly in the average range, his motor skills were in the below average range, and he presented with unwillingness to effectively interact with the examiner throughout testing. The examiner reported Participant 1 had difficulty with social interaction and presented with a communication style similar to children with ASD.

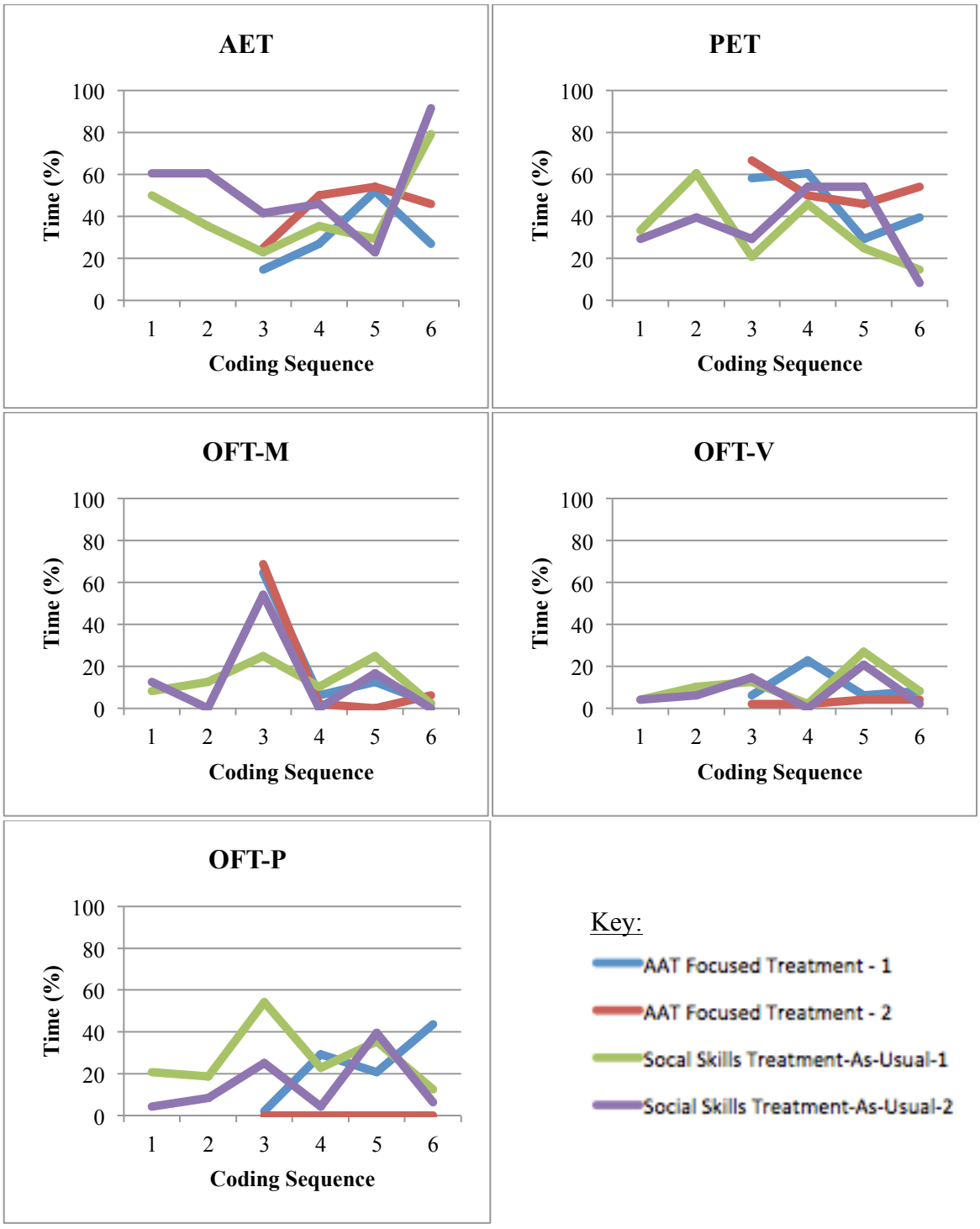
ASSP. Functionally, Participant 1 had high overall social skills as measured by the ASSP (total score 126) compared to the other participants in this study (Table 2). However, over the course of camp, his ASSP Total Score did not meaningfully increase, as his post-test ASSP total score was 124. Further, the Social Reciprocity subscale decreased by two points, the Social Participation/Avoidance subscale decreased by one point, and the Detrimental Behaviors subscale increased by two points.

ASRS. Participant 1's ASD symptoms appeared to diminish over the course of camp as his ASRS Total Score and DSM-5 Scale reduced from Elevated to Average range (Table 10).

Specifically, his Social Communication scale reduced from Slightly Elevated to Average, Unusual Behaviors from Elevated to Slightly Elevated, and Self-Regulation from Slightly Elevated to Average. Further, his Peer Socialization reduced from Elevated to Average, Social/Emotional Reciprocity from Slightly Elevated to Average, Atypical Language from Very Elevated to Slightly Elevated, Stereotypy from Elevated to Slightly Elevated, Behavioral Rigidity from Elevated to Average, and Attention from Slightly Elevated to Average. The following subscales remained in the same qualitative category from pre-test to post-test: Adult Socialization and Sensory Sensitivity. In general, Participant 1 displayed a variety of symptom reductions as measured by the ASRS.

BOSS. Overall, the PABAK values for Participant 1 were in the moderate agreement and above (Table 19). There were three occasions when PABAK agreements were in the fair range for passive engagement time, one fair agreement for off-task motor, and one fair agreement in off-task passive. Further, seven out of 10 days were in the almost perfect or perfect agreement for off-task verbal. Results of the BOSS coding for Participant 1 are displayed below in Figure 1.

Figure 1. Participant 1 BOSS Results



Note. AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-V = Off-Task Verbal; OFT-P = Off-Task Passive; Dog-1 = first coder, focused treatment (AAT); Dog-2 = second coder, focused treatment (AAT); NoDog-1 = first coder, treatment as usual (social skills); NoDog-2 = second coder, treatment as usual (social skills)

Graphically, there was relative agreement in all behaviors for the focused treatment (AAT) as compared to the treatment as usual (social skills), with the exception of off-task passive. Participant 1's active engagement resulted in a U-shape curve for social skills lessons over the course of camp, but an opposite, reverse-U pattern was observed for the AAT lesson across camp. This reveals his active engagement might have increased over the course of camp, but decreased (with a spike in the social skills lesson) during the last week. In terms of passive engagement, Participant 1 displayed relatively more passive engaged time across all weeks in the AAT lesson as compared to the social skills less. Participant 1 displayed high levels of off-task motor specifically in the second week, but low levels of off-task motor for the remainder of camp, consistent across both interventions. His off-task verbal and off-task passive levels were both relatively low across all weeks of camp for both interventions.

These results are generally supported by the ES calculations (Tables 34 and 35). While the first coder observed a strong reduction (ES = 1.2) in the AAT active engagement category, a small negative effect was observed for coder 1's social skills intervention (ES = 0.1), coder 2's AAT intervention (ES = 0.0), and coder 2's social skills intervention (ES = 0.0) active engagements. In terms of passive engagement, coder 1 failed to observe an effect (ES = 0.0) while coder 2 observed a strong positive effect (ES = -2.7) in the AAT treatment. Conversely, coder 1 observed a strong negative effect (ES 1.1) and coder 2 a small positive effect (ES = -0.3) for passive engagement in the social skills intervention. This passive engagement discrepancy is supported by the relatively greater difference in PABAK agreement (Table 19). Both coders observed an increase in negative behavior for off-task motor, off-task passive, and off-task verbal in both interventions, with the exception of off-task passive and off-task verbal for coder 2. Taken together, Participant 1 displayed greater overall engagement as compared to off-task

behaviors for all weeks of camp in both treatments, but greater passive engagement during the AAT intervention (as compared to the social skills treatment-as-usual intervention) and greater active engagement in the social skills treatment-as-usual intervention (as compared to the AAT intervention). However, there were conflicting effect size values supporting these proposed differences between the engagement categories and two interventions. Low prevalence rates for all three off-task behaviors make comparison between the treatments difficult.

Participant 2. Participant 2 was a seven-year-old Caucasian male in the youngest age group who recently finished first grade and was in his first year of participation in this camp. He lived with one sibling (10-year-old brother) and both of his parents who were married. Participant 2's mother's highest degree was a master's degree and his father had an associate's degree, with a mean annual family income of approximately $65,000. Participant 2 was reportedly diagnosed with autism at the age of two and a half at an autism center. Participant 2 received two years of full-time ABA therapy in his home between the ages of three and five, and was currently seen by a psychiatrist for medications. He had a comorbid diagnosis of ADHD and was taking the following medications: Wellbutrin 150 mL XL (morning), Imipramine 75 mg (evening), and Risperidone 1.5 mg (morning). His only reported medical history was chronic ear infections with two tube placements.

Participant 2's parents noted the following for precipitating factors for behavioral outbursts: rejection, over-stimulation, not being able to finish something, not paying attention, not doing what he wants to do, and having very poor impulse control. Distraction and avoidance of triggers reportedly helped Participant 2 remain on task. Participant 2's interests and hobbies included use of the iPad or computer time, free time to run or throw a ball, hot wheel cars, Legos, dinosaurs, and diggers. Current self-stimulatory behaviors included: genital stimulation,

oral stimulation, and self-abusive behaviors. Participant 2 reportedly chewed on his fingers, clothes, and "any toys that will fit." His parents noted they have tried giving Participant 2 chew sticks, which at times could become over-stimulating for Participant 2. Current problematic behaviors were noted as the follows: bullying, withdrawal, noncompliance, hitting, occasional suicidal ideations, impulsivity, mood swings, throwing objects, kicking, sexual acting out, anxiety, depression, verbal threats, scratching, spitting, disrobing, physical aggression (to self, peers, and adults), and darting or running away. To manage his behavior, Participant 2's parents noted it was helpful to give Participant 2 sensory input, to redirect him, to allow him to use a safe place, and to provide Participant 2 one-on-one attention. Participant 2 communicated verbally, with gestures, and through noises and sounds, without use of adaptive equipment. He had the following sensory issues: tactile (messy, mushy, or scratchy), auditory (occasionally wore headphone), and visual (wore glasses). Participant 2 had some fine motor difficulties in zipping coats, tying shoes, eating, brushing teeth, unbuttoning pants, riding a bike, and dressing.

Participant 2's previous teacher noted he was in a mainstreamed classroom with a 1:10 ratio. His grades prior to camp participation were B's and B-'s with a high level of interest in science and background knowledge. He reportedly was on grade level for all subjects and is good at class discussion. His most significant academic challenges were writing and reading comprehension. Participant 2 reportedly struggled with impulsiveness at school, as he often blurted out thoughts rather than raising his hand, would take things from others without waiting his turn, and become aggressive (hitting) towards other students if upset. Notably, Participant 2 often needed to finish whatever he had started, even if it seemed insignificant to others, otherwise would become extremely agitated and frustrated.

Participant 2's latest IEP was available in his records. His strengths were recorded as follows: friendly, well-liked by others, good humor, displays good effort, kind, gets along well with others, creative, and has a good memory. Participant 2 reportedly showed academic progress since Kindergarten and did not display as many behavioral difficulties in the school setting this previous year. His pragmatic language skills were reportedly poor and his cognitive abilities were above average. Further, Participant 2 used odd phrases or repeats things in communication, used words he invents, displayed facial expressions not appropriate to the situation, did not like being touched, did not like the textures of food, and needed constant food and water. He displayed clinically significant scores of significant concern in externalizing problems like hyperactivity, aggression, atypicality, and behavioral symptoms. Reportedly, Participant 2 preferred to sit alone at lunch and not socialize, and did not like to use the school's sensory room. An occupational therapy evaluation determined Participant 2 struggled with letter formation, size, and spacing in handwriting. Participant 2 was generally able to participate in school without his sensory processing interfering with his functional abilities in the school environment. Participant 2 required small group testing and performed better when materials were orally read to him. The IEP also noted Participant 2 functioned at the following achievement levels: high average letter-word recognition, average word attack, high average math skills, high average written expression, average fine/gross motor skills. His IEP goals were listed as follows: he will remain in designated area throughout the school day in four of five days per week, he will demonstrate appropriate personal boundaries with peers four out of five school days, and he will write five word sentences with proper size, spacing and formation in four of five trials.

Participant 2 was evaluated at two years of age by an autism specialty clinic through use of the Autism Diagnostic Observation Scale (ADOS). The report from that evaluation included a thorough developmental history as follows. During pregnancy, Participant 2's mother reportedly had preeclampsia and used Wellbutrin 300mg, but denied further complications during pregnancy, labor, and birth. Participant 2 was reportedly born tongue tied and had a surgical correction for this at one year of age. He reportedly sat at seven months, walked at 11 months, and spoke full words soon after. However, Participant 2 displayed echolalia and repeated phrases non-stop. He reportedly was aversive to touch since one year of age and did not enjoy being held. Participant 2 often struggled with eye contact and it reportedly was difficult to obtain his attention. Participant 2's family denied observing hand flapping, rocking, walking on tiptoes, and spinning. He displayed great difficulty eating and only finished one to two meals per day, refusing new foods if it "looked different." Participant 2 had a history of night terrors and increased opposition to going to bed at the time of testing. There reportedly was no history of seizures, brain infections, head trauma, or loss of consciousness.

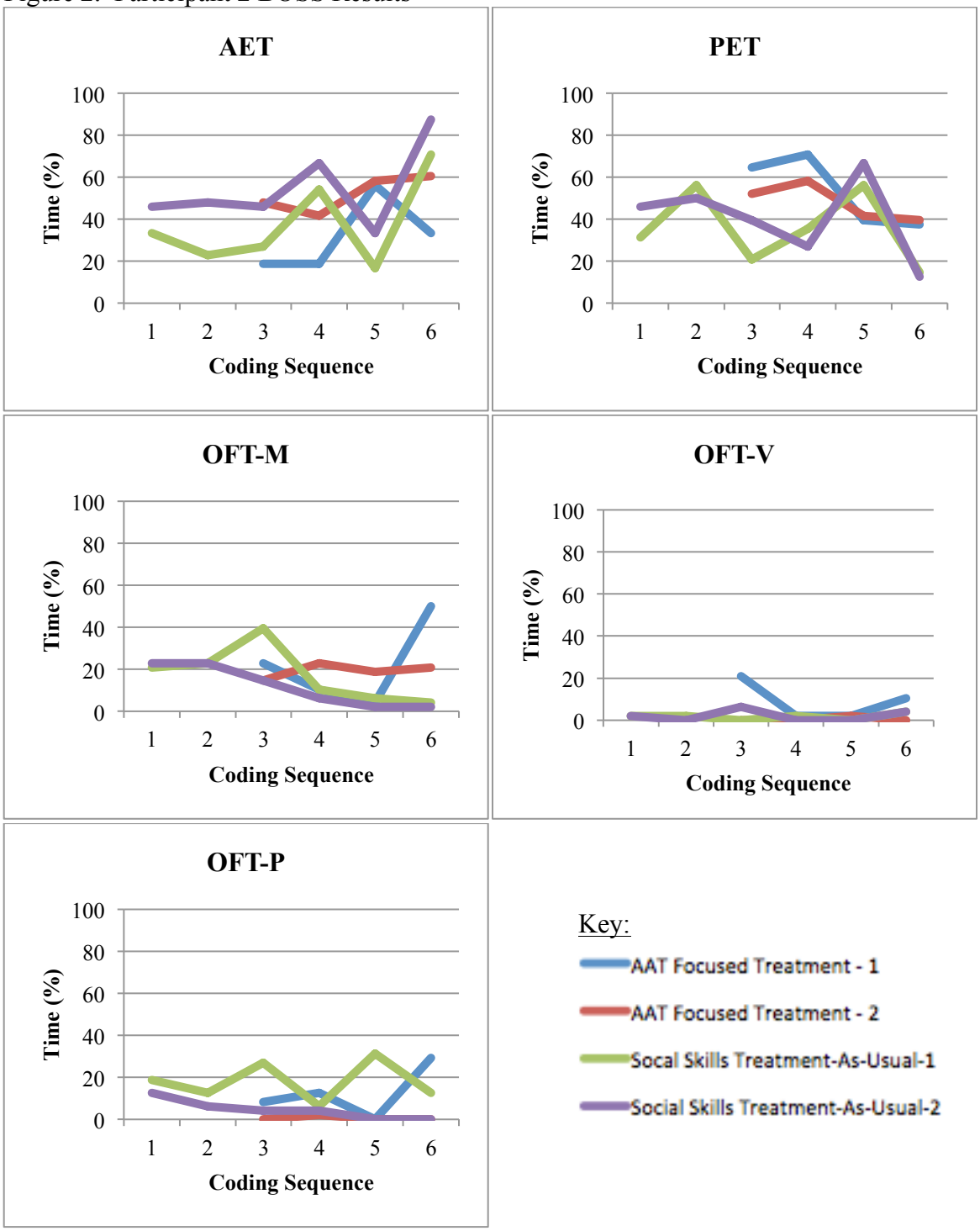
ASSP. Participant 2 displayed comparatively lower social skill functioning, as measured by the ASSP, but his Total Score increased over the course of camp from 86 to 90 (Table 3). His Social Reciprocity subscale was also comparatively lower, with a pre-test score of 33 and post-test score of 34. Participant 2's Social Participation/Avoidance subscale increased one point value, from 24 to 25, as did his Detrimental Social Behaviors (21 to 22). In general, Participant 2 displayed relatively lower social skills than others in the camp, and relative weakness in social reciprocity, based on the ASSP data of this study.

ASRS. Similarly, Participant 2 displayed Very Elevated scores for pre-test and post-test on both the ASRS Total Score and DSM-5 Scale (Table 11). However, his Self-Regulation

subscale decreased from Very Elevated to Elevated, Peer Socialization from Very Elevated to Elevated, Adult Socialization from Very Elevated to Elevated, and Attention from Very Elevated to Elevated. The following subscales remained within the same qualitative description from pre-test to post-test: Social Communication, Unusual Behaviors, Social/Emotional Reciprocity, Atypical Language, Stereotypy, Behavioral Rigidity, and Sensory Sensitivity. In general, Participant 2's parents reported a raised profile across most domains on the ASRS scale.

BOSS. Participant 2's inter-rater reliability scores were largely in the moderate agreement and above range. PABAK scores yielded one passive engagement score in the fair agreement range and one in the slight agreement range. PABAK rating scores also yielded a slight agreement rating for one off-task passive category. Results of the BOSS inter-rater reliability are displayed in Tables 20 and 21. Participant 2's BOSS ratings are displayed graphically below in Figure 2.

Figure 2. Participant 2 BOSS Results



Note. AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-V = Off-Task Verbal; OFT-P = Off-Task Passive; Dog-1 = first coder, focused treatment (AAT); Dog-2 = second coder, focused treatment (AAT); NoDog-1 = first coder, treatment as usual (social skills); NoDog-2 = second coder, treatment as usual (social skills)

Generally, Participant 2 displayed relatively more engaged than non-engaged behaviors across both interventions (Figure 2). While both interventions generally displayed an increase in active engagement behaviors, Participant 2 seemed to display slightly greater active engagement behavior during the social skills intervention-as-usual as compared to the AAT focused treatment. These results are supported by the ES calculations across both interventions (Tables 34 and 35). A medium effect was observed by coder 1 (-0.5) while coder 2 observed a strong effect (-3.5) in active engagement for the AAT intervention, while a strong effect was observed for active engagement by both coders in the social skills treatment-as-usual intervention (coder 1 ES = -1.9, coder 2 ES = -7.8). However, Participant 2 displayed an increase in passive engagement across both treatment categories, with greater improvement in the social skills intervention. For the AAT intervention, coder 1 suggested an increase in passive engagement with a medium effect (ES = -0.5) while coder 2 displayed no effect (0.0). In the social skills intervention, both coders suggested a large effect (coder 1 ES = 0.7, coder 2 ES = 3.9). Graphically, participant 2 seemed to display a slight increase in off-task motor behaviors in the AAT lesson at the end of the camp and low off-task motor behaviors maintained in the social skills lessons. However, both coders observed no effect in off-task motor behaviors for the AAT intervention (ES = 0.0), but a strong decrease in observed off-task motor behavior in the social skills lesion by coder 1 (ES = 4.6) and no effect by coder 1 (ES = 0.0). Further, Participant 2 rarely displayed off-task verbal or off-task passive behaviors, with conflicting ES values. These results suggest Participant 2 generally displayed greater active and passive engagement in the social skills intervention as compared to the AAT intervention, and greater overall engagement as compared to off-task behavior in both interventions.

Participant 3. Participant 3 was a seven-year-old, Caucasian male who recently finished second grade and was also new to this camp the year that this study was conducted. Participant 3 was in the youngest age group in this camp. Participant 3 had six siblings. He lived with his mother, sister, and grandmother. He reportedly did not know his biological father and five of his siblings were older and live nine hours away. Participant 3's mother was single and had some college education with a mean annual household income of $18,000. Participant 3 was first diagnosed with autism by his school. Participant 3 had never received ABA treatments. He also had no known comorbid diagnoses or medical history and did not take medications. This was his first year at this camp.

Camp records indicate Participant 3 was easily "triggered," but his parents noted there was no specific cause for his triggers, and the same stimulus reportedly would affect him differently at different times. To diminish challenging behaviors, his parents noted it was useful to change the activity, use a calming voice, use time-outs, and give him time to de-escalate. Participant 3 liked reading, playing on the computer, watching movies, painting, drawing, Legos, and dinosaurs. Participant 3 did not currently display any self-stimulatory behaviors, but previously engaged in oral stimulation and rocking. His misbehavior included bullying, hitting, impulsivity, mood swings, throwing objects, kicking, making verbal threats, scratching, spitting, and darting or running away. His parents noted Participant 3 had the following sensory issues: tactile, auditory, and visual (primary). In addition, Participant 3 struggled with others invading his personal space.

IEP records indicated Participant 3 was a "very bright" individual who enjoyed coming to school and learning. He reportedly struggled with social interaction, and had unusual responses to sensory experiences. Last year, Participant 3 reportedly has a record of searching horror

images on the Internet, sharing these images with other students, requesting to see other students' genital areas, purposefully stepping on other students' feet, threatening to stab another student in the face, and displaying general fixation on horror movies and morbid topics like human and animal sacrificing. Participant 3 was required to undergo daily backpack checks, use a continual behavior chart with positive reinforcement, use a calm down chart taped to his desk, and discuss social behaviors with school professionals as needed. Participant 3 was referred for outpatient therapy last year due to reduced success in his school placement and behavior intervention plan. Further, his plan was changed so he would not attend school on Fridays (reportedly his hardest day), and he attended half days the other days of the week (8:00 AM to 10:30 AM). His IEP noted other students struggled to accept him because of his "violent" behavior. Participant 3's teacher noted he was "always in constant motion," frequently flapped his hands when excited, displayed a flicking motion with his fingers when upset, displayed aggressive behaviors throughout the day, commonly touched female students, often rushed between places, muttered aggressive phrases to others (i.e., "I'm going to bash your head in"), and was often removed from situations to take breaks. He reportedly struggled the most during recess. His IEP goals included the following: learning to follow rules to raise hand instead of speaking out of turn and improve interpersonal skills by keeping one arm distance away from others. He also received special instructional services in behavior through social story and discussion in a special education setting. Participant 3 was in a general education classroom 40-79% of the day. Participant 3 came to school with "bumps and bruises" multiple times and school administrators expressed concern these might be the result of abuse or neglect, however, there was no confirmed history of abuse. Academically, Participant 3 struggled with math application and social skills, but displayed strong reading and vocabulary ability. The school psychologist made

note that Participant 3 typically only maintained brief eye contact, often had his hands to his ears, asked questions impulsively, and sometimes mumbled or whispered in an unusual manner.

No psychological report was available for Participant 3, but an occupational therapy report was completed when he was six-years-old. Participant 3 was reportedly referred due to noted deficits in fine and gross motor skills and sensory processing/coordination. He displayed no obvious delays in cognition, but required increased verbal cues and encouragement to attend to tasks. Participant 3 reportedly had poor coordination and gross motor skills (i.e., unable to complete jumping jacks, hunched posture while walking and constantly rubbing against walls). He was able to copy complex shapes with good accuracy, wrote his name with fair accuracy, was able to use scissors but struggled to integrate his hands into the cutting task. Participant 3's postural control was slightly decreased due to observations of leaning on the table or desk frequently.

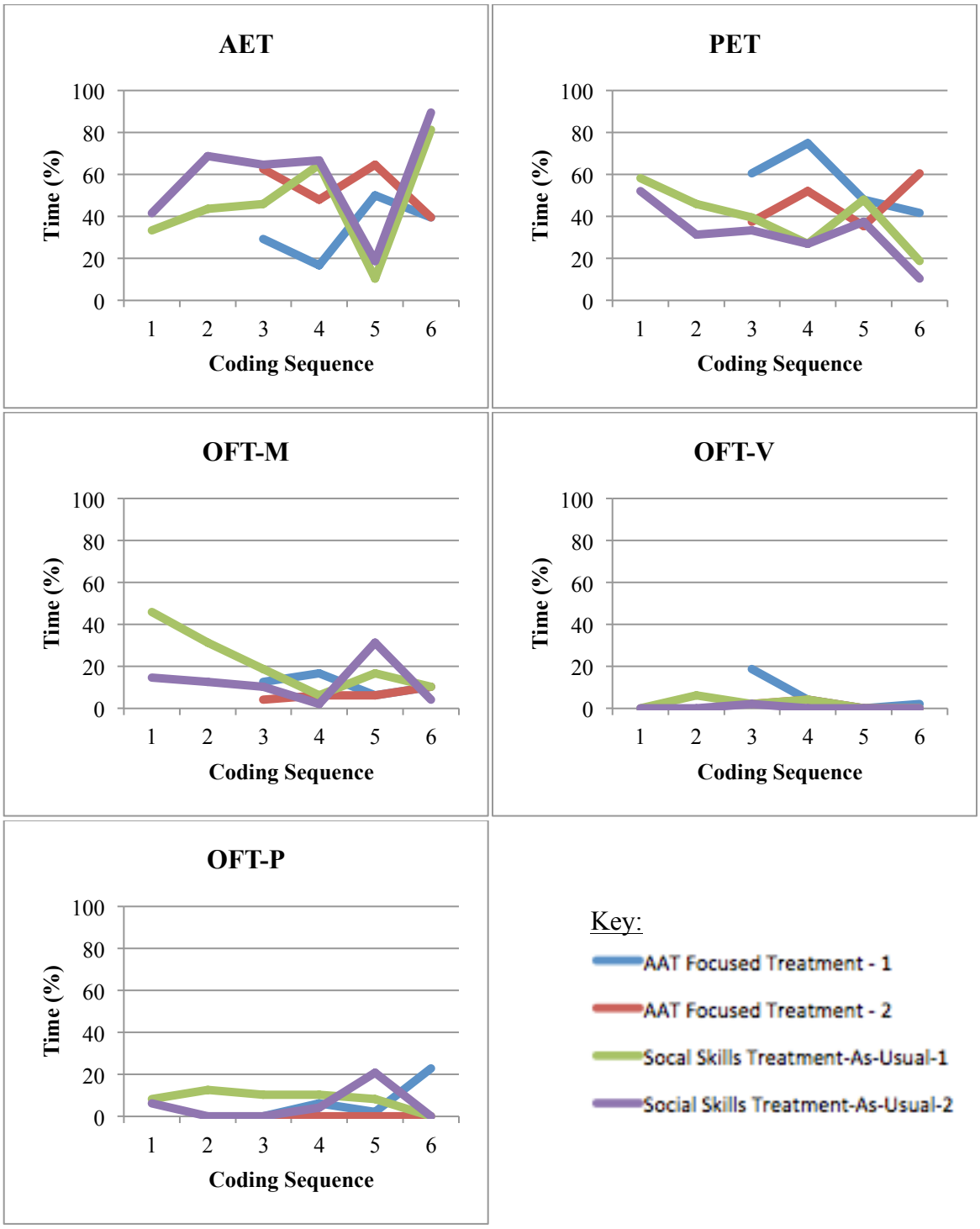
ASSP. Participant 3 displayed fairly high social skill functional ability, as observed on the ASSP (Table 4). Further, his Total Score increased six points from 114 at pre-test to 120 at post-test. Participant 3 displayed most growth in Social Participation/Avoidance, from a score of 31 to 35. He also improved in Social Reciprocity (51 to 53), but displayed a slight decrease in Detrimental Social Behaviors (24 to 23).

ASRS. On a symptomatic level, Participant 3 displayed less improvement on the ASRS (Table 12). His Total Score and DSM-5 Scale both remained at the Elevated level from pre-test to post-test. However, his Unusual Behaviors reduced from Elevated to Slightly Elevated, Self-Regulation from Slightly Elevated to Elevated, Social/Emotional Reciprocity from Very Elevated to Elevated, and Sensory Sensitivity from Slightly Elevated to Average. The following subscales remained at the same qualitative description from pre-test to post-test: Social

Communication, Peer Socialization, Atypical Language, Stereotypy, and Behavioral Rigidity. His scores increased in Self-Regulation from Slightly Elevated to Elevated, and Adult Socialization from Slightly Elevated to Very Elevated. Participant 3 appeared to have made the most growth in reduced unusual behaviors, improved social/emotional reciprocity, reduced behavioral rigidity, and reduced sensory sensitivity.

BOSS. The inter-rater reliability was fairly strong for Participant 3's BOSS ratings (Tables 22 and 23). PABAK statistic revealed fair agreement on his active engagement and passive engagement. The majority of his ratings were either in the substantial agreement or almost perfect or perfect agreement levels. Participant 3's BOSS ratings are displayed below in Figure 3.

Figure 3. Participant 3 BOSS Results



Note. AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-V = Off-Task Verbal; OFT-P = Off-Task Passive; Dog-1 = first coder, focused treatment (AAT); Dog-2 = second coder, focused treatment (AAT); NoDog-1 = first coder, treatment as usual (social skills); NoDog-2 = second coder, treatment as usual (social skills)

Overall, Participant 3 displayed more engaged than non-engaged behaviors (Figure 3, Tables 34 and 35). In particular, his active engagement appeared to decrease in the focused AAT intervention (coder 1 ES = 0.6, coder 2 ES = 0.1) and increase in the social skills treatment-as-usual intervention (coder 1 ES = -1.6, coder 2 ES = -0.2). However, Participant 3 displayed more passive engagement in AAT lessons as compared to social skills lessons (AAT medium ES = -0.5 and -0.3 for coders 1 and 2, respectively; social skills strong ES = 2.1 and 1.0 for coders 1 and 2, respectively). He displayed very little off-task motor, off-task verbal, and off-task passive behaviors in both treatments across the entire camp. There were generally strong reductions in off-task motor behaviors in both interventions (coder 1 ES = 2.6 and 2.5, coder 2 ES = 2.6 and 1.1 for the AAT and social skills interventions, respectively). There was conflicting ES results for off-task passive and off-task verbal change by both coders between both interventions. Overall, Participant 3 seemed to display greater passive engagement in the AAT intervention (as compared to the social skills intervention) and greater active engagement in the social skills intervention (as compared to the AAT intervention). Conflicting and comparable effect sizes were observed for all three off-task behaviors, so conclusions could not be drawn for the off-task behaviors between interventions.

Participant 4. Participant 4 was a nine-year-old African American male who had just completed 2nd grade and had previously participated in this camp in years prior to study conduction. Participant 4 was in the middle age group in this camp. He had no known medical history or comorbid diagnoses. Participant 4 took Intuniv (dosage unknown) at night and Guanfacine 1mg (morning and night) was started during the first week of camp. Participant 4 was reportedly diagnosed with ASD by his school and medical doctor when he was five-years-old. His mother reportedly was single and he lived with both his mother and brother. Participant

4's mother had some college education and had a mean annual family income of $25,000. Participant 4 also attended ASD treatment through a local center (frequency and type unknown). Participant 4 had attended this camp for four consecutive years.

Participant 4's mother reported Participant 4's largest behavioral concern was changes in routine, but chewing bubble gum "helps a lot," as well as redirection and swinging on playground swings. Participant 4 reportedly did not have many dislikes, but "he will tell you if he likes something or not." He frequently engaged in oral stimulation, rocking, and self-abusive (biting) behaviors for self-stimulation. He communicated verbally without use of adaptive equipment. Participant 4 had the following tactile sensory issues: chews on hands/fingers/feet and wears necklace with chewy attached.

Participant 4's record included a current IEP. He reportedly displayed strength in the following areas: knowing what expectations are required on a daily basis, following classroom routines, math ability, and improved social skill interactions. At the most recent IEP review, Participant 4 was working on learning to decode words, showing progress in speech therapy, asking for help and starting to make requests for his wants and needs, using decreased eye contact, displaying decreased prosody, having more difficulty comprehending abstract concepts, and rote count but not grasp quantity concepts. His language and processing disability reportedly affected his ability to follow complex direction and instructions. His IEP goals were listed as follows: improve sight words and comprehension of words read, improve language comprehension skills (abstract vocab, auditory and written receptive language), complete oral activities involving syntactic language with 90% accuracy, articulate words with f, v, and multiple syllables or blends with 90% accuracy, and achieve a domain score of 60 for reading on a reading assignment. Participant 4 receives the following accommodations: extended testing

time for math, use of calculator, tests read aloud, access to scribe for open-ended items, visual supports/boundaries, visual demonstration of instruction, visual schedule, break down of multi-step directions, allow breaks, access to sensory activities/materials for input, mouth chewy for oral sensory needs, outdoor swing, structured options during recess presented at the beginning to reduce conflict with peers, direct teacher instruction of "tell what you need" to encourage verbalization of wants/needs in class, and allowance to be first in line or use visual "walk" card. Participant 4 also received speech services three times per week and was allowed sensory breaks to reduce anxiousness and over-stimulation while in the general classroom. Participant 4 was in the general classroom with special education supports 40-79% of the day.

No psychological testing evaluation report was available for Participant 4.

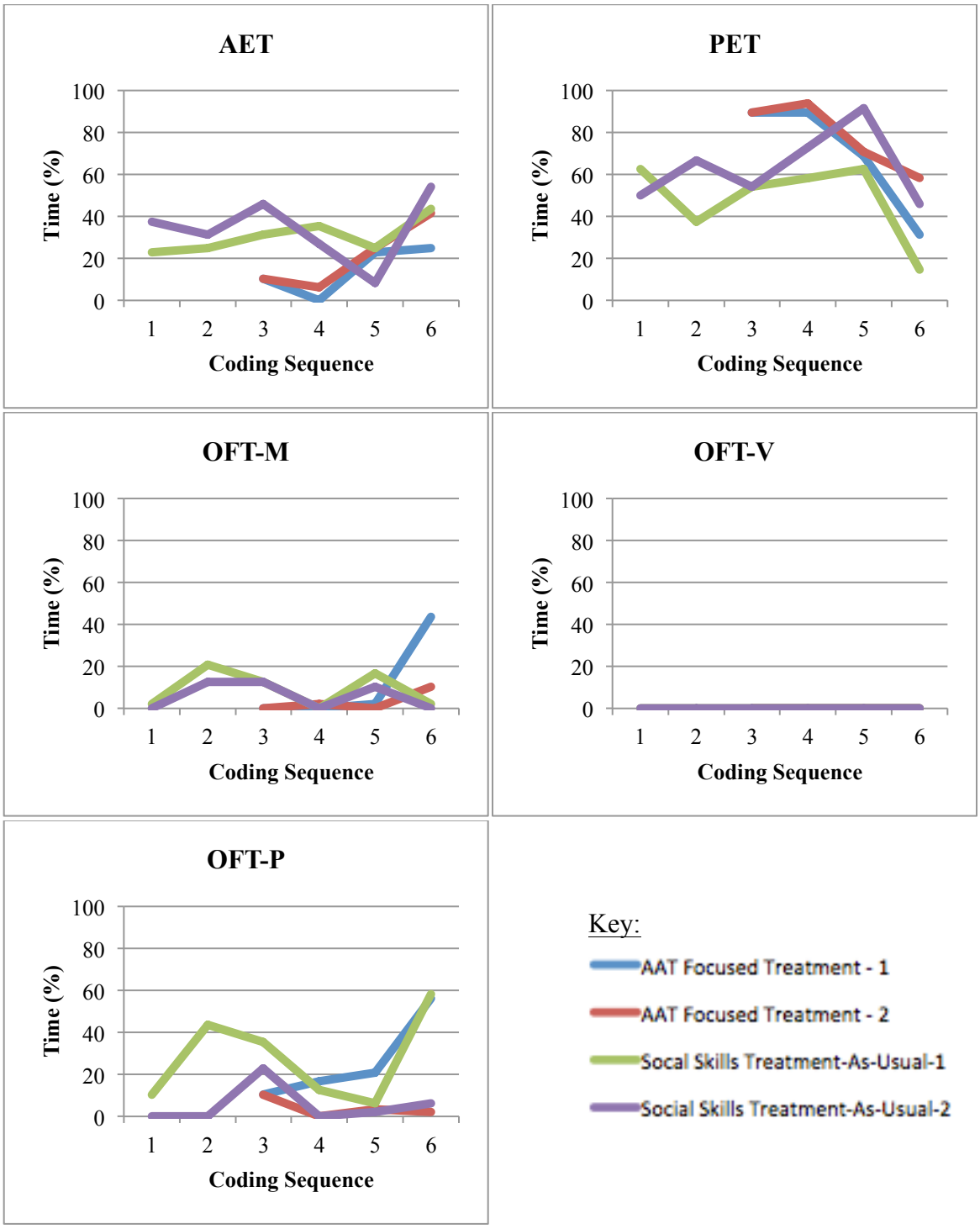
ASSP. Functionally, Participant 4 displayed relatively high social skill functional abilities, as measured by the ASSP (Table 5). However, his ASSP total score decreased from 112 at pre-test to 107 at post-test. This decrease was largely due to a decrease in the Social Participation/Avoidance subscale, which also decreased from 34 to 27. Participant 4's Social Reciprocity increased from 44 to 45, and his Detrimental Social Behaviors increased from 25 to 26. Overall, Participant 4 displayed relatively higher social reciprocity ability, as compared to other participants in this study.

ASRS. Participant 4 displayed Very Elevated Total Score results on the ASRS at both pre-test and post-test (Table 13). However, his DSM-5 Scale reduced from Very Elevated to Slightly Elevated. Further, there were no subscale clinical descriptive category changes on the following subscales: Unusual Behaviors, Self-Regulation, Adult Socialization, Social/Emotional Reciprocity, Atypical Language, Stereotypy, Behavioral Rigidity, Sensory Sensitivity, and Attention. The following subscales increased in symptom severity: Social Communication and

Peer Socialization. It appears Participant 4 did not display any notable symptomatic improvements over the course of this camp program.

BOSS. Inter-rater reliability for Participant 4 was largely in the substantial agreement and almost perfect or perfect agreement with a few exceptions (Table 25). Notably, his passive engagement and off-task passive categories each had three situations in either the fair agreement (three passive engagement, one off-task passive) or slight agreement range (two off-task passive). The most significant challenges with inter-rater reliability for Participant 4 were during final week of camp. Otherwise, there was strong inter-rater reliability for Participant 4. BOSS ratings for Participant 4 are displayed below (Figure 4).

Figure 4. Participant 4 BOSS Results



Note. AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-V = Off-Task Verbal; OFT-P = Off-Task Passive; Dog-1 = first coder, focused treatment (AAT); Dog-2 = second coder, focused treatment (AAT); NoDog-1 = first coder, treatment as usual (social skills); NoDog-2 = second coder, treatment as usual (social skills)

Overall, Participant 4 displayed more engagement behaviors than off-task behaviors (Figure 4, Tables 34 and 35). Participant 4 displayed more active engagement during social skills lessons than AAT lessons; however, active engagement ES calculations were conflicting. The AAT active engagement very strongly decreased (coder 1 ES =6.4 and coder 2 ES = 3.1), but the social skills active engagement ES calculations were as follows: coder 1 ES = -6.7 (large decrease) and coder 2 ES = 0.1 (small increase). However, he displayed the opposite trend for passive engagement, with more passive engagement during AAT lessons (coder 1 ES = -1.1 and coder 2 ES = -1.7) than social skills lessons (coder 1 ES = 0.1 and coder 2 ES = -0.7), with conflicting ES results in the passive engagement social skills intervention. Notably, Participant 4's active engagement for both interventions increased during the final week of camp, while his passive engagement for both interventions decreased. There were no discernible differences in off-task motor and off-task passive tasks for either intervention across all weeks of camp. Participant 4 displayed no off-task verbal behaviors in either intervention across all weeks of camp. Overall, Participant 4 displayed a greater reduction in active engagement in the AAT intervention (as compared to the social skills intervention) and greater passive engagement during the AAT intervention (as compared to the social skills intervention). Strong conclusions cannot be made for the off-task behaviors due to conflicting effect sizes and low prevalence rates for all three behaviors.

Participant 5. Participant 5 was a nine-year-old, Caucasian male who had just finished second grade. Participant 5 was in the middle age group of this camp. Participant 5 lived with his biological mother, father, and sister with a median family income of approximately $47,000. Participant 5's mother attended some college and his father had a bachelor's degree. Participant 5 reportedly was first diagnosed with ASD by his school and a psychologist. Participant 5 also

attends occupational therapy and speech therapy regularly, and was not currently in an ABA program. He had a history of mild eczema and seasonal allergies but no other comorbid diagnoses, medical history, or use of medication. Participant 5 participated in this camp last year and also attended another similar camp in the years prior.

The primary precipitating factors for behavioral dysregulation for Participant 5 mostly occurred when he was not allowed to take a break from activities. In addition, he reportedly struggled with withdrawal, biting, and lying. His interests included computers, videogames, and animal facts. Participant 5 had the following self-stimulatory behaviors: genital stimulation, oral stimulation, and self-abusive behaviors (biting himself). To manage Participant 5's behavior, his parents recommended use of sensory input, time out, removal from the group, and safe places. Participant 5 reportedly had tactile (messes or being dirty) and auditory (loud) sensory issues.

Participant 5 was in a general education classroom with a 2:23 classroom ratio for approximately 80% of the school day. His most recent IEP identified the following strengths: loved to share experiences about things at home, very creative and funny, enjoyed helping friends who are struggling, and rote skills (reading, math facts). The most recent progress monitoring revealed the following: produced eight sentences independently on the last writing sample, was seen twice per week for speech therapy, was working on paying compliments to others as a way to start conversations, was working on ending conversations, was capable of responding to other students, and was close to meeting his goal of three exchanges but needed cuing to continue the exchange. His cognitive abilities were reportedly in the Low Average range, achievement in the Low Average to Average range, and in the Very Likely range on parent- and teacher-report scales for autism. Participant 5 was reportedly a strong reader and

was able to read quickly "almost to a fault" as he would rush over words and miss what they were saying. He usually needed help to complete math assignments because he often missed instructions due to challenges with attention. Participant 5 was beginning to initiate play and would join in when asked, but he did not consistently answer questions. Sometimes, he would respond with answers that were off topic. He had reportedly been making new friends and would engage in play with his friends. Participant 5's school was seeking to improve his adaptive skills, as he still required accommodation and redirection to stay on task. In school-based occupational therapy, Participant 5 was receiving sensory strategies and modifications as necessary to assist with optimal classroom functioning. Participant 5's IEP goals were as follows: write at least one complete sentence when given a short answer question, initiate and maintain conversation with peers and adults with an increase of two interchanges, and tell how two presented items are similar and different without use of cues. Participant 5 received the following accommodations: extended testing time, small group testing, visual aids provided as needed, preparation for schedule changes, sensory breaks throughout the day, reading tests aloud, occupational therapy services integrated into the school day, and small group speech lessons. Participant 5 was in a general education classroom for most of the day (80%).

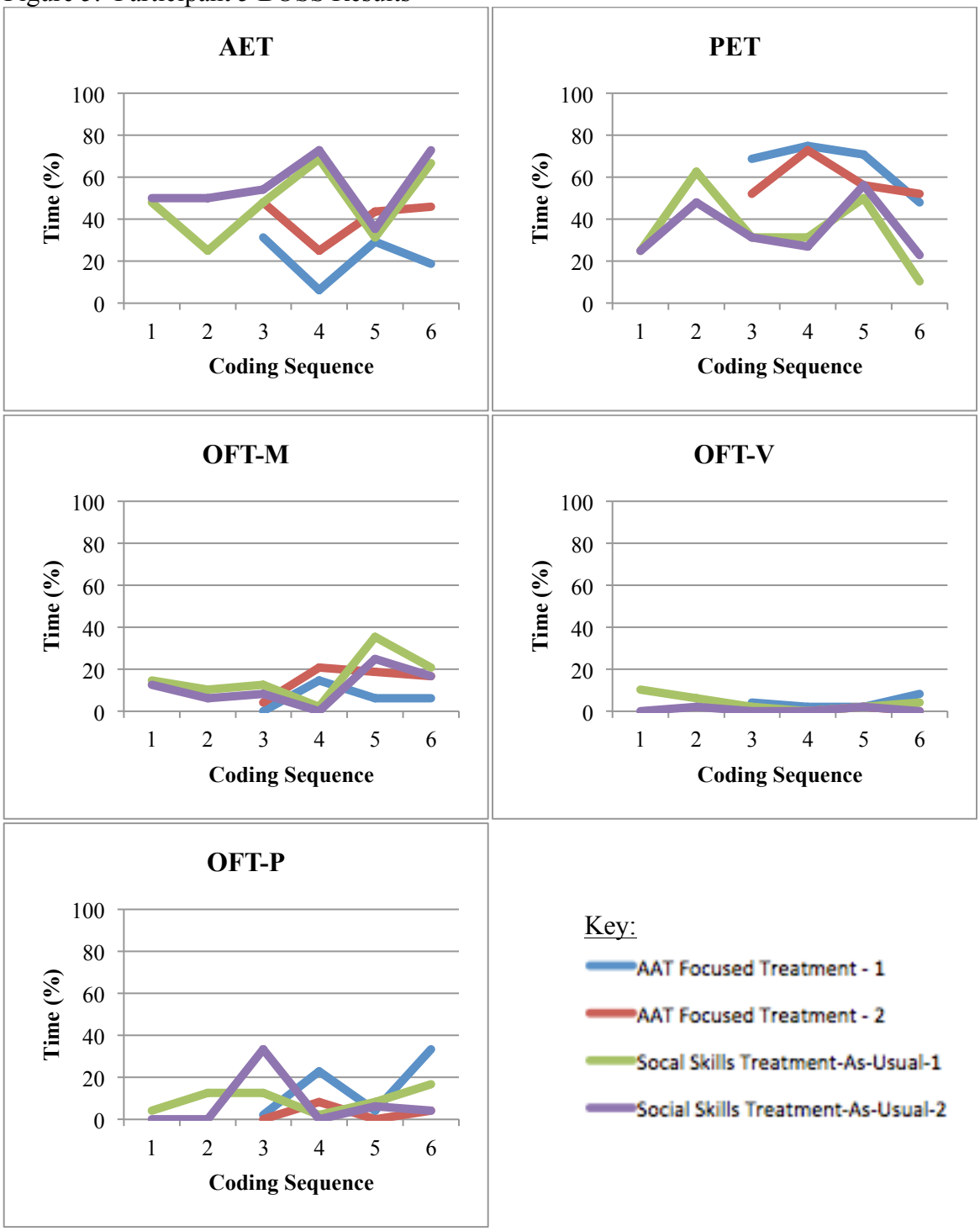
No psychological testing evaluation report was available for Participant 5.

ASSP. Participant 5 had the highest pre-test total score on the ASSP out of all study participants (Table 6). However, his total score decreased from 128 to 117 over the course of the program. In particular, his Social Reciprocity subscale decreased by 10 points (67 to 57) and Social Participation/Avoidance subscale reduced by one point (27 to 26). Participant 5's Detrimental Social Behaviors subscale increased by one point (26 to 27). Overall, Participant 5 displayed generally high functional social skills, but relative weakness in social participation.

ASRS. Participant 5 displayed Elevated Total Scores on the ASRS (Table 14). His DSM-5 Scale reduced from the Very Elevated to the Elevated range. His Adult Socialization reduced from Elevated to Slightly Elevated and his Sensory Sensitivity reduced from Very Elevated to Elevated. The following subscales maintained the same clinical category: Unusual Behaviors, Self-Regulation, Peer Socialization, Social/Emotional Reciprocity, Atypical Language, Stereotypy, Behavioral Rigidity, and Attention. His Social Communication went from Average (non-clinical) to the Slightly Elevated clinical range. Overall, Participant 5 displayed moderate symptomology on the ASRS.

BOSS. The PABAK agreements for Participant 5's behaviors were very strong (Table 27). The majority of the agreements were in the substantial level and above, with just nine instances in the moderate agreement range. Therefore, the research assistants deemed Participant 5's behaviors fairly predictable and consistent. BOSS ratings for Participant 5 are displayed below (Figure 5).

Figure 5. Participant 5 BOSS Results



Note. AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-V = Off-Task Verbal; OFT-P = Off-Task Passive; Dog-1 = first coder, focused treatment (AAT); Dog-2 = second coder, focused treatment (AAT); NoDog-1 = first coder, treatment as usual (social skills); NoDog-2 = second coder, treatment as usual (social skills)

BOSS rating scales revealed Participant 5 generally displayed more engaged behaviors than off-task behaviors (Figure 5, Tables 34 and 35). In particular, he appeared to be more actively engaged in the social skills lessons as compared to the AAT lessons. However, the ES calculations between the two coders were conflicting for the active engagement differences (coder 1 ES = 0.9 and ES -1.1 for AAT and social skills, respectively; coder 2 ES 0.0 and ES = 0.0 for AAT and social skills, respectively). However, he was more passively engaged in the AAT lessons than in the social skills lessons. Passive engagement effect sizes for the AAT lesson were as follows: coder 1 ES = -0.8 and coder 2 -1.4. Passive engagement effect sizes for the social skills lesson were as follows: coder 1 ES = 0.5 and coder 2 ES = 0.1. This demonstrates Participant 5 had a large increase in passive engagement during AAT lessons and medium to low decrease in passive engagement during the social skills lesson, as compared to the baseline levels. Participant 5 displayed slightly more off-task motor behaviors in the AAT lessons as compared to the social skills lesson in weeks two and three, but the opposite trend for weeks four and five (more in social skills lesson than AAT lesson). Effect size results for off-task motor were comparable, with opposing differences in the AAT lesson as compared to baseline (coder 1 ES = 2.0 and coder 2 ES = -1.3) but similarly large increases in off-task motor in the social skills lesson (coder 1 ES = -1.8, coder 2 ES = =0.7). Participant 5 displayed some oft-task verbal and off-task passive behaviors in both interventions, but did not display a greater tendency of these two behaviors in either intervention with similar results in effect size calculations. Overall, Participant 5 was more likely to be passively engaged in the AAT lesson (strong effect size) as compared to the social skills lesson (medium to small effect size). While the effect sizes were conflicting, Participant 5 might also be more actively engaged in the social skills lesson, and some (though albeit less) off-task behaviors in each lesson.

Participant 6. Participant 6 was an 11-year-old Caucasian male who just finished fifth grade and also had previously participated in this camp prior to the study conduction year. Participant 6 was in the oldest age group in this camp. Participant 6 was also diagnosed with ADHD and Kabuki Syndrome, and he received the following medication interventions: Ziprasizone HCL 40mg (twice daily), Trazadone 100mg (evening), Sertraline 25mg (morning), Strattera 40mg (twice daily), and Risperidone 2mg. Participant 6 was reportedly first diagnosed with ASD at age five and a half by a developmental pediatrician. He lived with his mother, father, brother, and sister with an average annual family income of approximately $20,000. Both of Participant 6's parents reportedly had received some college education. Participant 6 was not participating other ASD treatments during camp, but he had previously received ABA services through a local agency.

Participant 6 reportedly had most trouble when he did not get his way or did not want to engage in particular behaviors. His interests included making jets, playing on the computer, drawing, and playing with hot wheel tracks. Participant 6 engaged in oral stimulation occasionally at present. He had previously engaged in hand flapping, head banging, and self-abusive behaviors. Participant 6's primary behavioral concerns included noncompliance, hitting, stealing, impulsivity, swearing, mood swings, throwing objects, lying, and spitting. Participant 6 reportedly did not view adults as authority, and his teacher reported he views classmates and teachers as "the same." His parents reportedly used time outs, redirections, removal from an activity, and positive reinforcement to manage Participant 6's behavior. Participant 6 reportedly required some assistance in toileting, but ate independently and engaged in verbal communication without adaptive equipment. His parents denied any sensory issues for Participant 6.

An updated IEP plan was available for Participant 6's academic progress. Participant 6 was in a self-contained classroom that had a ratio of 4:10. His strengths included mastering the alphabet, knowing all of his personal information verbally, and being able to write simple sentences and his full name. Participant 6 was in a remedial reading program. He reportedly made academic growth the previous year, but continued to be significantly behind his same-aged peers in academic achievement. He required concrete repetition for skill development. Participant 6 attended speech therapy at school where he was described as an eager communicator, who spoke clearly, and was able to comment and ask questions. However, he was working on listening and turn taking, as well as choosing appropriate means of expressing feelings in certain situations. His IEP goals were as follows: able to subtract facts to 20 with 90% accuracy through small group instruction, able to write simple paragraphs while staying on topic, and respond appropriately with meaningful language to ask/answer questions and problem solve when given problem/solution scenarios (with support of visual/verbal cues, social stories, and video modeling). All of Participant 6's academics were in a self-contained classroom. His teacher's noted he had done well with small class environments and structure, but had been rude and disrespectful to others, including adults. In particular, Participant 6 "often wanted to do what he wanted to do 'all the time' and not what is expected of him." He reportedly was often tired at school and could become aggressive to adults and classmates. Participant 6 was reportedly ready to attend "specials" (i.e., art, music, physical education) with his general education peers next year.

Participant 6 was evaluated by a neurodevelopmental pediatrician when he was five years old. He reportedly was referred due to concerns at his pre-school. At that time, he displayed a global delay with functioning below one to two standard deviations from the mean for

communication. Participant 6 reportedly displayed aggressive behaviors toward other children. History included in that evaluation suggested he was born from an uncomplicated pregnancy with a normal prenatal period except for the presence of nuchal cords. Participant 6 had a family history of maternal depression and schizophrenia (great grandfather). The neurodevelopmental pediatrician diagnosed him with ASD and Kabuki Syndrome.

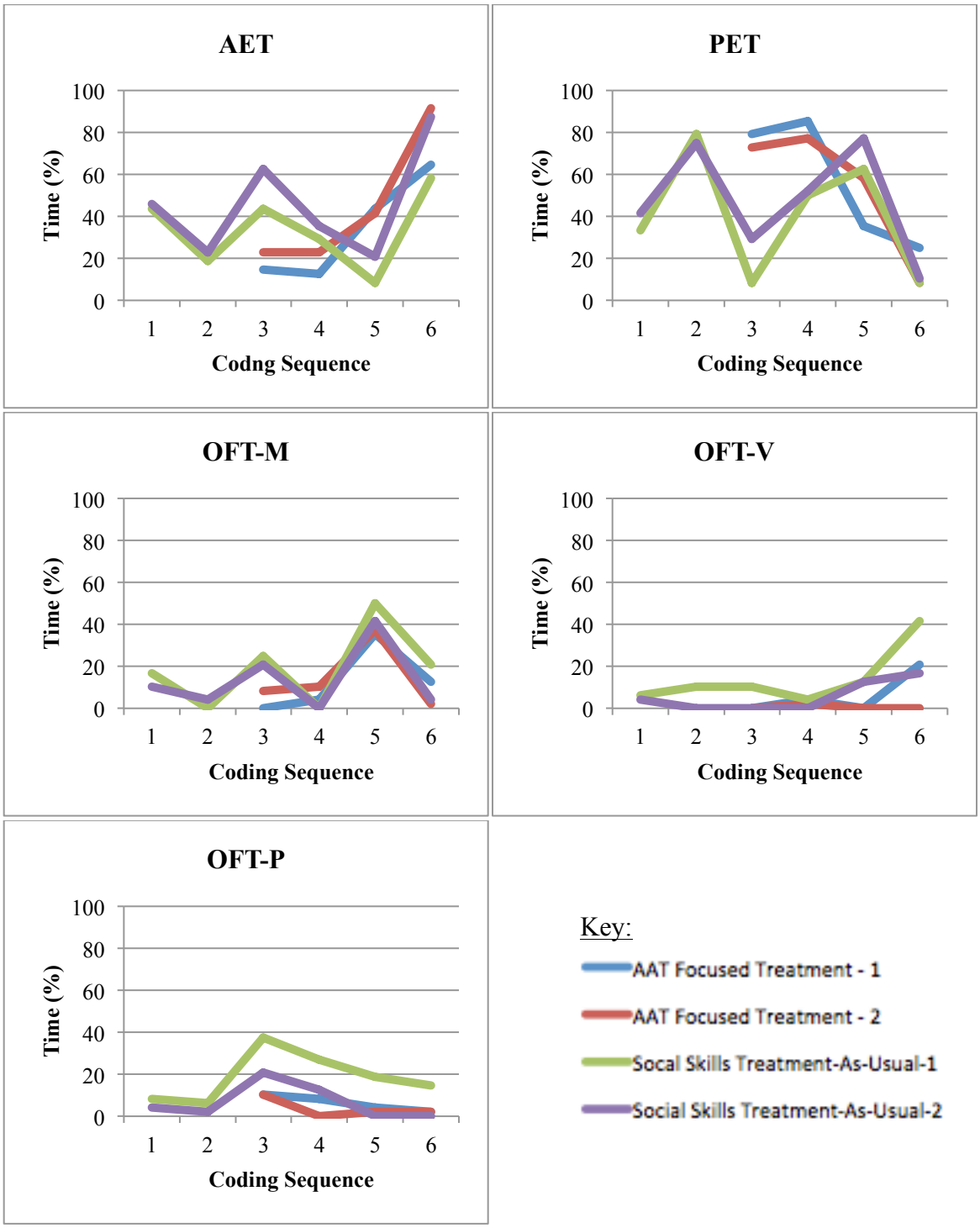
ASSP. Participant 6 had average functional social skills on the ASSP that increased four points over camp (107 to 111) (Table 7). The Social Participation/Avoidance subscale was a relative strength for Participant 6, which increased from 31 to 33 from pre-test to post-test. Participant 6's Detrimental Social Behaviors subscale also increased by one point (21 to 22), but his Social Reciprocity subscale decreased by one point (48 to 47). Overall, Participant 6 had a moderate amount of functional social skills, with particular ability in social participation.

ASRS. Symptomatically, Participant 6 scored in the Elevated range on the ASRS (Table 15). His ASRS Total Score decreased from the Elevated to Slightly Elevated range, but his DSM-5 Scale stayed in the Elevated range. The following ASRS subscales decreased: Social Communication (Very Elevated to Slightly Elevated), Unusual Behaviors (Elevated to Slightly Elevated), Adult Socialization (Elevated to Slightly Elevated), Social/Emotional Reciprocity (Very Elevated to Elevated), Atypical Language (Very Elevated to Elevated), and Sensory Sensitivity (Elevated to Average). The following subscales did not change from pre-test to post-test: Self-Regulation, Peer Socialization, Stereotypy, Behavioral Rigidity, and Attention. Overall, Participant 6 displayed relatively moderate levels of ASD symptomology, with particular improvement in social and emotional communication and sensory sensitivity domains.

BOSS. Participant 6's PABAK agreements for inter-rater reliability were fairly strong (Table 29). The majority of PABAK ratings were in the substantial agreement and almost

perfect or perfect agreement levels. Just a few ratings were in the moderate agreement range. One rating was in the fair agreement range for each of the off-task motor and off-task passive categories. BOSS ratings for Participant 6 are displayed below (Figure 6).

Figure 6. Participant 6 BOSS Results



Note. AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-V = Off-Task Verbal; OFT-P = Off-Task Passive; Dog-1 = first coder, focused treatment (AAT); Dog-2 = second coder, focused treatment (AAT); NoDog-1 = first coder, treatment as usual (social skills); NoDog-2 = second coder, treatment as usual (social skills)

BOSS ratings revealed high amounts of overall engagement, some amount of off-task motor behaviors, and limited off-task verbal and off-task passive behaviors for Participant 6 (Table 29). Graphically, his active engagement increased over the course of the camp for the AAT lesson and may have decreased during social skill lessons over camp (with one spike in the final week) (Figure 6, Tables 34 and 35). However, effect size calculations in active engagement revealed conflicting magnitudes of increase in the AAT lessons (coder 1 ES = -0.2 and coder 2 ES = -0.6) and social skills lessons (coder 1 ES = -0.2 and coder 2 ES = -1.1). Participant 6's passive engagement was relatively higher in the AAT lesson as compared to the social skills lesson. However, there appeared to be a small to no decrease in effect size for passive engagement during the AAT lesson (coder 1 ES = 0.0 and coder 2 ES = 0.2) and a large decrease in effect size in passive engagement during the social skills lesson (coder 1 ES = 0.7 and coder 2 ES = 0.7). Interestingly, Participant 6's passive engagement also generally decreased while his active engagement increased over the course of the camp. Participant 6's off-task motor had a moderate spike in week five, but did not appear to be different between the AAT and social skills lessons, with conflicting off-task motor effect sizes for each (coder 1 ES = -0.4 and -1.3, coder 2 ES = -1.7 and -2.1 for the AAT and social skills lesson, respectively). Similarly, his off-task verbal and off-task passive behaviors were not well-differentiated between the two treatments and both were relatively low throughout camp. However, both the off-task passive and off-task verbal appeared to have stronger increases in the social skills lesson (coder 1 ES = -11.7 and -3.0, coder 2 ES = -3.5 and -1.8, respectively) as compared to the AAT lesson (coder 1 ES = -0.7 and 0.7, coder 2 ES = -0.4 and 0.5, respectively). Overall, Participant 6 appeared to have conflicting levels of change in the AAT and social skills lesson. While Participant 6's passive engagement did not necessarily increase, it seemed to decrease more in the social skills lesson

(as compared to baseline) than the AAT lesson. Participant 6 also appeared to display more off-task passive and off-task verbal behaviors in the social skills lesson (as compared to baseline) than the AAT lesson.

Participant 7. Participant 7 was a 13-year-old Caucasian male who recently completed the eighth grade and had previously participated in this camp prior to the year of this study conduction. Participant 7 was in the oldest age group in this camp. He had a comorbid diagnosis of ADHD, no other medical diagnoses, and was treated with Ritalin three times a day (20mg in the morning, 10mg at noon, and 10mg in the evening). Participant 7 did not have any siblings and lived with his mother and father with an annual family income of approximately $120,000. His mother had attended some college and his father had a bachelor's degree. Participant 7 was reportedly first diagnosed with comorbid ADHD (Combined Type) and ASD at the age of nine by a psychologist at an autism center. He had not participated in other treatments for ASD.

Participant 7's camp file indicated his parents had the following behavioral concerns: noncompliance, impulsivity, anxiety, and depression. He had some auditory sensory issues, as loud noises tended to bother him. He was able to verbally communicate without use of adaptive equipment. His parents denied engagement in self-stimulatory behaviors.

Participant 7's latest IEP was available for review. Participant 7 reportedly enjoyed computers and technology. He received speech and language services once per month, special education services once per day, and counseling services once per week at school. His IEP goals were as follows: demonstrate appropriate social interactions during weekly socialization events by asking appropriate questions, inviting relevant conversations, maintaining eye contact, speaking in 80% of instances, and participating in unstructured conversation with no more than

one pragmatic related cue for five minutes when conversing with peers. Participant 7 received the following accommodations in school: extended testing time, use of calculator, tests read aloud, testing in small group settings, teacher monitoring of his agenda, teacher provides him a copy of the notes, use of a "calm down" pass if he becomes frustrated or overwhelmed, word banks and use of chunking for tests and quizzes, and it was not required for him to show all written steps when performing math-related assignments or tests. Participant 7 was reportedly above grade-level in reading recognition, at or above grade-level in math calculation, and below grade-level in social skills. His greatest area of strength was math, science, and reading, while his most significant needs were age-appropriate peer relationship skills and communication with peers, keeping hands to self, and learning patience within large group settings.

No psychological testing was available for Participant 7.

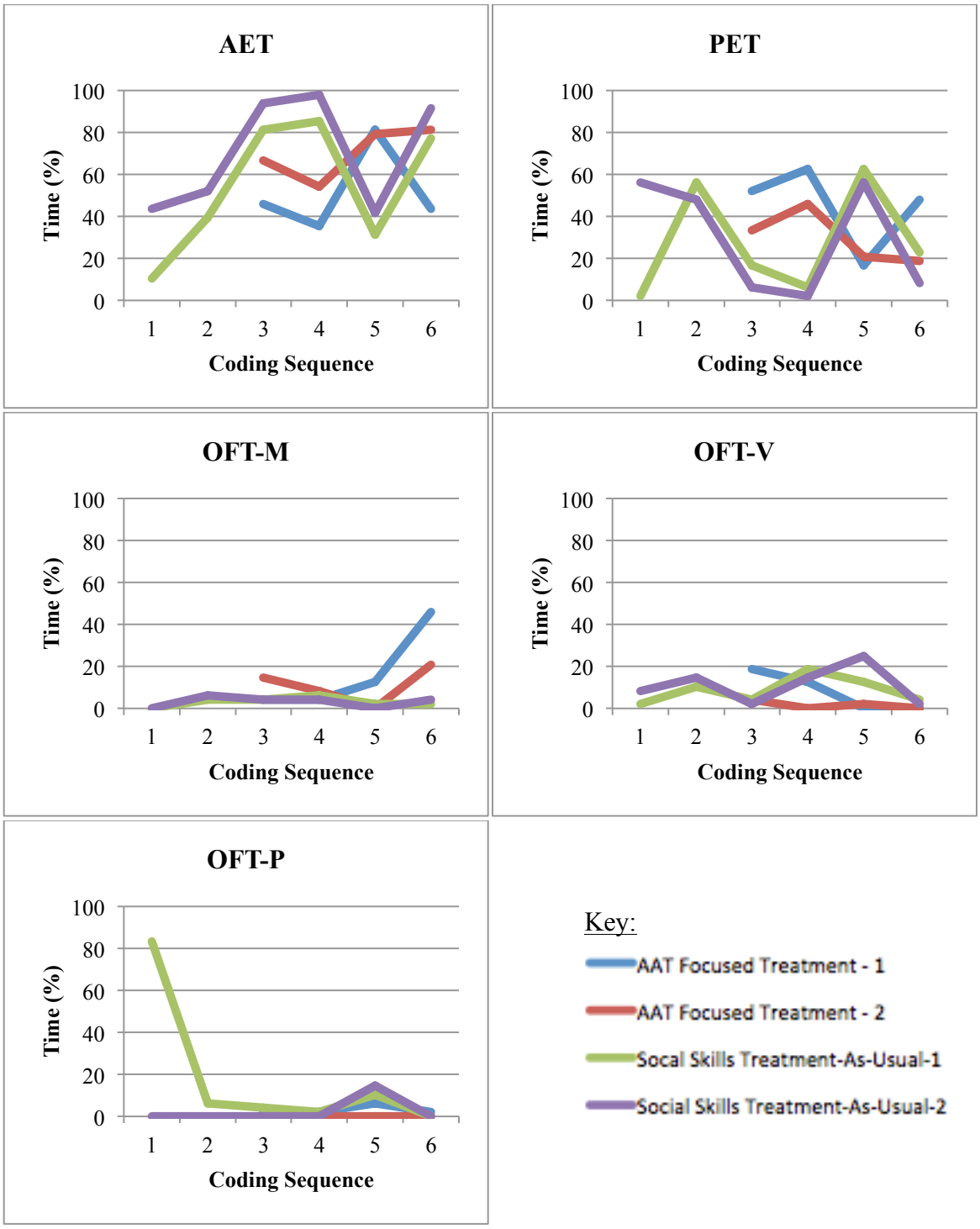
ASSP. Participant 7 displayed relatively average social skill functionality as calculated by the ASSP (Table 8). However, his total score on the ASSP reduced three points from pre-test to post-test, from 110 to 104. His Social Reciprocity skills were a relative strength for Participant 7; however, they decreased from 54 to 47 over camp. Participant 7's Social Participation/Avoidance subscale decreased by one point (26 to 25) while his Detrimental Social Behaviors subscale increased by two points (23 to 25). Overall, Participant 7 had average social skills compared to other participants in this study.

ASRS. Symptomatically, Participant 7's Total Score and DSM-5 Scale both increased from the Elevated to Very Elevated ranges from pre-test to post-test (Table 16). His Adult Socialization subscale was the only subscale to decrease, from Very Elevated to Elevated. The following subscales increased in clinical symptom severity: Social Communication, Unusual Behaviors, Self-Regulation, Social/Emotional Reciprocity, Stereotypy, Sensory Sensitivity, and

Attention. Three subscales did not change from pre-test to post-test: Peer Socialization (Very Elevated), Atypical Language (Average), and Behavioral Rigidity (Very Elevated). Overall, Participant 7's ASRS scores seemed to increase from pre-test to post-test. He seemed to have particular difficulty in peer socialization and behavioral rigidity.

BOSS. Participant 7's inter-rater reliability scores as measured by the PABAK statistic were relatively strong (Table 31). There was only one instance with fair agreement (active engagement), and six instances of moderate agreement (two active engagement, three passive engagement, and one off-task motor). The remaining coding samples were in the substantial agreement and almost perfect or perfect agreement ranges. BOSS ratings for Participant 7 are displayed below (Figure 7).

Figure 7. Participant 7 BOSS Results



Note. AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-V = Off-Task Verbal; OFT-P = Off-Task Passive; Dog-1 = first coder, focused treatment (AAT); Dog-2 = second coder, focused treatment (AAT); NoDog-1 = first coder, treatment as usual (social skills); NoDog-2 = second coder, treatment as usual (social skills)

Overall, Participant 7 displayed relatively high levels of active engagement and passive engagement, and minimal off-task behaviors (Figure 7, Tables 34 and 35). He displayed greater active engagement in the social skills lesson as compared to the AAT lesson for weeks two and three, greater active engagement for the AAT lesson in week four, and comparable active engagement in both AAT and social skills lessons in week five. In terms of effect sizes for active engagement, Participant 7 had a large increase in the AAT focused treatment (coder 1 ES = -1.3, coder 2 ES = -3.8) but a comparably larger increase in social skills treatment-as-usual intervention (coder 1 ES = -2.2, coder 2 ES = -5.6). Further, Participant 7 displayed greater passive engagement in the AAT lesson as compared to the social skills lesson in weeks two and three, but greater passive engagement in the social skills lesson in weeks four and five. Similarly, the effect sizes were conflicting for passive engagement in both the AAT lessons (coder 1 ES = -0.4, coder 2 ES = 3.8) and social skills lessons (coder 1 ES = 0.1, coder 2 ES = 5.8). Participant 7 displayed minimal off-task motor behaviors, except for a small spike during the AAT lesson in week five. However, effect sizes reveal a greater decrease in off-task motor behaviors in the AAT lessons (coder 1 ES = -5.0, coder 2 ES = -1.8) than the social skills lessons (coder 1 ES = -0.5, coder 2 ES = 0.0), as compared to baseline. He had some off-task verbal behaviors that were relatively greater in social skills lessons as compared to AAT lessons. There were again conflicting results for off-task passive and off-task verbal in both the AAT lesson (coder 1 ES = 0.8 and -0.3, coder 2 ES = 0.0 and 2.2, respectively) and social skills lesson (coder 1 ES = 0.7 and -0.6, coder 2 ES = 0.0 and 0.1 respectively). Participant 7 displayed relatively minimal off-task passive behaviors in both lessons, as compared to engagement behaviors. Overall, Participant 7 appeared to have display more engaged time than off-task behaviors. Further, Participant 7 displayed a greater increase in active engagement during the social skills

intervention (as compared to the AAT lesson) and a greater decrease in off-task motor behavior during the AAT lesson (as compared to social skills lesson). His passive engagement did not appear to change significantly between the two interventions.

Participant 8. Participant 8 is a 12-year-old Caucasian male in the oldest age group who just finished sixth grade and had previously participated in this camp prior to the year of this study conduction. Participant 8 reportedly did not have any comorbid diagnoses or significant medical history aside from one seizure in the previous year. He was treated with the following medications: Gabapentin 200mg (evening), Intuniv 4mg (evening), Melatonin (evening), and diazepam 10mg (if seizing). Participant 8 was first diagnosed with ASD by a psychologist when he was 3-years-old. He lived with his mother, father, and sister with a median annual family income of approximately $100,000. Participant 8's mother had a bachelor's degree and his father had a master's degree. Participant 8 was not in other ASD treatments during this study, but previously attended an ABA program when he was younger. He participated in this camp the last three years.

Participant 8's camp forms indicated his hardest behavior was separating from his mother, noncompliance, and swearing. He reportedly did well with clear plans and rules, and liked to play with friends, trains, and music. Participant 8 reportedly did not have any self-stimulatory behaviors. He communicated verbally without the use of adaptive equipment and had no reported sensory issues.

His latest IEP was also available for review. Participant 8's reported strengths included the following: very happy, strives to please teachers, follows directions well, is able to carry out instructed tasks with minimal reminders, funny, outgoing, determined, responds well to a tally system on behavior chart, and usually ceases unnecessary discussions when warned of possible

marks. His latest progress monitoring data revealed Participant 8 was at a second grade reading level, had great attendance, rode the bus with minimal refusals (reportedly a "huge" improvement), improved math (second grade level) but struggled with identifying whether to add or subtract, struggled with consistently remembering to place capital letters at the beginning of sentences and placing correct punctuation at the end, displayed 23% accuracy with reciprocity of conversation for at least three interchanges between conversation partners, and could identify emotions with 38% accuracy after being told a scenario and asked how someone would feel. He had a history of significant difficulty riding the bus to school due to separation anxiety (from mother). Participant 8 was in a resource classroom for all of instruction, but participated in lunch, recess, and specials with his homeroom classroom with the support of an assistant. His behavior reportedly improved "significantly" over the last year, with only one threat of aggression the whole year. He was able to walk around the building with an adult and required minimal reminders to remain close. He was performing below grade level in all academic areas, and received small group instruction for reading, math, and writing. He struggled to communicate frustrations during the school day and to have a reciprocal conversation with peers and adults. His scripting reportedly interfered with his ability to stay focused on task or in a conversation. The two most prominent behaviors impeding his learning were noncompliance (saying "no" or "I don't want to do this," ignoring staff, making loud noises, refusing to start or complete activities, talking about unrelated topics), and impulsivity (off-task, short attention span, making noises, anxiousness). Participant 8 had a behavior therapist and speech-language pathologist who worked with him during the school day. His IEP goals were as follows: subtract double digits by regrouping with 80% accuracy, state the main idea and identify three details in a reading passage with 80% accuracy, write three simple sentences on a preferred topic with zero

prompts per sentence, increase reading fluency to 111, increase word count per minute to 120, , improve reciprocity of conversation for at least three interchanges between conversation partners from 23% to 80% accuracy independently, improve accuracy of identifying emotions from 38% to 80% after reading a scenario and asking how someone felt, improve accuracy of verbally answering "when" why" and "how" questions from 17% to 80%, and have no more than two incidents of noncompliance per week. His accommodations included use of alternative methods of response (circle, point, state) in all core subjects, small group instruction for core classes, one-on-one assistance in band, and special education services for reading, health, science, social studies, and math.

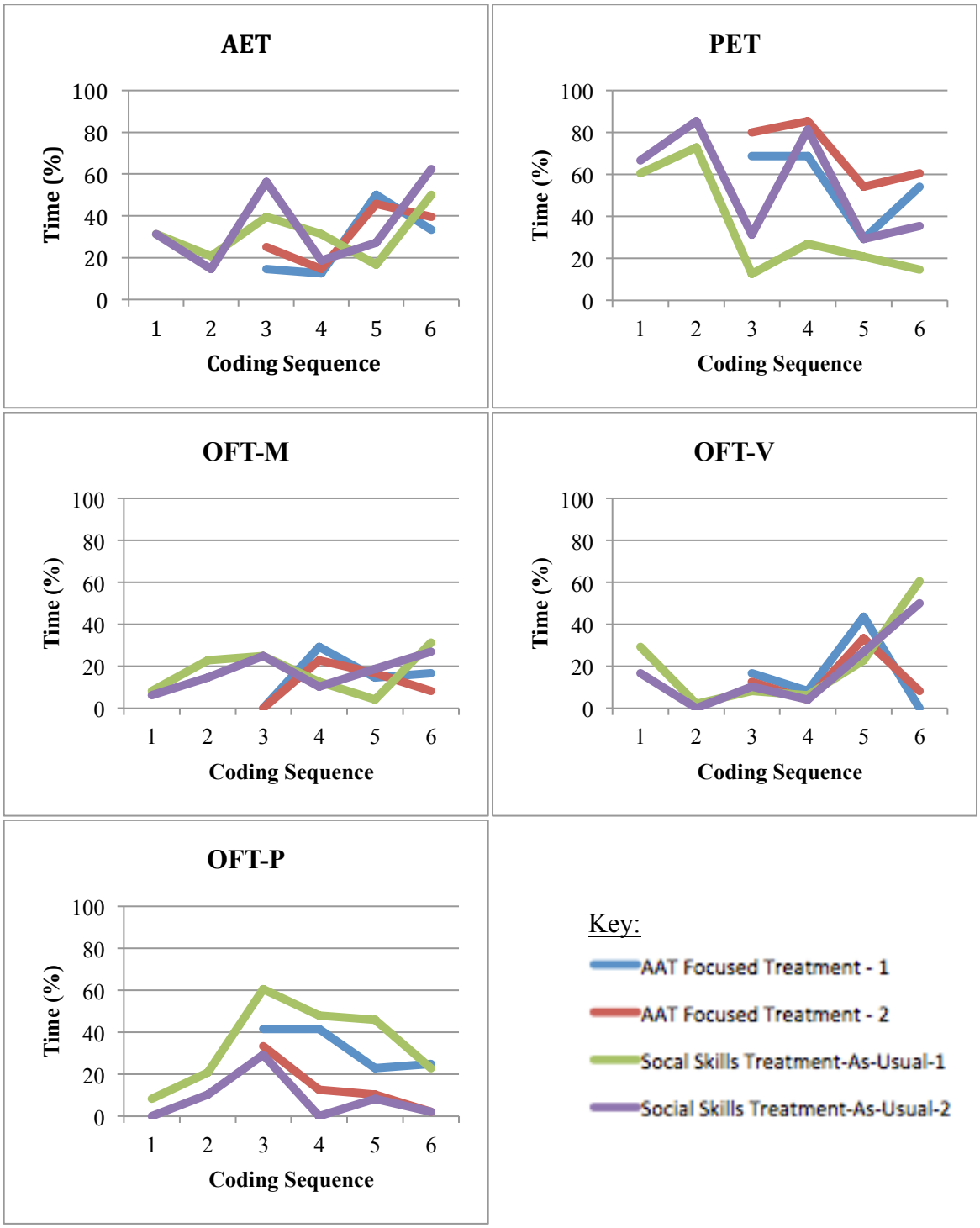
No psychological testing was available for Participant 8.

ASSP. Participant 8 displayed relatively average social skill ability, as measured by the ASSP (Table 9). His pre-test score of 109 decreased to 106 over the course of camp. He displayed average performance on all three subtests, as compared to other study participants. His Social Reciprocity subscale decreased from 49 to 47, his Social Participation/Avoidance subscale increased by one point (26 to 27), and his Detrimental Social Behaviors subscale remained the same (25).

ASRS. Participant 8's ASRS scores were in the Very Elevated range for the DSM-5 Scale in both pre-test and post-test, and his Total Score increased from Elevated to Very Elevated (Table 17). He displayed one subscale reduction, from Slightly Elevated to Average on Sensory Sensitivity. The following subscales remained the same from pre-test to post-test: Social Communication, Adult Socialization, Social/Emotional Reciprocity, Atypical Language, Stereotypy, and Behavioral Rigidity. The following subscales increased in score: Unusual Behaviors, Self-Regulation, Peer Socialization, and Attention.

BOSS. Participant 8's PABAK agreements for inter-rater reliability were mostly in the substantial agreement and almost perfect or perfect agreement ranges (Table 33). There were nine instances of moderate agreement, two instances of fair agreement, and one instance of slight agreement. Both instances of fair agreement were in the off-task passive category and the slight agreement was in the passive engagement category. BOSS ratings for Participant 8 are displayed below (Figure 8).

Figure 8. Participant 8 BOSS Results



Note. AET = Active Engagement; PET = Passive Engagement; OFT-M = Off-Task Motor; OFT-V = Off-Task Verbal; OFT-P = Off-Task Passive; Dog-1 = first coder, focused treatment (AAT); Dog-2 = second coder, focused treatment (AAT); NoDog-1 = first coder, treatment as usual (social skills); NoDog-2 = second coder, treatment as usual (social skills)

Overall, Participant 8 displayed a mixture of both engaged and off-task behaviors, as measured by the BOSS coding system (Figure 8, Tables 34 and 35). His active engagement was comparable between both social skills and AAT lessons; however, his active engagement increased more in the social skills lesson (coder 1 ES = -1.1, coder 2 ES = -1.6) than the AAT lesson (coder 1 ES = -0.2, coder 2 ES = -0.7). Graphically, his passive engagement appeared to be relatively higher in AAT lessons as compared to social skills lessons, both of which decreased over the course of the camp. In terms of effect size, Participant 8's passive engagement displayed a large to moderate decrease for the AAT lesson (coder 1 ES = 1.3, coder 2 ES = 0.5) and a large effect size decrease in the social skills lesson (coder 1 ES = 5.4, coder 2 ES = 2.4). He displayed some off-task motor behaviors that were comparable, with conflicting effect sizes, across both lesson settings. Similarly, his off-task verbal behaviors were also comparable in both settings, which both seemed to gradually increase over the course of the camp with the exception of the final week (greater off-task verbal in social skills lesson than AAT). Effect sizes for off-task verbal were also conflicting. Participant 8 displayed a moderate amount of off-task passive behavior with mixed results (including effect size differences) due to inconsistent inter-rater reliability across all five weeks. Overall, Participant 8 appeared to display a greater increase in active engagement during the social skills lesson. His passive engagement and off-task behaviors displayed conflicting levels of change as measured by effect sizes, but there was a greater reduction in passive engagement in the social skills intervention (as compared to the AAT intervention). Overall, Participant 8 seemed to display greater engagement behaviors as compared to off-task behaviors for both interventions.

Between-Subjects Results

Overall, there was a fair amount of social skill functioning and ASD symptom severity across all eight participants, as measured by the parent-report behavioral rating scales. A handful of the participants had comorbid medical and psychiatric diagnoses that complicated symptom and behavioral patterns. There was some variability in ASSP scores (Tables 2 to 9) that did not seem to be strongly tied to symptom severity on the ASRS (Tables 10 to 17). Functional symptom change across camp and between participants did not seem to be clearly significant, as some participants improved in social skills while others deteriorated. However, there is a possibility that a developmental trend existed in ASD symptom improvements (as measured by the ASRS), as the youngest group either stayed the same or improved symptomatically, while two out of the three participants in the oldest group seemed to either stay the same or worsen symptomatically (Tables 10 to 17).

In terms of the observational data, most study participants appeared to display greater passive engagement during AAT than in the social skills lessons. This difference from the baseline sessions appeared greater than was observed in active engagement, which tended to be generally comparable between both interventions for most participants. Off-task motor behaviors were sometimes greater in AAT lessons as compared to social skills lessons, but these results were not consistent across participants. Off-task verbal and off-task passive results were inconclusive although they appeared to occur less frequently in both the AAT lessons and social skills lessons. In general, participants seemed to display more passive engagement during AAT lessons.

Discussion

The high heterogeneity of symptoms (Reichow et al., 2012), high rates of comorbidity with other psychological disorders (Damiano et al., 2014), high rates of genetic variability (Abrahams & Gescwind, 2008), and debate regarding the diagnostic etiology and pathophysiology (Damiano et al., 2014) make empirical research on treatment interventions for ASD challenging. Each of these dimensions introduces confounding variables into group-level analyses, potentially masking key components of therapeutic change. Further, such specificity may be lost in group-level comparisons. Therefore, the purpose of this study was to utilize a multiple subject case study design to provide greater specificity on how particular symptom presentations interact with the implemented interventions.

Social skill deficits are a core component of the ASD diagnosis (Carter et al., 2005), but a single treatment may not always be the most efficacious for all individuals with ASD due to the previously described confounding variables. AAT has preliminary empirical evidence for individuals with ASD, but at the time of this study, there was no agreement detailing the efficacy of AAT interventions to build social skills in children with ASD. Therefore, it was the purpose of this study to compare the focused AAT technique and social skills treatment-as-usual lessons within the multiple subject case study design. Further, engagement is one of the core features of academic achievement (Greenwood et al., 2002), but children with ASD often struggle in this domain due to a variety of learning challenges associated with the diagnosis. Therefore, the construct of engagement was chosen as a marker to describe the proposed differences between the two primary interventions in this study.

Findings

The eight participants in this study had a variety of ASD symptom presentations, medical and psychiatric comorbidities, and behavioral patterns that support the heterogeneity in symptom challenges to empirical research. Interestingly, the AAT intervention did not appear to demonstrate consistent improvement in positive engagement for all participants in this study. Functionally (as measured by the ASSP) and symptomatically (as measured by the ASRS), some participants displayed improved social skills, while other participants either remained the same or even decompensated slightly. Recall the following three research questions were proposed:

1. Does the use of AAT:
    a. Increase overall engagement as compared to off-task behaviors?
    b. Increase active engagement time (AET) as compared to passive engagement time (PET)?
    c. Reduce off-task motor (OFT-M) more than off-task verbal (OFT-V) and off-task passive (OFT-P)?
2. Do the parents of the children diagnosed with ASD participating in a social skills group observe functional social skill improvements, as measured by the Autism Social Skills Profile (ASSP), in their children over the course of the summer camp program?
3. Do the parents of the children diagnosed with ASD participating in a social skills group observe ASD symptom improvements, as measured by the Autism Spectrum Rating Scales (ASRS), in their children over the course of the summer camp program?

AAT. Observational coding procedures were utilized to address the three dimensions of the first research question. In general, research question 1a was supported, though with minimal magnitude in differences (measured by effect sizes) compared to the social skills treatment-as-

usual. Further, the focused AAT treatment did not appear to increase active engagement time (AET) more than passive engagement time (PET), so research question 1b was not supported. However, it is unable to be determined whether this difference in AET and PET between interventions is truly due to treatment effects, or as a result of the nature of the lessons. The social skills treatment-as-usual activities generally required more active engagement than the focused AAT lessons. During the first few AAT lessons, campers were required to sit in a circle, pay attention, and take turns more than the social skills treatment-as-usual. While the content of each intervention was comparable each week (i.e., discussion about sadness, manners, self-regulation), the nature of each lesson may have been different due to the nature of the AAT lesson. For example, only one therapy dog was present in the AAT lessons, so the need to take turns and sit quietly was more inherent to the AAT intervention. Therefore, the required on-task behavior for the AAT lesson was predominantly passive engagement while the required on-task behavior for the social skills treatment-as-usual was predominantly active engagement. This discrepancy was not able to be deciphered within the design of this study and requires further evaluation. Finally, research question 1c could not be reliably confirmed or denied due to comparably low prevalence rates and conflicting effect sizes for all three off-task behaviors across both interventions.

Moreover, there were a few measurement considerations in the BOSS coding procedures utilized in this study to assess levels of engagement between the two interventions. First, there was more variability and inconsistency in inter-rater reliability on the passive engagement and off-task passive categories across study participants. While this variability may be indicative of the content of the lessons, as mentioned above, it may also reflect the heterogeneity of symptom presentations within the ASD diagnosis, as the passive engagement levels were comparably more

difficult to operationalize in this context. Second, there was much greater inter-rater reliability for off-task verbal ratings, but the prevalence of off-task verbal rating was relatively less common and thus may have decreased the opportunities for coding disagreement. In turn, the effect size differences for all three off-task behaviors (including off-task verbal) was inconsistent and often conflicting, making strong interpretation for off-task behavior comparison difficult within the scope of this study. Finally, the relatively greater inconsistency in inter-rater reliability (as measured by PABAK estimates) likely contributed to the stated effect size inconsistencies between the two raters and across the two interventions. Overall, the BOSS behavioral rating scales appear to better differentiate clinical significance in the context of this study, as compared to parent-report measures.

Parent Ratings. Behavioral rating scales were implemented to address research questions two and three. However, findings were mixed for functional skill improvements (as measured by the ASSP, research question two) and symptomatic improvements (as measured by the ASRS, research question three). While no significant improvement was noted on the ASSP, these scores were poorly correlated with the ASRS, a more established and empirically supported measure. Therefore, research question two was not supported.

Similarly, the ASRS findings were mixed. There was limited change in standard scores on the ASRS, but changes were noted in the clinical categories. Such change was not always in a favorable direction, but there may have been a developmental effect observed in these behavior rating scores. As outlined in Tables 36, 37, and 38 below, the older participants appeared to be more likely to either stay the same or display greater symptoms (“worsening”), while the younger participants seemed to be more likely to either display no change or display a reduction in ASD symptoms (“improvement”). Interestingly, this trend seemed to be corroborated because

the middle group tended to be more likely to display no change across most categories. Therefore, it is possible there was a developmental effect to the results in this study. Most notably, the AAT and social skills lessons may have had a greater effect on the younger children of the study, as compared to the older children. While direct inferences for this observation cannot reliably be made within the confines of this study, it is possible the older participants may also have been asserting more age-typical separation-individuation behaviors when they spent time with their peers, thus displaying a worsening of ASD symptomology as measured by parent-report on the ASRS.

Table 36: *ASRS Trends for Group 1*

Domain	Participant 1	Participant 2	Participant 3
Social Communication	+	=	=
Unusual Behaviors	+	=	+
Self-Regulation	+	+	-
Peer Socialization	+	+	=
Adult Socialization	=	+	-
Social/Emotional Reciprocity	+	=	+
Atypical Language	+	=	=
Stereotypy	+	=	=
Behavioral Rigidity	+	=	=
Sensory Sensitivity	=	=	+
Attention	+	+	=

Note: "+" denotes Improvement, "=" denotes No Change, "-" denotes Worsening

Table 37: *ASRS Trends for Group 2*

Domain	Participant 4	Participant 5
Social Communication	-	-
Unusual Behaviors	=	=
Self-Regulation	=	=
Peer Socialization	-	=
Adult Socialization	=	+
Social/Emotional Reciprocity	=	=
Atypical Language	=	=
Stereotypy	=	=
Behavioral Rigidity	=	=
Sensory Sensitivity	=	+
Attention	=	=

Note: "+" denotes Improvement, "=" denotes No Change, "-" denotes Worsening

Table 38: *ASRS Trends for Group 3*

Domain	Participant 6	Participant 7	Participant 8
Social Communication	+	-	=
Unusual Behaviors	+	-	-
Self-Regulation	=	-	-
Peer Socialization	=	=	-
Adult Socialization	+	+	=
Social/Emotional Reciprocity	+	-	=
Atypical Language	+	=	=
Stereotypy	=	-	=
Behavioral Rigidity	=	=	=
Sensory Sensitivity	+	-	+
Attention	=	-	-

Note: "+" denotes Improvement, "=" denotes No Change, "-" denotes Worsening

Clarification regarding such developmental considerations requires further empirical validation, but a few preliminary hypotheses were identified. When comparing the three groups, it seems as though the following ASRS categories displayed this slight developmental trend with greater gains for the youngest group and minimal gains or worsening for the oldest group: Self-Regulation, Peer Socialization, Social/Emotional Reciprocity, Stereotypy, and Attention. It is possible this narrower view of social skills within the AAT and social skills interventions displayed a more accurate level of change in the younger-aged children. Interestingly, the following categories displayed less developmental difference: Adult Socialization, Atypical Language, Behavioral Rigidity, and Sensory Sensitivity. Further empirical investigation is warranted before more concrete conclusions can be made.

A few measurement considerations should be made for the parent-rating scales. First, the lack of significant change detected by both the ASSP and ASRS could signal the test-retest period used in this study for the ASSP and ASRS may not have been sufficient to capture meaningful symptom changes. However, it should be noted that most of the 95% confidence intervals for the ASRS were fairly large in range, making statistically significant change difficult. Thus, it may be more accurate, especially considering the design and timeline of this study, to consider the qualitative category changes. In addition, it is possible that the timeframe of camp (duration of intervention) was insufficient to achieve functional and symptomatic improvement in participants' behavior. It should also be noted that the camp took place during the summer where parents generally spent more time with their children and the days were comparably less structured than the school year, potentially impacting parent expectation for participation change. The possible developmental effects observed in the ASRS results could also indicate parent expectations may change as their children got older. Such considerations could be explored through future empirical study. Together, these results indicate the parent-report measures may not be a reliable measure of change in this context.

Limitations

While the current study can provide many domains of empirical evidence, it does not come without its limitations. The most obvious limitation of this study was the inability to completely parcel out specific treatment effects for each intervention. For obvious ethical reasons, a no-treatment control was not possible, and therefore the current study did not have a clearly defined no treatment control comparison. Similarly, evaluation of the specific treatment effects of the DIR model was not explored in the context of this study. Despite best efforts to constrain the constructs of interest, it should be noted the children who participated in this

summer camp were also attending a variety of other activities each day. Therefore, the impact of participation in the entirety of the camp could not be isolated from the effects due to the social skills lessons and AAT alone. This study also used parent self-reports, which have potential for bias. Further, the self-report scales may not be sensitive enough to pick up subtle and short term social skill changes, and it is possible parents may not be able to reliably notice skill changes. Other studies have shown even while still meeting validity criteria, parent self-reports have low to moderate correlation with child self-reports in quality of life studies with the ASD population (Bastiaansen, Koot, Ferdinand, & Veerhuls, 2004; Sheldrick, Neger, Shipman, & Perrin, 2012). Further, due to the nature of the summer camp, it was not possible for this study to assess longer-term maintenance of treatment gains. It should also be mentioned that results from this study are specific to children diagnosed with ASD, and may or may not translate to use with other populations.

A few methodological implications inherent to the observational coding system used in this study should also be noted. While video recording allows for a more naturalistic assessment of participant behavior (i.e., less researcher invasion to the normal environment), coding (and therefore behavioral assessment) can only be made for behaviors shown within the video frame. This presented as one particular challenge for this study as there were times when participants left the video frame and coders were not able to assess for behaviors present in those moments. As mentioned, coders were instructed to not code anything (i.e., a "no code" segment) during these moments, but this discrepancy clearly reduces the prevalence of the displayed behavior. Similarly, the peer-coding segment could not be removed from the BOSS program, so this increased the "no code" segments for each video. Further, use of video recordings in a relatively noisy classroom often made identification of participant verbal behavior challenging. The

coding researchers in this study stated they could at times infer participant verbalizations, but depending on the volume of the classroom (and distance of participant to camera), complete interpretation was at times reduced. These discrepancies likely contributed to the variability in inter-rater reliability estimates.

Finally, it should be noted that the results of this study are specific to the ASD population and may not be generalizable to the general population. The unique nature of ASD symptomatic patterns have potential to interact with the interventions in this study, making generalizability outside of this population reduced. Further, it is possible the symptom patterns of ASD may uniquely interact with the AAT intervention. Future study could investigate the comparison of the ASD population to a same-age, typically developing population on measures included in this study.

Strengths

At the same time, this study has potential to add considerable research evidence in a variety of domains. As mentioned, AAT has gathered strong anecdotal evidence, but the research designs to strengthen its support are still limited in number and methodological rigor. This study provided a proposed mechanism whereby AAT can increase engagement and thus increase the effectiveness of interventions. The case study methodology also assists in better addressing the limitations of using group study methods by recognizing the heterogeneity of symptoms within the ASD diagnosis. A more in-depth investigation for each participant lends more specificity in description for how the proposed interventions were connected with particular symptom patterns. Further, this study utilized an observational coding program that may provide a stronger assessment of specific treatment components and behaviors. On a

broader level, this study also adds empirical evidence to strengthen the support for social skills groups for children with ASD.

Implications

The complexity and detail-rich description of this case study design provides useful information for future investigation. The nature of the design can benefit both research and clinical treatment for the ASD population, each of which will be described in the following sections.

Research. One particular strength of this study is the effectiveness of the BOSS program in deciphering on-task versus off-task levels of engagement for children with ASD during interventions. Results of this study suggest the BOSS programming provided a useable method of tracking both positive and negative behaviors throughout lessons. However, as mentioned, the nature of AAT and traditional academic settings, such as those in this study, may complicate active versus passive engagement comparisons due to the nature of each setting. Rather, it may be useful to remove this positive behavior specificity and instead capture overall engagement (i.e., "on task") versus the three off-task behaviors for this population. Future interventions can capitalized on this specificity by further validating the BOSS programming and applying the rating system to other interventions for children with ASD. This investigation regarding how interventions are potentially efficacious is particularly important because there is considerable debate regarding which theoretical framework and model of intervention (i.e., ABA, DSP) is the most efficacious for children with autism (Smith & Iadarola, 2015).

In addition, another implication of this study concerns the inability to reliably predict functional and symptomatic change using parent-report measures within the context of this study's setting. These results highlight the currently available rating scales may not be sensitive

enough to detect the specificity of change across the shorter timeframes of camp programming. It is possible the amount of parent-child interactions were not prevalent enough for parents to detect such changes, or there may be other confounding variables impacting such specificity. Future research could either modify the currently available parent-report rating scales, or produce a more efficacious method of measuring such behavioral changes as observed by parental figures.

Treatment. These results also confirm AAT interventions may potentially be at least partially effective due to the increased level of passive engagement during lessons. While greater passive engagement, as compared to active engagement, was not initially predicted to increase in this study, these results may make theoretical sense when the constructs are considered in the context of the ASD diagnosis. Shapiro (2013) defines active engagement as tasks that typically involvement physical movement (i.e., writing, raising one's hand, talking, walking) while passive engagement arguably involves more internal regulation and modulation (i.e., listening, looking) behaviors. In the context of AAT, future research study could highlight the potential utility of passive engagement during AAT interventions. Further, future research should focus on why this discrepancy occurred between active and passive engagement, and how the results can be capitalized to improve academic achievement and social skill functioning in children with ASD.

Concluding Comments

This study sought to address the gap in empirical evidence in AAT interventions for children with ASD through use of a multiple subject case study design. The results of this study add some support for the effectiveness of social skills and AAT interventions for children diagnosed with ASD. The results of this study also demonstrate children with ASD may display

more passive engagement in the presence of a therapy dog during social skills lessons. Further, the BOSS behavioral rating scale demonstrated greater specificity in tracking participant behavioral changes, as compared to the two parent-report measures. Future research can capitalize on the utility of the positive and negative behavior tracking of the BOSS programing. Based on these results, AAT appears to positively influence passive engagement behaviors for children with ASD during social skills lessons.

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Appendix A

Extended Literature Review

HAI Theory

The HAI theory is a general framework that describes the relations between humans and animals in a variety of contexts (Freund et al., 2016). Research on HAI began in the 1980s and has been steadily growing (Hosey & Melfi, 2014). The theory rests on the realization that humans are social creatures and have the capacity to develop and engage in social interactions with other humans and animals (Freund et al., 2016). HAI theory also asserts humans have a desire to connect with animals on an emotional level, which can present in a variety of ways (Hosey & Melfi, 2014). HAI may also play a role in improving human health, preventing emotional distress, reducing stress, and increasing well-being across the lifespan (Freund et al., 2016). Freund et al. suggest HAI can have social, emotional, physical, cognitive, and attachment benefits; each will be briefly reviewed in the following section.

Social Benefits. First, animals can facilitate social interaction in humans. Ling, Kelly, and Diamond (2016) refer to companion animals as social catalysts, and suggest these benefits can span from being a conversation starter, encouraging individuals to go on walks (thereby increasing social potential), and buffering psychological well-being. Kotrschal (2016) suggests empathy is at the core of social competence. Interestingly, Walsh (2009) found children display more empathy and appreciation of individual differences when such differences are associated with a pet – both of which increase sociability. Ling et al. (2016) also suggest children can practice social skills with a pet, which can translate to human interactions later.

Brown and Coan (2016) suggest HAI can impact emotion regulation through social support. The authors explain self-regulation requires energy from brain structures such as the

prefrontal cortex. However, energy can be limited for self-regulatory processes, which Brown and Coan argue can be mitigated by social support. Neuroimaging studies have confirmed participants' prefrontal cortexes were less active (i.e., less energy allotted) in situations with social support, as compared to conditions without social support (Coan, Beckes, & Allen, 2013). Therefore, "social support is an efficient and energy cost-effective means of controlling (self-regulating) emotional responses and stress reactions" which can be facilitated through HAI (Ling et al., 2016, p. 169).

Emotional Benefits. There are a variety of ways in which animals have been suggested to help improve emotional regulation in humans. Ling et al. (2016) suggest HAI can help humans see oneself as a better person, thereby increasing positive feelings. Pets may also reduce loneliness (Barker, Knisely, Barker, Cobb, & Schubert, 2012), particularly for people living alone, children with and without disabilities, rural youth, and the elderly (Ling et al., 2016). Beetz and Bales (2016) summarize therapy dogs can also: reduce depressive symptoms, facilitate a positive mood, reduce anxiety, promote calmness, buffer human stress, reduce aggression, and promote general healthiness. Many have suggested this is primarily due to the unconditional positive regard and acceptance of animals (Ling et al., 2016) as well as the facilitation of trust (Beetz & Bales, 2016). Beetz and Bales also suggest these positive emotional benefits may be due to oxytocin release, which reduces stress, decreases cortisol levels, and decreases blood pressure.

Physical Benefits. HAI can also demonstrate physical health benefits. There is evidence that individuals with pets report higher physical activity than those without a pet (Scheibeck, Pallauf, Stellwag, & Seeberger, 2011). This can be due to a variety of reasons, including physical activity as a regular part of pet ownership and physical benefits from horseback riding

(Ling et al., 2016). Such research appears to be more correlational to owning a companion animal than causal, however.

Cognitive Benefits. While there currently is no empirical research specifically demonstrating the link, Ling et al. (2016) theoretically propose HAI has possibility to facilitate executive function (EF) improvement. EFs are defined as the important processes for strategizing, paying attention, prioritizing tasks, maintaining self-control, and adjusting to situations (Ling et al., 2016). Improvement of EF includes activities that directly train and challenge EFs, in addition to reducing things that disrupt them (i.e., stress) (Diamond, 2014). Ling et al. suggest HAI is ripe for EF improvement because it accomplishes all of these tasks. Further, Ling et al. suggest caring for an animals strengthens working memory, inhibitory control, consistency, and responsibility - all EF processes. Animals can also relieve stress in children with insecure attachments and with employee stress in the workplace (Beetz, Julius, Turner, & Kotrschal, 2012). Gee, Church, and Altobelli (2010) suggested dogs can help improve EF in preschool children in the classroom setting, as the presence of the dog was correlated with preschoolers requiring fewer instructional prompts, keeping their attention focused on work, making fewer errors, and working more efficiently. While the results appear promising and are "substantially" likely to be causal, Kotrschal (2016) cautions confirmatory causal statements of HAI and EF which require more empirical evidence.

Attachment Benefits. Beetz and Bales (2016) argue HAI meets the criteria for attachment as proposed by Ainsworth (1991) because development of a secure attachment with a companion animal is possible, there is close physical contact, and animals provide opportunity to display caregiving behavior. Beetz et al. (2012) demonstrated children benefit from friendly animals but not toy animals, even with poor attachment patterns. The HAI connection with

oxytocin release may be related to human-animal bonding, as it is similarly involved in maternal-infant bonding (Bales, Boone, Epperson, Hoffman, & Carter, 2011).

AAT Benefits

Preliminary evidence indicates AAT has been found to be beneficial to the general population in a variety of ways. First, the presence of a therapy animal strengthens the therapeutic relationship. The animal is thought to build companionship (Cohen, 2002), demonstrate unconditional love (McNicholas & Collis, 2000), prompt self-disclosure (Parshall, 2003), and display a warm, non-judgmental nature (Reichert, 1998). Reichert (1998) suggests the therapy animal is a transitional object that connects the therapist and client. Therapy animals are suggested to be able to express: sympathy, acceptance, nurturance, intimacy, safe touch, and physical affection to comfort clients (Fine, 2006). AAT can also effect change through stress relief (Hansen, Messinger, Baun, & Megel, 1999) and promoting human health and well-being (Wells, 2009). Therapy animals have also been suggested as social catalysts that facilitate interaction among humans (Triebenbacher, 1998).

AAT has also been determined beneficial for use with individuals with autism spectrum disorders (ASD). Gabriels et al. (2012) suggest AAT assists individuals with autism in making improvements in appropriate self-regulation behavior skills (i.e., lethargy, irritability, stereotypic behavior, hyperactivity, expressive language skills, motor skills, and verbal praxis/motor planning skills). O'Haire (2013) conducted a systematic review and indicated a common theme that therapy dogs increased social interaction and communication, reduced stress levels, and reduced problematic behaviors for individual with autism.

Silva, Correia, Lima, Magalhães, and de Sousa (2011) determined dogs can also prime children with ASD for therapy. The study sought to bridge the research gap by conducting an

intensive, single case study design. Results of the study demonstrated the presence of the therapy dog allowed for more frequent and longer duration of positive behaviors (i.e., smiling, positive physical contact) and less frequent negative behaviors (i.e., aggressiveness) (Silva et al., 2011). While these results are promising, this was a single-case study design and results may not be generalizable outside of the parameters of this case, so more replication is necessary.

The presence of pet dogs also appears to be related to increases in assertion scores for children with autism. Carlisle (2015) used correlational data to assess the presence or absence of social skill deficits for children with ASD and the presence or absence of dog ownership. The study was conducted via a telephone study and determined children who owned a dog had higher mean scores for social skills as well as greater assertion scores. It appears the presence of pet ownership can increase social skills for children with ASD, but it should be dually noted that this is solely correlational data. There is a strong possibility of other extraneous variables, as well as selection bias in participants. However, it appears children with ASD generally have positive impressions regarding interactions with dogs.

Appendix B

Informed Consent (for Parent)

Study Purpose and Rationale

The purpose of this research project is to examine how the presence of a therapy dog influences the level of engagement during social skills lessons for children diagnosed with autism. Findings from this research may help understand how to increase the effectiveness of social skills instruction.

Inclusion/Exclusion Criteria

To be eligible to participate in this study, you must be at least 18 years old and have a male child participating in the full Camp Achieve program for the summer of 2016.

Participation Procedures and Duration

For this project, you will be asked to complete two questionnaires about your child's early childhood experiences regarding social skills and symptom presentations, as well as a short demographic questionnaire. You will be asked to complete the forms at pre-test (approximately 50 minutes to complete) and post-test (approximately 40 minutes to complete).

Data Confidentiality or Anonymity

All data will be maintained as confidential and no identifying information such as names will appear in any publication or presentation of the data. All completed scales will be identified only by a participant number and date, and will not include either yours or your child's name.

Storage of Data

Paper data will be stored in a locked box in the locked Social Skills classroom for the duration of the camp, and in a locked chart room of the BSU Counseling Practicum Clinic following camp. The data will also be entered into a software program and stored on the researcher's password-protected computer. Only members of the research team will have access to the data. The data will be retained for 7 years in order to later reanalyze the data and test additional hypotheses regarding social skills and animal-assisted therapy interventions for children with autism.

Risks or Discomforts

There are no perceived risks for participating in this study.

Who to Contact Should Your Child Experience Any Negative Effects from Participating in this Study

Should you or your child experience any feelings of anxiety, there are counseling services available to you and your child through the BSU Counseling Practicum Clinic at 765-285-8047.

Benefits

One benefit you may gain from participating in this study may be a better understanding of how animal-assisted therapy affects the engagement process in social skills interventions.

Compensation
There is a small compensation for participation in this study of a $5 gift card to Walmart (per child/parent pair). Full study completion is required prior to compensation.

Voluntary Participation
Your participation in this study is completely voluntary and you are free to withdraw your permission at anytime for any reason without penalty or prejudice from the investigator or on your child's ability to fully participate in Camp Achieve. Please feel free to ask any questions of the investigator before signing this Consent form and at any time during the study.

IRB Contact Information
For questions about your rights as a research subject, please contact Director, Office of Research Integrity, Ball State University, Muncie, IN 47306, (765) 285-5070, irb@bsu.edu.

Parental Consent
I give permission for my participation in this research project entitled, "Engagement During Animal-Assisted Therapy for Children with Autism Spectrum Disorders." I have had the study explained to me and my questions have been answered to my satisfaction. I have read the description of this project and give my permission to participate. I understand that I will receive a copy of this informed consent form to keep for future reference.

_____ _____
Parent's Signature Date

Researcher Contact Information

Principal Investigator:

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Appendix C

Informed Consent (for Child)

Study Purpose and Rationale

The purpose of this research project is to examine how the presence of a therapy dog influences the level of engagement during social skills lessons for children diagnosed with autism. Findings from this research may help understand how to increase the effectiveness of social skills instruction.

Inclusion/Exclusion Criteria

To be eligible to participate in this study, your child must be male, between the ages of 6 and 14, participate in the full Camp Achieve program for the summer of 2016, and have been previously diagnosed with autism.

Participation Procedures and Duration

For this project, your child will fully participate in the normal camp activities regardless of study participation. The camp lessons (including your child) will be video recorded to track engagement. The researchers will also have access to the camp program files for your child.

Audio or Video Tapes

For purposes of accuracy and coding engagement, with your permission, the camp lessons of the Social Skills group will be video taped. The tapes will be stored on a password-protected laptop stored in a locked classroom for the duration of camp, and in a locked chart room of a counseling clinic (BSU Counseling Practicum Clinic) following camp.

Data Confidentiality or Anonymity

All data will be maintained as confidential and no identifying information such as names will appear in any publication or presentation of the data.

Storage of Data

Paper data will be stored in a locked box in the locked Social Skills classroom for the duration of the camp, and in a locked chart room of the BSU Counseling Practicum Clinic following camp. The data will also be entered into a software program and stored on the researcher's password-protected computer. Only members of the research team will have access to the data. The data will be retained for 7 years in order to later reanalyze the data and test additional hypotheses regarding social skills and animal-assisted therapy interventions for children with autism.

Risks or Discomforts

Some children have fear and allergies to dogs, but there otherwise are no perceived risks for participating in this study.

Who to Contact Should Your Child Experience Any Negative Effects from Participating in this Study

Should your child experience any feelings of anxiety, there are counseling services available to you and your child through the BSU Counseling Practicum Clinic at 765-285-8047.

Benefits

One benefit your child may gain from participating in this study may be a better understanding of how animal-assisted therapy affects the engagement process in social skills interventions.

Compensation

There is a small compensation for participation in this study of a $5 gift card to Walmart (per child/parent pair). Full study completion is required prior to compensation.

Voluntary Participation

Your child's participation in this study is completely voluntary and you are free to withdraw your permission at anytime for any reason without penalty or prejudice from the investigator or on the child's ability to participate fully in Camp Achieve. Please feel free to ask any questions of the investigator before signing this Parental Permission form and at any time during the study.

IRB Contact Information

For questions about your rights as a research subject, please contact Director, Office of Research Integrity, Ball State University, Muncie, IN 47306, (765) 285-5070, irb@bsu.edu.

Parental Consent

I give permission for my child to participate in this research project entitled, "Engagement During Animal-Assisted Therapy for Children with Autism Spectrum Disorders." I have had the study explained to me and my questions have been answered to my satisfaction. I have read the description of this project and give my permission for my child to participate. I understand that I will receive a copy of this informed consent form to keep for future reference.

_____ _____

Parent's Signature Date

Researcher Contact Information

Principal Investigator:

Katlyn Rice, M.S., Graduate Student
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Faculty Supervisor:

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Appendix D

Child Assent

My name is Katlyn Rice. I am trying to learn about having therapy dogs in social skills lessons because I want to learn how to best help children learn. If you would like, you can be in my study.

Each lesson of Camp Achieve will be video recorded so that researchers can collect information about the social skills lessons and how they work. You will be able to do Camp Achieve whether you and your parents do this study or not.

This study might help researchers better know how to help children with autism learn social skills. Some children are scared and/or have allergies to dogs, but there are no other identified risks to your participation to this study.

Other people will not know if you are in my study. I will put things your parents tell me about you together with things I learn about other children with autism, so no one can tell what parts came from you. When I tell other people about my research, I will not use your name, so no one can tell who I am talking about.

First your parents or guardian have to say it's OK for you to be in the study. After they decide, you get to choose if you want to do it too. If you don't want to be in the study, no one will be mad at you. If at first you say you want to be in the study and you change your mind later, that's OK. You can stop at any time. If you do not want to be in the study or you decide you want to leave the study, you can still fully participate in Camp Achieve.

My email is krice2@bsu.edu and my faculty advisor is Dr. Theresa Kruczek (tkruczek@bsu.edu). You or your parents can email me or Dr. Kruczek if you have questions about the study or if you decide you don't want to be in the study any more.

I will give you a copy of this form in case you want to ask questions later.

Agreement

I have decided to be in the study even though I know that I don't have to do it. Katlyn Rice has answered all my questions.

_____ _____

Signature of Study Participant Date

_____ _____

Signature of Researcher Date

Appendix E

Demographics Form

****Please do not put yours or your child's name on this form****

Age of child: _____

Grade child will enter in the fall: _____

Number of siblings the child has: _____

Age child was diagnosed with Autism: _____
By whom? (i.e., primary care doctor, therapist, etc.): _____

Racial/ethnic identity of your child: _____

Approximate annual household income: _____/year

Highest education level completed:

Mother:	Father:
__Some High school	__Some High school
__High School degree	__High School degree
__Some College	__Some College
__Associate's Degree	__Associate's Degree
__Bachelor's Degree	__Bachelor's Degree
__Master's Degree	__Master's Degree
__Ph.D.	__Ph.D.
__Medical Degree (MD, DDS, etc.)	__Medical Degree (MD, DDS, etc.)
__Other (Please Specify: _____)	__ Other (Please Specify: _____)

Is your child participating in other treatments for autism in the present time? (yes/no)
Has your child participated in treatments for autism in the past? (yes/no)
If yes to **either,** please explain below:

_____

_____

_____

Has the child ever been diagnosed with anything other than autism (i.e., medical diagnoses, mental health diagnoses, etc.)? (yes/no)
If yes, please explain:

Who lives in the home (i.e., brother, grandmother, etc.)? (***Please do not use names***)

Are the child's parents (check all that apply):

__Married
__Divorced
__Separated
__Dating/Partnered
__Single
__Never Partnered

Does your child receive Applied Behavior Analysis (ABA) services? (yes/no)

If yes, are the services at home or school? _____

Appendix F

Six Developmental Milestones of the DIR Model*

Developmental milestones	**Descriptive qualities**
Level 1: Self-Regulation and Interest in the World	Internal regulation and homeostasis. Calm interest in and purposeful responses to sensory experiences.
Level 2: Attachment and Engagement in Relationships	Able to form relationships with caregiver and/or others. Growing expressions of intimacy and relatedness (i.e., joyful smiles initiated and sustained).
Level 3: Two-Way Purposeful Communication	Purposeful communication (gesturing, vocalization, facial expression). Back and forth interactions with emotional expressions, sounds, hand gestures, etc. to convey intentions.
Level 4: Behavioral Organization, Problem-Solving, and Internalization	Engages in continuous flow of interactions. Many social and emotional interactions in a row used for problem-solving (i.e., showing Daddy a toy)
Level 5: Representational Capabilities	Internal representation (imagery). Able to recognize things and feelings can be named and mentally represented. Development of symbolic or pretend play.
Level 6: Representational Differentiation	Logical bridges between ideas and feelings. Develops abstract thinking (what, when, how, and why questions). Logical connections between meaningful ideas (i.e., "Want to go outside *because* I want to play!")

*Adapted from Greenspan & Wieder (2001) and Dionne & Martini (2011)