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The Sprouts Early Childhood Program: An Evaluation of Child Outcomes

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AN EVALUATION OF CHILD OUTCOMES

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This investigation examines the cognitive, adaptive, communicative, social and autism-related outcomes for those enrolled in an early childhood intervention program for children age three to five with autism spectrum disorders. First, relevant literature on autism spectrum disorders, early intervention, evidence-based practice, and published investigations of existing comprehensive treatment programs for young children with autism are reviewed, the current investigation is outlined, and results and implications are discussed.

Using developmental trajectory analyses to investigate changes in each child's trajectory over time, as well as by comparing changes in scores over time on standardized measures of communication, adaptive skills, cognitive skills, social skills, and autism-related symptoms, the current study evaluated a comprehensive treatment program for young children with autism by examining the outcomes for those children enrolled over a 9-month span of treatment. Results indicated that overall, children enrolled displayed significant positive increases in skill development across the several areas assessed.

Consideration of this matter is critical to ensure that treatment programs for children with autism are evidence-based, appropriate, and successfully address the

challenges faced by young children with autism spectrum disorders. The positive outcomes observed in the current study add to the research on comprehensive treatment models, and suggest that the current model can improve the overall developmental trajectory for these children, which ultimately informs the development of future comprehensive treatment programs for children with autism.

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CHAPTER I

THE PROBLEM AND ITS BACKGROUND

In recent years, the prevalence of autism spectrum disorders (ASD) has increased dramatically. In the early 1980s, the prevalence of the disorder was estimated to occur in 3 to 5 individuals out of 10,000, whereas recent figures indicate a current prevalence rate of 1 in 68 children (Centers for Disease Control and Prevention, 2014). Although autism typically results in lifelong impairments in social and communicative functioning, researchers have demonstrated that specific intervention methods delivered early in life may improve intellectual and communicative functioning in many children with ASD (Anderson, Avery, DiPietro, Edwards, & Christian, 1987; Birnbrauer & Leach, 1993; Harris, Handleman, Gordon, Kristoff, & Fuentes, 1991; Lovaas, 1987; Sheinkopf & Siegel, 1998). The increasing prevalence rates of ASD, coupled with the clear need for effective interventions, have motivated both families and professionals to identify children with ASD as early as possible.

The early identification of ASD has resulted in increasing numbers of very young children being referred to early intervention programs. This group of toddlers and preschoolers with ASD is a new population for many interventionists, and they raise important questions about what intervention strategies and tactics will be most effective and efficient, what intervention settings and circumstances are most appropriate, and what types of activities, materials, and routines are most useful for promoting social, communication, adaptive, and cognitive growth. Whereas federal lawmakers have

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recommended that educators and clinicians use evidence-based interventions and practices, there has been a lack of consensus regarding appropriate service models for educating young children with autism (e.g., Heflin & Simpson, 1998; Simpson, 2003).

Therefore, the purpose of the current study was to evaluate an early childhood intervention program for young children with autism spectrum disorders. Specifically, changes in the children's communicative, cognitive, adaptive, social, and autism-related functioning over a 9-month period of enrollment were assessed via administration of standardized assessment measures, specific rating scales, and direct observations of behavior at baseline and again at the conclusion of the intervention program for eight participating children. Additionally, changes in parent stress levels over time were assessed and evaluated. Finally, measures of the program's treatment fidelity and treatment acceptability were also collected.

CHAPTER II

REVIEW OF RELATED LITERATURE

Severe social impairments, communicative deficits, restricted interests, and repetitive behaviors have long been characteristics of Autism Spectrum Disorder (ASD), a neurodevelopmental disorder first described by Leo Kanner in 1943. Since Kanner's (1943) original description of autism, the diagnosis has continued to encompass these three general categories of communication difficulties, social deficits, and restricted interests/repetitive behaviors. Under the previous Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; APA 2000), autism was characterized under the umbrella term of Pervasion Developmental Disorders (PDDs), which also included Asperger's disorder, Pervasive-Developmental Disorder- Not Otherwise Specified (PDD-NOS), Rett's disorder, and Childhood Disintegrative Disorder (CDD).

However, when the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5; APA, 2013) was introduced in May 2013, the three core domains of autism were pooled into two categories- social communication and restricted interests- and several of the previous sub-classifications were removed, including Asperger Syndrome, Rett Syndrome, Childhood Disintegrative Disorder, and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) (APA, 2013).

Thus, at the present time, a diagnosis of ASD is defined in terms of observed deficits in social communication and interactions, and restricted interests or repetitive behaviors. In an effort to address the collapse of other diagnoses that previously served to further specify symptom severity level (i.e., Asperger's Syndrome), the DSM-5 has also provided symptom severity levels in the two domains based on perceived level of support required (i.e., Level 1- "requiring support," to Level 3- "requiring very substantial support").

The implication of these changes for the future diagnostic status of those individuals who may have previously qualified for a diagnosis of PDD-NOS or Asperger's disorder is as of yet unclear. Although these changes to diagnostic classifications could likely affect the incidence rate of ASD (McPartland, Reichow, & Volkmar, 2012;Worley & Matson, 2012), it may not immediately affect the prevalence, as the recommendation is not to re-evaluate individuals already qualifying for ASD under various classifications (Hyman, 2013; Koegel et al, 2014). However, studies comparing the criteria under both classification systems (DSM-IV-TR & DSM-5) suggest many individuals who would have previously qualified as PDD-NOS under DSM-IV-TR will no longer meet the more stringent criteria for an ASD diagnosis under DSM-5 (e.g., Gibbs et al., 2012; Young & Rodi, 2014).

All diagnostic changes aside, ASD continues to manifest as a disorder characterized by variability in both display of symptoms and severity level. Furthermore, its symptoms are complex, depending on both individual characteristics and environmental contexts. That is, children with ASD often exhibit a range of behavioral complexities such as hand-flapping, body rocking, and ritualistic behaviors not unlike

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those seen in obsessive-compulsive disorder (DSM-IV-TR, 2000). In addition, individuals with ASD often present with several accompanying symptoms, such as difficulty attending to social stimuli (Dawson, Meltzoff, & Osterling, 1995), imitating others (Dawson & Adams, 1984), and engaging in appropriate play with others (Jarrod, Boucher, & Smith, 1993). Many children with autism also engage in various forms of challenging behaviors (Dawson & Osterling, 1997; Simpson & Myles, 1998) such as self-injury, non-compliance, and aggression.

ASD is known as a pervasive disorder because deficits are often observed in the very early months of an infant's life, involve lifelong challenges for the individual's typical development, and are exhibited across settings (Floyd and McIntosh, 2009). ASD generally has life-long effects on how children learn to be social beings, to take care of themselves, and to participate in the community. A particularly striking feature of ASD is its heterogeneity. The characteristics of ASD often present themselves variably; ranging from mild to more severely impaired. For example, some children may speak frequently and in complete sentences, while others may never learn to speak at all. Some children remain aloof and uninterested in social interactions, others are affectionate and seek relationships with others. Some children may spin in circles or engage in hand flapping, while others may have preoccupations in specific areas of interest.

Epidemiological reports indicate that the number of children diagnosed with ASDs is rising (Fombonne, 1998; 2003) with current rates estimated to be 1 in 68 (CDC, 2014). The reason for this increasing prevalence rate over time is unclear, though it may be partially due to better detection and assessment procedures and expanded classification criteria (Waterhouse, 2008). Although a specific cause of ASD has not yet

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been identified, research suggests that both genetic and environmental factors are involved (Eikeseth, 2008; Muller, 2007; Volkmar, Lord, Bailey, Schultz & Klin, 2004). Despite the absence of precise identified neurobiological mechanisms, it is clear that ASD reflects the operation of factors in the developing brain (NRC, 2001). For example, some studies have observed enlarged amygdalas in toddlers with ASD, which may have implications for how these children regulate emotions and develop social understanding (Mosconi et al., 2009; Schumann et al., 2009). The heterogeneity of potential brain deficits, impaired behaviors, and observed genetic variants in ASD have challenged researchers and theorists, and a standard causal synthesis has yet to emerge (Waterhouse, 2008).

ASD is a significant childhood disorder that necessitates systematic and long-term treatment (DeMyer et al., 1973). Children with ASD not only face a difficult future but also present a number of daily challenges due to their difficulties learning ordinary skills, deficits with social behaviors, their challenging behaviors, communication deficits, and their variable learning rates (Rogers, 1998). Although the last 15 years have yielded substantial increases in public understanding and widespread diagnoses of ASD, the growing numbers of children diagnosed with ASD raise important questions about what intervention strategies and tactics will be most effective and efficient, what intervention settings and circumstances are most appropriate, and what types of activities, materials, and routines are most useful for promoting social, communication, adaptive and cognitive growth. The need for researchers and practitioners to identify appropriate programs to meet the intervention needs of children with ASD and their families is clear.

Theories of autism spectrum disorders. Since ASD was first described by Leo Kanner (1943) many theories have been proposed to account for this enigmatic condition. There is much debate in regards to the cognitive/neuroanatomical structures responsible for the symptoms of ASD. Overall, there are three basic cognitive theories that have dominated psychological research into autism: the theory of mind hypothesis (ToM), the theory of executive dysfunction in autism (EF), and weak central coherence theory (WCC).

The prevalent "theory of mind" hypothesis for ASD claims that the social and communicative difficulties commonly displayed by individuals with the disorder are due to impairments in their capacity to construe persons in terms of their inner mental states (Happe, 1995; Wellman, Cross & Watson, 2001). Deficits have been demonstrated in social and emotional perspective-taking as well as with logic and belief inferencing (Baron-Cohen, 1991). It appears as though children with ASD experience significant deficits or delays in their development of a ToM, which may in turn explain the deficits in perspective-taking and social abilities commonly exhibited by these individuals (Wellman, Cross & Watson, 2001). The most widely used test of ToM is the unexpected transfer false belief test (Wimmer & Perner, 1983). During the task, a participant watches a sequence of events, usually enacted using dolls. The task tells a story in which one doll has a false belief about the location of an object. The participant is asked to make a judgment about where the doll will look to find the object, and in order to give the correct answer the child must infer the mental state of the doll. Baron-Cohen, Leslie, and Frith (1985) found that 80% of children with ASD tend to fail these tasks, and thus display a deficit in ToM. However, criticisms of the ToM hypothesis for ASD posit that if 20% of

individuals with ASD actually pass these tasks, then the deficit is not universal (e.g., Happe, 1994). It follows that the ToM hypothesis for ASD may explain some of the cognitive impairments seen in ASD, but it does not likely explain all facets of the disorder.

A second hypothesis suggests that autism characteristics are the result of executive functioning deficits (Ozonoff et al., 1991). Perhaps the most important difference between the theory of mind hypothesis and executive functioning accounts of ASD is that executive functions are intrinsically domain-general, whereas the theory of mind hypothesis posits a more domain-specific account. Executive function is defined as the ability to maintain an appropriate problem-solving set for attainment of a future goal; it includes behaviors such as planning, impulse control, inhibition of irrelevant responses, set maintenance, organized search, and flexibility of thought and action (Denkla, 1996). Children with ASD frequently display a need for sameness, a difficulty switching attention, a tendency to perseverate and a lack of impulse control; all symptoms similar to those shown by individuals with what is known as Dysexecutive Syndrome (Rajendran & Mitchell, 2007). Such individuals have problems with executive function usually, but not exclusively, due to frontal lobe damage. This led researchers (e.g., Ozonoff et al., 1991) to suggest that ASD could be explained as deficit in executive functioning. It may be that a distinct executive functioning profile distinguishes ASD from other neurodevelopmental disorders. Hence, one of the strengths of the executive functioning hypothesis is that it can account for many of the non-social aspects of autism, and it is the only theory that acknowledges both the cognitive and motor (repetitive hand flapping, rocking) characteristics of autism. There is a debate, though, as to whether theory of mind

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tasks could be reduced to executive processes (e.g., Russell et al., 1991), or whether a theory of mind is required for executive control (e.g., Perner, Lang, & Kloo, 2002).

The third theory is Weak Central Coherence Theory (WCC, Frith, 1989, 2003; Frith & Happé, 1994; Happé, 1999), which describes a domain general process that explains some of the non-social as well as the social features of autism, such as attention to acute details and a tendency to hyper-focus. The essence of the theory is that typically developing individuals process information by extracting the overall global meaning. Frith and Happé suggest autism is characterized by a weak or absent drive for global coherence, and that individuals with autism process things in a detail-focused or piecemeal way; processing the individual parts rather than the global whole (Rajendran & Mitchell, 2007). The WCC theory predicts that people with autism are forever lost in detail and never achieve an understanding of systems as a whole. Criticisms of this theory have posited three main objections: first, weak coherence may actually represent an outcome of superiority in local processing, rather than a deficit in global processing (Baron-Cohen, 2002). Second, weak coherence may be a processing bias, rather than a deficit. Third, weak coherence may occur alongside, rather than explain, deficits in social cognition (Happe & Frith, 2006).

Each theory of ASD considered above appears able to explain many of the core features and peripheral aspects of the disorder. As of yet, however, there is no fully integrated account that manages to both describe and explain each and every characteristic of autism. It may be best not to systematically investigate just one aspect of autism in isolation, because such an approach does not reflect the complexity and multi-dimensionality of human behavior (Waterhouse, 2008).

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Early identification of ASD

The identification of ASD in toddler-aged children is gradually increasing as early screening and diagnostic evaluation protocols become more widely accessible (Schertz, Baker, Hurwitz, & Benner, 2011). Although the diagnosis is beginning to extend to younger children, the mean age at which children are typically diagnosed with ASD is only around 3 years old (Fountain, King & Bearman, 2011). Furthermore, this estimate is dependent upon several factors, primarily socioeconomic status. That is, children with highly educated parents tend to be diagnosed earlier, and there is a persistent gap in the age of diagnosis between children from families of high compared to low socioeconomic status (SES), such that children from low SES environments are consistently diagnosed 6-8 months later (Fountain, King & Bearman, 2011). However, with the advent of more valid diagnostic tools and early screening processes, most researchers now agree that ASD can be reliably identified by 18-24 months of age (Lord et al., 2006; Zwaigenbaum et al., 2009).

In recent years, research has emphasized the identification of early warning signs of ASD in infants and toddlers. The goal is to identify behavioral or physiological indicators that may reliably predict the onset of the disorder (Boyd et al., 2010). Often, symptoms of ASD can be observed within the first few months of a child's life. Parents report varied numbers and degrees of symptoms such as abnormalities in eye contact, disinterest in social, verbal, and physical contact, self-stimulatory behaviors, atypical interest in toys and other objects, rigidity in schedules, and distinct delays in or absence of verbal language and functional communication (NIMH, 2007).

Researchers have identified a number of distinct early behavioral warning signs of

ASD, including delays in early social behaviors, such as smiling, looking at faces, or responding to ones name, and delays in communication behaviors such as producing vocalizations, using a variety of gestures and nonverbal behaviors such as pairing eye contact with vocalizations (Boyd et al., 2010; Yoder, Stone, Walden, & Malesa, 2009).

Recently, several eye tracking studies of young children with ASD have been published, illustrating an emerging consensus that detailed characterization of young children with ASD at the level of eye movements is extremely important (Chawarska, Macari, Shic, 2013; Elsabbagh et al., 2013; Falck-Ytter, Botle, & Gredeback, 2013; Klin et al., 2009). These studies have found that reduced time looking at people and faces, as well as problems with disengagement of attention, appear to be among the earliest signs of ASD; emerging during the first year of life.

Given the plethora of active research on ASD, scholars have developed and validated a range of autism-screening instruments with supporting psychometric evidence (Boyd et al, 2010). Both broadband screeners and autism-specific screeners exist for practitioner use in the diagnosis of infants and toddlers with ASD. For example, the *Modified Checklist for Autism in Toddlers* (M-CHAT; Robins, Fein, & Barton, 1999) is validated for screening toddlers between 16 and 30 months of age to assess risk and symptomology of ASD. Currently, the most widely accepted gold-standard of autism diagnosis is based on a combination of results gleaned from a diagnostic interview (e.g., the Autism Diagnostic Interview-Revised; Lord et al., 1999) together with the *Autism Diagnostic Observation Schedule, 2nd Edition* (ADOS-2), a developmental play-based assessment protocol involving the systematic observation of key features associated with ASD (Lord & Risi, 2001). The most recent version of the ADOS (ADOS-2; Lord et al.,

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2012) now includes a Toddler Module designed specifically for children between 12 and 30 months of age who do not consistently use phrase speech. Existing ADOS-2 components have been revised, and new components added, to more accurately identify toddlers at risk for ASD.

The increased prevalence of ASD and the increased ability to detect and diagnose during the first 3 years of life clearly has substantial relevance for the provision of early intervention services (Boyd et al, 2010). Developing interventions appropriate for these young children that can begin immediately after diagnosis and can support the needs of parents at this difficult time in their lives should be a strong educational priority (National Research Council, 2001). As autism interventions tend to vary widely in their approach and methodology, early intervention programs and schools preparing to serve children with autism face difficulty in determining which interventions are most appropriate (Levy 2006), and experience increased pressure to provide intensive, evidence-based intervention programs for young children with ASD (Rogers, 1998). Whereas federal lawmakers have recommended that educators and interventionists use evidence-based interventions and practices (i.e., IDEA, 2004), there has been an overall lack of consensus regarding appropriate service models for educating children with autism (e.g., Heflin & Simpson, 1998; Simpson, 2003).

Evidence-based practice

The concept of evidence-based practice began in the field of medicine in the 1970s, but in recent years has become common in many other disciplines. In the field of psychology, the concept was originally called "empirically validated treatment" and arose as a means of documenting the benefits of adult psychotherapy in the context of pressures

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from psychiatric medication companies (APA Division of Clinical Psychology, 1995). Currently, the term has been adapted to examine different forms of intervention for various clinical and disabled populations in the fields of psychology and education. The core principles of evidence-based practice, as derived from the American Psychological Association's 2006 definition (APA, 2006) and modified by Kazdin (2008), include the integration of the best available research with clinical expertise in the context of patient characteristics, culture, and preferences. Evidence-based practice involves the integration of research findings with professional judgment and data-based decision making, values and preferences of families, and assessment and improvement of the capacity of the delivery system to implement an intervention with a high degree of accuracy (Wilczynski & Christian, 2008).

As the number of children diagnosed on the autism spectrum increases, so too does available treatment options (Warren et al., 2011). Since the first descriptions of the disorder, a host of different treatment modalities have been prescribed, including those publicized as "miracle cures" that are passionately promoted by their supporters in the absence of any evidentiary data. These fad treatments include gluten-free diets, dolphin therapy, and even alternative medical treatments such as chelation or exposure to hyperbaric oxygen chambers that may be potentially harmful (Horvath & Perman, 2002). Although the literature contains case studies and many anecdotal reports pertaining to the effectiveness of these treatments, few of them have been studied in a systematic, controlled fashion. Clearly, the need for effective evidence-based practices for the treatment of ASD is paramount.

When considering evidence-based practices for children with ASD, two classifications of intervention practices can be found in the professional literature. The first involves focused intervention practices, which are designed to produce specific behavioral or developmental outcomes for individual children with ASD (Odom et al., 2010). Examples of these focused interventions include prompting, video modeling, discrete trial training, reinforcement and peer-mediated interventions. These interventions are commonly used with individuals with ASD for a limited period of time (e.g., 3 months) with the intent of eliciting change in the target behavior. Comprehensive treatment models (CTMs) are the second type of intervention practice that appears in the literature. CTMs consist of a set of practices designed to achieve a broader learning or developmental impact on the core deficits of ASD, and they are implemented over extended periods of time (National Research Council, 2001).

In 2009, two published reports attempted to identify evidence-based practices for children with ASD and released comprehensive reviews of the educational and behavioral treatment literature. The National Standards Project (NSP; NAC, 2009) and the report from the National Professional Development Center on ASD (NPDC on ASD, 2009) both reviewed literature to establish evidence-based practices for individuals with autism spectrum disorders between the ages of birth and 22 years. Both reviews included literature up to and including 2007, and both applied rigorous criteria when determining which studies would be included as evidence of efficacy for a given practice.

The National Standards Project (NAC, 2009) identified the strength of evidence for both focused intervention practices and comprehensive treatment models. The NSP shed light on those treatment packages that have established outcomes for individuals

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with ASD. The outcome of this project identified 11 "Established" treatments, or treatments that produce beneficial outcomes and are known to be effective for individuals on the autism spectrum, as well as   22 "Emerging" treatments, or treatments that have some evidence of effectiveness, and   5 "Unestablished" treatments, or treatments for which there is no sound evidence of effectiveness. Those practices identified as established by the NSP include comprehensive behavioral treatment for young children, behavioral treatment packages, including (but not limited to) antecedent interventions, imitation, discrete trial training, token economy systems, errorless learning, chaining and shaping procedures, and prompting. In addition, naturalistic teaching strategies, joint attention interventions, modeling, peer training, pivotal response treatment, visual strategies, and self-management procedures were also found to be effective evidence-based interventions for treating the impairments associated with ASD (NAC, 2009).

When the Office of Special Education Programs in the U.S. Department of Education funded the National Professional Development Center on Autism Spectrum Disorders (NPDC) to promote the use of evidence-based practices in programs for youth with ASD in 2007, the original intent was to incorporate the results from the National Standards Project (NPDC on ASD, 2009). Unfortunately, the timing of the National Standards Project report was such that it would not be completed until after the NPDC had begun work with states in 2008 (Smith et al., 2010). Therefore, the NPDC conducted an independent evaluation of the evidence base for interventions for children with ASD.

Not surprisingly, there is significant overlap in the findings of the NAC report and the NPDC report. Specifically, evidence-based practices as identified by the NPDC include antecedent-based interventions, computer-aided instruction, differential

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reinforcement, discrete trial training, extinction, functional behavior assessment, functional communication training, naturalistic interventions, parent-implemented intervention, peer-mediated instruction and intervention, Picture Exchange Communication System (PECS), pivotal response training, prompting, reinforcement, redirection, self-management, social narratives, social skills groups, speech generating devices, structured work systems, task analysis, time delay, video modeling and visual supports (NPDC on ASD, 2009). All of these findings mirror those found in the NSP report, with the exception of social skills groups, computer aided instruction, PECS, and extinction. These four interventions were identified as only "emerging" treatments in the NSP. However, these differences may be due to variations in how each project defined "practice" as well as how reviewed practices were clustered and differences in the evaluation process. For example, the NPDC defined as their unit of analysis "focused intervention practices", and the NSP identified as their unit of analysis "treatments." Focused interventions are individual instructional practices or strategies that teachers and other practitioners use to promote specific outcomes for children with ASD. These practices should provide explicit information about steps involved in their implementation. For the NSP, treatments represent either intervention strategies (i.e., therapeutic techniques that may be used in isolation) or intervention classes (i.e., a combination of different intervention strategies that hold core characteristics in common). NSP's notion of treatment was a broader conceptualization than focused intervention practices, which led to the NSP report incorporating multiple focused interventions into treatment "packages" of comprehensive treatment programs.

Overall, the results of the NSP and NPDC reports can be used to identify the research support that is critical in treatment selection when practitioners engage in evidence-based practice for children with ASD (Wilczynski et al., 2011). Convergent recommendations from these reviews of the current treatment literature point towards the effectiveness of behavioral treatment packages when considering which types of treatments to include in an empirically-based treatment program.

Early intervention and ASD

In the mid-1980s, after many years of finding that children with autism made only small or temporary improvements in treatment (DeMyer, Hingtgen. & Jackson, 198l), investigators began to report substantial success with some early intervention programs (Lovaas, 1987: Simeonnson, Olley, & Rosenthai, 1987). In particular, a published report by Lovaas in 1987 of an early behavioral intervention for children with ASD resulted in 49% of the study children showing significant IQ gains following treatment and being being included in regular classrooms as they entered kindergarten, less restrictive placements than were typically offered to children with ASD. The results reported by Lovaas and his associates challenged mainstream views on autism in two important ways. First, they indicated that the prognosis for autism might be more favorable than generally believed, given effective early intervention. Second, they raised awareness about the importance early behavioral intervention in children with ASD (Eikeseth, 2011).

It is now widely agreed upon that the earlier that intervention begins in children's lives, the better the outcomes are likely to be (National Research Council, 2001). In controlled research, up to 50% of children with ASD have been reported to benefit enormously from early intervention programs, some even achieving scores in the average

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or above-average range on a variety of standardized measures (Sallow & Graupner, 2005; Smith, Groen & Wynn, 2000). Recent reviews of the literature using meta-analytic methods to estimate the average effects of an intervention have revealed that early intervention can be capable of producing large gains in IQ and adaptive behavior for many young children with ASD (Eldevik et al. 2009; Makrygianni and Reed 2010; Reichow and Wolery 2009; Virues-Ortega 2010; Peters-Scheffer et al. 2011). Furthermore, research today shows that if provided with intervention services, fewer than 10% of individuals with ASD will remain non-verbal (Koegel, 2000). Moreover, data suggest that children who are completely non-verbal who begin intervention in the early pre-school years are far more likely to become verbal than children who begin intervention over the age of 5 years (Koegel, 2000).Clearly, intervention for children with ASD must start at the earliest possible point in time. The "wait and see" method for early intervention of ASD is likely to have significant negative consequences on children with ASD (National Research Council,

2001).

Despite the aforementioned positive results, the fact remains that the outcomes of these studies are strongly influenced by the inherent heterogeneity of ASD with numerous variables likely affecting a child's response to treatment. This complicates the scientific and clinical pursuit of identifying specific predictors of early intervention outcomes (Gabriels et al., 2001). In addition, many studies lack methodological rigor, gold-standard diagnostic criteria, comprehensive outcome measures, and measures of treatment fidelity and treatment acceptability ratings (Dawson et al., 2010). As such, early intensive intervention has significant demonstrated potential but further research is

essential in delineating key agents of change. At present, research leaves us with studies that suggest promising results but reveal a critical need for replication, extension, and control.

Comprehensive Treatment Models. Comprehensive treatment models (CTMs) are a specific type of early intervention program that differs from general interventions in scope, intensity, and complexity (Boyd, Odom, Humphreys, & Sam, 2010). CTMs consist of multiple focused intervention practices organized around a theoretical framework. They usually address multiple developmental areas and the core behavioral features of ASD, and they are implemented over extended periods of time. CTMs seek to reduce the level of impairment in individuals with ASD, and provide treatments that aim to change the nature of the outcome in ASD and improve the overall quality of life for these children (Rogers, 1998). Carrying out these approaches typically involves a team of individuals with varying levels of training, usually drawn from educational, clinical, or medical settings in a community.

Over the years, there have been many comprehensive treatments developed for children with ASD, evolving from various theoretical philosophies. CTMs typically involve the use of behavioral interventions, developmental interventions, or eclectic interventions that combine several conceptual approaches to treatment. CTMs have been described as "branded" interventions in that they are often identifiable by a consistently used name (Rogers & Vismara, 2008). Many comprehensive treatment models for children with ASDs exist in the literature, among the most widely known are the UCLA Young Autism Project (Lovaas, 1987), the LEAP model (Lifeskills and Education for Students with Autism and other Pervasive Developmental Disorders) (Hoyson, Jamieson

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& Strain, 1984), the DIR/Floortime approach (Greenspan & Wieder, 1997), the Early Start Denver Model (Rogers & DiLalla, 1991), and the TEACCH Model (Marcus, Lansing, Andrews, & Schopler, 1978; Mesibov, 1997; Schopler, Mesibov, & Baker, 1982). Most of these programs have been developed for very young children (starting around age 2) and extend until the child reaches school age (age 5-6).

Research on the effectiveness of these comprehensive treatment models is especially important for furthering the literature on the treatment of ASD, because such programs seek to ultimately alter the course and prognosis of the disorder. Any treatment that can fundamentally change the course of ASD and improve long-term outcomes is of utmost importance to school professionals, therapists, and families in order to help them make informed decisions about provision of services and allocation of resources. The following represents an overview of several well-documented CTMs in the research literature, organized by theoretical orientation to treatment. Due to the large number of early intervention programs found in the literature, this list is not exhaustive, and includes only a summary of the most established, "branded" comprehensive treatment packages from a variety of theoretical viewpoints that have documented successful outcomes for children ages 2-5 with ASD.

Behavioral Models. The University of California at Los Angeles (UCLA) Young Autism Project was one of the first empirical studies of an intervention program for children with autism. The UCLA Young Autism Project uses the Lovaas method of intervention, specifically discrete trial intervention, implemented in a one-to-one format by trained ABA therapists who work in a child's home, supervised by trained professionals. The treatment is focused primarily on developing language and early

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cognitive skills and decreasing excessive rituals, tantrums, and aggressive behaviors. The first year of intervention is aimed at teaching children to respond to basic requests, to imitate, to begin to play with toys, and to interact with their families. During the second year, the focus on teaching language continues; and there is a shift toward teaching emotion discriminations, pre-academic skills, and observational learning (Lovaas, 1987).

The UCLA Young Autism Project has extensive empirical support, both from the original study (Lovaas, 1987) and replication studies (Anderson et al., 1987; Birnbrauer & Leach, 1993; Sheinkopf & Siegel, 1998; Smith et al., 2000). In the original investigation (Lovaas, 1987) at the time treatment began, the children had a mean age of 35 months in the experimental group and 41 months in the control group. The experimental group received one-to-one intervention 40 hours a week, and the control group received intervention 10 hours a week for 2 to 3 years. Lovaas (1987) used IQ and class placement as outcome variables in this study. Nine of the nineteen children who received intensive intervention showed IQ gains of at least 20 points, compared to only 1 of 40 children in the control group. In addition, follow-up tracking of the nine best-outcome children in the original study revealed that by age 13, eight of the nine children continued to have high IQ scores, and they were functioning unsupported in regular education classrooms (McEachin, Smith, & Lovaas, 1993). Follow up information on the control group was not provided.

Although undoubtedly influential, there have been numerous criticisms of this study (Howlin 1997; Jordan et al., 1998). These include the non-random selection of groups (the age restriction was lower for children without language and children had to achieve a certain mental age to be included), non-random assignment to groups

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(participants were assigned based on where they lived and staff availability to provide therapy) and differences in IQ measures given at pre and post assessment, which may lower the reliability of the IQ data. Also, in the view of some investigators (e.g., Schopler et al., 1989), Lovaas's sample functioned at a higher level at intake than is typical of children with autism. Moreover, the follow-up assessments may have failed to detect residual problems in areas such as social skills or adaptive functioning (Mundy, 1993).

There have been a few attempted independent replications of Lovaas's original study. Anderson and colleagues (1987), Birnbrauer and Leach (1993), Sheinkopf and Siegel (1998) and Smith and colleagues (2000) have all reported partial-replication (i.e., employing the same treatment manual but providing fewer hours of treatment and altering some treatment procedures) studies of outcomes of children treated in adherence to Lovaas's model. For example, Anderson and colleagues (1987) examined the outcomes for fourteen children with a diagnosis of ASD who received in-home treatment via Lovaas's behavioral method for 15-25 hours a week for 1-2 years. Results indicated a significant increase in mental age and developmental rates using pre-post standardized measures of IQ, language, and adaptive behavior. However, there was no control group utilized in this study, and no follow up was conducted with the fourteen participants after treatment ceased.

Birnbrauer and Leach (1993) conducted a community-based study based on Lovaas's manual, and provided 18 hours of treatment per week to 9 children with ASD, with a control group of 5 children. Outcome data were reported after 2 years of treatment, and 44% of the experimental group children were considered to have made high improvements; double the gains of the control group. However, data was primarily

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descriptive, and there were no statistical analyses presented on group differences on the pre and post-treatment measures.

In a retrospective study using reviews of records of 11 children who had received treatment according to Lovaas's model, data was compared to a matched control group of children and a 25-point IQ difference between groups was observed, with higher scores for children receiving the Lovaas treatment (Sheinkopf and Siegel, 1998). The treatment group also demonstrated modest reductions of statistical significance on scores of autism symptom severity. However, these children received much less intensive services than UCLA (18-25 hours compared to 40), and information about language development, adaptive behavior, or social functioning was not reported. Further, the use of archival data leaves unanswered questions about treatment and procedural integrity, and the lack of central coordination of the treatment brings into question the methodological rigor of the investigation (Smith et al., 1999).

These independent replications provide some support for the Lovaas model, but several methodological points arise. Lack of treatment fidelity data and comparisons based mostly on IQ and symptom severity do not allow for straightforward comparison with the Lovaas study. In addition, treatment intensity and duration in many replications did not match the level of intensity observed in Lovaas's original study. However, while it is true Lovaas's study has generated much controversy, commentators have generally agreed that the study makes a strong case that the children involved made major, long-lasting improvements as a result of the intervention package they received (Baer, 1993; Foxx, 1993; Kazdin, 1993: Mesibov, 1993; Mundy, 1993). That being said, clearly the

study needs to be fully replicated by independent investigators using improved methodologies.

Learning Experiences, an Alternative Program for Preschoolers and their Parents (LEAP) is another behaviorally-based comprehensive treatment model, with the first data on child outcomes published in 1984 (Hoyson, Jamieson, & Strain, 1984). LEAP is unique in that it was the first CTM to put a strong emphasis on including typically-developing peers in its intervention programs. The inclusion of peers is especially important because many children with autism have difficulty generalizing skills learned, and they may show particular difficulty generalizing skills learned with adults to same-age peers (Bartak & Rutter, 1973). Typical peers are an essential component of the LEAP program, as each class is comprised of 10 typical children and 6 children with autism between the ages of 3 and 5 years. The children are in class for 15 hours a week (semi-intensive). The classroom is highly structured and incorporates ABA methods of intervention including direct instruction, use of reinforcement, and incidental teaching. Interventions are both child and adult-directed. Typical peers are taught to facilitate social and communicative behaviors from their peers with ASD. Children with ASD are also provided with prompting, curricular adaptations, and general support to aid their participation in peer-mediated social skills interventions. Finally, skill training for families is provided with a focus on behavioral strategies. LEAP aims for individualized curriculum and targets goals in social, emotional, language, adaptive behavior, cognitive, and developmental areas.

Results of the most recent randomized-control trial of LEAP classrooms indicated that children in intervention classrooms made significantly more progress than

comparison children at the end of 2 years on measures of cognitive, communication, autism symptom severity, problem behaviors, and social skills (Strain & Bovey, 2011). In addition, LEAP was the first CTM to report fidelity of treatment data for a comprehensive treatment program for children with ASD, with all intervention classrooms reaching 80% treatment fidelity after 2 years of implementation. However, one significant limitation of LEAP is that data on child progress comes mostly from parent-completed rating scales, and outcome data does not include direct observations of children's behaviors in the classroom setting. In addition, follow up studies to assess the maintenance of outcomes observed in earlier published studies (e.g., Hoyson, Jamieson, & Strain, 1984) have not been conducted.

Developmental Models. Developmental intervention programs describe a philosophy and specific strategies for working with children with autism. One common feature of developmental interventions is that they are child-directed. In developmental interventions, the environment is organized to encourage or facilitate communicative and social interactions. The child initiates, and the adult responds. Developmental methods require considerable effort and skill on the part of the teacher or therapist, as she or he must know what child behaviors to respond as well as how to respond (Rogers, 1998). Unlike approaches derived from ABA, in which children's teaching goals are derived from assessment of children's behavioral deficits and excesses, a developmental model derives teaching goals from assessments of children's developmental skills. Furthermore, developmental approaches posit that highly prescribed or highly structured approaches for toddlers with ASD (like behavioral approaches) may be less supportive of family strengths by not promoting child learning through everyday parent–child interactions.

One of the most well-known developmental approaches is the Greenspan approach, also known as the Developmental Individual Difference (DIR) or Floortime Model (Greenspan & Wieder, 1997). The Floortime model is described as a relationship-based model in which the goal is to help the child develop interpersonal connections that will lead to the mastery of cognitive and developmental skills. These include: (1) attention and focus, (2) engaging and relating, (3) nonverbal gesturing, (4) affect cuing, (5) complex problem solving, (6) symbolic communication, and (7) abstract and logical thinking (Greenspan & Wieder 1997). The program is based on following the child's lead and looking for opportunities to respond in a way that leads to expanding a skill or interaction. Within this model, it is recommended that a child spend at least 4 hours a day in spontaneous play interactions with either a parent or therapist, at least 2 hours a day in semi-structured skill building activities with an adult, and at least 1 hour a day in sensory-motor play activities. The DIR/Floortime program is supplemented by time in an inclusive preschool program, including speech and occupational therapy. Time in intervention is variable. This model clearly differs from many behavioral approaches, which have a prescribed pattern of responses and adult-initiated teaching trials.

Initial research examining the efficacy of the DIR approach included case reviews of 200 children, all of who had started the intervention between 2 and 4 years and had received between 2 and 8 years of intervention, follow-up consultation, or both (Greenspan & Wieder 1997). The children were divided into three groups based on their response to the program. Researchers found that after a minimum of 2 years of this developmentally-based intervention program, 58% of children evidenced "very good" outcomes. It was reported that these children became trusting and intimately related to

parents, showed joyful and pleasurable affect, and had the capacity for learning abstract thinking and interactive, spontaneous communication. In addition, this group shifted from the autism range into the non-autism range on the Childhood Autism Rating Scale (CARS). The second, or "medium outcome" group demonstrated slower and more gradual progress but still improved in their ability to relate and communicate with gestures and developed some degree of language. The third, or "slow" group made limited progress, and although most learned to communicate with gestures or simple words and phrases, they had continued difficulties with attention, self-stimulation, and perseveration. Subsequent to this study, Wieder & Greenspan (2005) conducted a 10- to 15-year follow-up study of sixteen children between the ages of twelve and seventeen years who were in the "very good" outcome group of the original 200 children. The study reported that the children maintained gains in relating, communicating, and reflective thinking, with most performing at the average to above average level in academic areas.

Although results from this review and subsequent follow-up were positive, this study was subject to several limitations, such as the use of archival data, a lack of comparison group data, and the use of subjective descriptions of behavior or parental ratings in lieu of more standardized assessment measures. In addition, treatment integrity data was not reported.

A more recent investigation on child outcomes following 12.5 hours per week of the Floortime CTM reported on an RCT of a DIR/Floortime parent training intervention for preschool children with ASD in Thailand. Outcome measures included the Functional Emotional Assessment Scale (FEAS) (Greenspan et al., 2000) and the CARS-2. The FEAS was developed by Greenspan specifically for use with the DIR/Floortime

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intervention, and is a criterion-referenced assessment that examines children's perceived level of regulation, attachment, two-way communication, and behavioral organization based on observations of play. The results of this study yielded an observed increase of 7 points on the FEAS for the intervention group compared to 1.9 for the control group, and an increase of 2.9 points on the CARS-2 compared to .8 for the control group after one year of the intervention (Pajareya & Nopmaneejumruslers, 2012).

The Denver model and Early Start Denver Model (ESDM) (Rogers et al., 1986) are also CTMs based on a developmental model of intervention. This program is delivered within a classroom setting and meets 3 to 5 hours a day, 5 days a week. The focus is on positive affect, pragmatic communication, and interpersonal interactions within a structured and predictable environment. Almost all activities and therapies are conducted within a play-based situation. Goals of the program include using positive affect to increase a child's motivation and interest in an activity or person, and using reactive language strategies to facilitate communication, joint attention, and mental representation.

Results of early studies of children receiving the Denver model (Rogers & DiLalla, 1991; Rogers et al., 1986; Rogers & Lewis, 1989) using a pre-post design described significant accelerations in developmental rates of children diagnosed with ASD in several areas, specifically cognition, language, and social development. More specifically, based on outcomes of 31 children between 2 and 6 years of age with ASD, one study indicated children demonstrated significant developmental improvements in cognition, language, social/ emotional development, perceptual/fine motor development, and gross motor development after 6 to 8 months in the program. While only 53% of the

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children had functional speech when they entered the program, 73% had functional speech at follow-up (Rogers & DiLalla, 1991). Independent replications of this model have been carried out in several Colorado school districts, and group data demonstrated similar child change effects as the original studies. Subsequent research has also expanded the model to younger children starting at age 2 (i.e., the Early Start Denver Model), with initial findings of efficacy using single-subject design research (e.g., Vismara et al. 2009, Vismara & Rogers 2008). Limitations of this developmentally-based model include a lack of reported treatment integrity, and variability in assessment measures used from pre to post testing (i.e., use of the Bayley Scales at baseline and WPPSI at follow-up to determine IQ).

In the most recent investigation of the efficacy of the ESDM, forty-eight children diagnosed with ASD between 18 and 30 months of age were randomly assigned to the ESDM intervention group or a community intervention (control) group (Dawson et al., 2010). After two years, children who received the ESDM intervention package showed significant improvements in IQ, adaptive behaviors, and autism diagnosis compared to children who received community-based intervention. Specifically, the ESDM group on average improved 15.3 standard score IQ points compared with 4.0 IQ points in the comparison group relative to baseline scores. Children who received ESDM also were more likely to experience a change in diagnosis from autism to pervasive developmental disorder, not otherwise specified (PDD-NOS), than the comparison group. However, the two groups did not significantly differ in terms of their ADOS severity scores, and the ESDM group did not exhibit significant increases in adaptive behavior as measured by the Vineland (VABS).

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Eclectic Models. The Treatment and Education of Autistic and Communication Handicapped Children (TEACCH) model was founded at the University of North Carolina in 1966 by Eric Schopler (Schopler & Reichler, 1971). The program shares with behavior analytic programs an emphasis on treating multiple problems rather than attempting to identify a central deficit, and having treatment occur in multiple settings with the involvement of many people. Also, the program sometimes incorporates behavior analytic approaches for controlling disruptive behaviors and enhancing self-help skills. However, in their treatment manual, Schopler, Reichler, and Lansing (1980) recommend against using behavior analytic approaches for other skills such as language acquisition. Schopler and colleagues (1980) assert that interventions based on clinical experience are more likely than behavior analytic approaches to generalize from intervention settings to everyday life. Also, the interventions favored by TEACCH are designed to accommodate the existing strengths and weaknesses of children with autism (Lord & Schopler. 1994), rather than remediating the weaknesses, as in many behavior analytic programs. TEACCH aims at addressing multiple problems such as communication, cognition, perception, imitation, and motor skills. It emphasizes teaching in multiple settings with the involvement of several teachers.

The TEACCH program includes the following components: focus on structural teaching, focus on strategies to enhance visual processing such as visual schedules, teaching a communication system based on gesture, pictures, signs, or words, teaching pre-academic skills, and involving parents in their child's treatment package (Eikeseth, 2008). Programming is based on individualized assessments of a child's strengths, learning style, interests, and needs, so that the materials selected, the activities developed,

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the work system for the child, and the schedule for learning are tailored to this assessment information and to the needs of the family.

There have been a number of studies describing outcomes in samples of young children who received services at TEACCH (i.e., Ozonoff & Cathcart, 1998; Welterlin, 2009). One early study compared the pre and post treatment developmental skills of a group of eleven preschoolers with ASD with the skills of a matched control group (Ozonoff & Cathcart, 1998). The group receiving the TEACCH treatment improved significantly more than the control group on overall scores on the Psychoeducational Profile-Revised (PEP-R; Schopler et al., 1990). However, limitations of this study include non-random assignment to groups and testers who were not blind to group status.

In addition, Welterlin (2009) evaluated the effectiveness of a 12-session, parent-implemented intervention using TEACCH methods on 5 three-year olds with autism or autism-like characteristics. A randomized wait-list control group also consisted of 5 three year olds. Results indicated significant increases in fine motor skills, decreased maladaptive behaviors, and increased independence, as well as marked decreases in parental stress levels. In addition, treatment fidelity data was collected for 4 of the 10 children, but this information was not reported. Limitations of this study include problems with the standardization of the TEACCH protocol when parents serve as therapists. That is, there could be a lack of standardization in how parents work with their children, which may have influenced results. Furthermore, children in the control group were matched based on age rather than severity level.

More recent investigations into the efficacy of the TEACCH CTM have yielded variable results. That is, a recent meta-analysis examined the pooled clinical effects of

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TEACCH in a variety of outcomes (Virues-Ortega et al., 2013). A total of 13 studies

were selected for meta-analysis totaling 172 individuals with autism exposed to the

TEACCH intervention program. The results suggested that TEACCH effects on

perceptual, motor, verbal and cognitive skills were of small magnitude in the meta-

analyzed studies. Effects over adaptive behavioral repertoires including communication,

activities of daily living, and motor functioning were within the negligible to small range.

There were, however, moderate to large gains in both social behavior and improvements

in maladaptive behaviors over time (Virues-Ortega et al., 2013). These exploratory

results point to the need for additional research examining the effectiveness of CTMS

using control groups, standardized assessment measures, and treatment fidelity data to

lend support and validity to the outcomes observed. In addition, it is necessary to

determine which components of CTMs are the most beneficial and contribute to positive

child outcomes.

Key Features of CTMs

Clearly, the available evidence from a variety of CTMs and their related

published studies suggest that early intervention leads to better outcomes (e.g., Lovaas,

1987;Rogers & DiLalla, 1991; Strain & Bovey, 2011;Welterlin, 2009). However, much

of the research on the available models is descriptive rather than based on empirical

studies, and currently there is no empirical evidence that one program is superior to

another. As CTMs for children with ASD also vary in their theoretical approach and

methodology, early intervention programs and schools preparing to serve children with

autism face great difficulty in determining which interventions are most appropriate

(Levy 2006). Findings point to the need for researchers to consider the key components of these early intervention programs.

Although they differ in philosophy and defining features, there are many common elements of the aforementioned comprehensive treatment programs. For example, all of the programs include young children (mean age at entry between 30 and 47 months), are relatively intensive in hours (12–40 hours a week), and most include a parent component (typically parent-training). In addition, in most of the CTM programs, staff is well trained and experienced in working with children with autism and the physical environment is structured and supportive. All of the programs focus on developmental skills and goals and contain ongoing objective assessments of progress. The programs also use teaching strategies designed for the generalization and maintenance of skills, implement individualized intervention plans based on a child's individual needs, and plan transitions from preschool to school age (Corsello, 2005). In addition, it appears as though the positive effects of treatment on developmental rates, IQ, and symptom severity are similar across several of the different CTMs. Therefore, it may be that the source of positive outcomes in CTMs, despite varying theoretical standpoints, may actually be due to the critical common elements found across models rather than to differences in each model's theoretical philosophy (Dawson & Osterling, 1996). To date, very few empirical syntheses of the literature have attempted to define the key features of comprehensive treatment models for children with ASD (Boyd et al., 2014; Levy, Kim & Olive, 2006; Schertz et al., 2011).

Based on the results of a synthesis of available literature from 1975-2001, Levy and colleagues (2006) found that the following features of early intervention programs

had positive effects on the treatment outcomes of children with autism: parent involvement, intensive behavioral interventions, multicomponent early interventions, and duration of intervention. An additional but independent review of the available literature determined those specific principles of effective early intervention programs that were based on a combination of standards from the DEC (Division of Early Childhood), the NAEYC (National Association for the Education of Young Children), and Part C of IDEA (Schertz et al., 2011). Using these sources, critical areas of overlap were identified. Schertz and colleagues (2011) posited that the following are indicators of quality early intervention programs: delivered in home/community/inclusive settings, supports a parent–child interactive relationship, supports families to promote child learning through typical activities, supports parent's role in planning and implementing, is broad based across contexts and materials, promotes foundational learning and child initiation, promotes developmentally accessible outcomes, and is implemented systematically based on evidence (Schertz et al., 2011). In summary, it appears as though comprehensive programs that include behavioral techniques, take into account the development levels of each individual child during treatment, and uses multi-component approaches that include an emphasis on parent and family support, training, and involvement are best-suited to meet the needs of young children with ASD.

More recently, Boyd and colleagues (2014) conducted the first known study to compare the efficacy of two well-known CTMs in the early intervention literature: LEAP and TEACCH. Results indicated that children made gains and reductions in autism characteristics across time irrespective of programmatic type. Furthermore, they found that children's pretest Mullen and PLS scores moderated the effects of TEACCH on

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children's autism severity, with children with lower Mullen but higher PLS scores at pretest having better outcomes on this composite. Higher PLS scores also moderated the effects of TEACCH on children's communication outcomes. This study is the first to suggest that perhaps it is not the *unique* features of the models that contribute most to child gains; but rather it may be the *common* features present across models that most influence child growth (Boyd et al., 2014). Further research in this area is warranted to shed additional light on these preliminary findings.

Factors that affect child outcomes

Of particular interest when evaluating CTMs for young children with ASD are those specific factors that may affect child outcomes, either negatively or positively. Most studies addressing this area focus on either child factors or treatment factors. Child factors include age at entry to treatment and starting IQ, whereas treatment factors include intensity of treatment and treatment setting.

Child factors. Comprehensive treatment that involves children under the age of 5 years has generally led to significant changes in the functioning level of these children (Fenske, 1985; Lovaas, 1987, Rogers & DiLalla, 1991). In an examination of the effects of age on outcome, the outcomes of nine children younger than age 5 and nine children older than 5 in a CTM at the Princeton Child Development Institute were compared (Fenske, 1985). The outcome variable reported was placement; either living at home and attending public school, or living at the center. Results indicated that 67% of the younger group achieved community placement, whereas only 11% of the older group were discharged to the community.

A second child factor that appears to be a discriminative variable in treatment effectiveness is level of intelligence at the start of treatment. Several studies have demonstrated a relationship between treatment outcome and cognitive ability at intake, with those children with higher pre-treatment IQs more likely to yield better outcomes (Eikeseth et al., 2002, 2007; Hayward, Gale, & Eikeseth, 2009). Specifically, one investigation examined IQ and age at treatment onset as predictors of later classroom placement (i.e., inclusive setting vs. self-contained). Findings indicated that children who were younger and had higher IQ scores at intake had better outcomes (Harris & Handleman, 2000). In contrast, a recent investigation by Boyd and colleagues (2014) found that children with lower pre-test scores on the Mullen's Scale of Early Learning (MSEL) exhibited greater reductions in autism severity overall.

Treatment factors. One treatment factor that may influence child outcomes is intensi**ty.** As most comprehensive programs involve 15-40 hours of intervention a week, it has been suggested that the effects of a CTM may actually be due to the intensity with which the intervention was provided rather than the specific treatment (Jordan et al., 1998). Therefore, the evidence for efficacy of the program would be based on its intensity alone. The logic of this argument rests on the assumption that therapeutic interventions have a graded effect, with the level of effectiveness directly related to the amount of intervention received. While this argument seems logical, additional research in this area is needed in order to support this assumption. Interestingly, studies of the effects of intensity of intervention on IQ outcomes have revealed variable results. That is, some studies have revealed significant IQ score gains in children who received intensive, 40 hours per week of intervention (Lovaas, 1987). Other studies, however, have

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suggested that the number of treatment hours per week does not correlate with outcomes when the outcome in question is an IQ score (e.g., Luiselli et al., 2000). These studies observed improvements in children regardless of the number of treatment hours per week.

A more recent investigation into the benefits of a low intensity CTM examined child outcomes after receiving 4 hours of the TEACCH program per week for 2 years, compared to a control group (D'Elia et al., 2014). The results showed changes across time in the main outcome indicators (severity of autism, language, and adaptive functioning), but no significant differences between the experimental and control group. Furthermore, in a meta-analysis evaluating the pooled effects of 13 studies of the TEACCH program, the effects observed were not moderated by aspects of the intervention such as duration (total weeks) or intensity (hours per week) (D'Elia et al., 2014). This data calls into question the effectiveness of low intensity interventions for causing changes over time in children's functioning levels above and beyond what would be expected without intervention as a result of developmental maturation.

Variables within the treatment setting may also influence child outcomes in CTMs. Specifically; studies have investigated the relative effectiveness of settings that include typically developing peers and those that are comprised entirely of children with ASD. In an investigation specifically designed to isolate this factor, the level of autistic behaviors were compared in the presence of typically developing children, of other children with autism, or of no other children (McGee, Paradis, and Feldman, 1993). The presence of typically developing children was significantly associated with decreased autistic behavior as compared with the presence of other children with autism and non-

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significantly associated with decreased autistic behavior as compared with the presence of no other children. Other studies that have examined the effects of the presence of typically developing children on social outcomes for children with autism reveal that children with autism appeared to display an increase in positive social outcomes and a decrease in negative autistic behavior when in inclusive vs. segregated settings (McGee et al., 1993; Schleien et al., 1995). However, a recent investigation into the effectiveness of LEAP compared to TEACCH yielded improvements across children receiving both interventions, and no significant differences between the two on measures of socialization (Boyd et al., 2014). This is surprising when it is considered that a central component of the LEAP model is the use of peer-mediated instructional strategies. This finding questions the true benefits of using typical peers in intervention packages for children with ASD, and raises further questions regarding possible factors that may correlate with increased or decreased outcomes with the presence of typical peers (i.e., language/IQ level at baseline).

In addition to child factors and treatment factors, it is possible there may be other factors that may impact child outcomes in treatment, such as levels of parent stress or parent involvement (Luiselli et al., 2000). Studies have demonstrated that greater family stress is associated with having a child with ASD than having a child diagnosed with mental retardation (Konstantareas et al., 1992), Down's syndrome (Sanders & Morgan, 1997) or a chronic physical illness (Bouma & Schweitzer, 1990). It is recognized that stress can lead to a number of deleterious effects on the well-being of individuals experiencing stress, and it can have negative effects on those who interact or depend on

the individual. Robbins, Dunlap & Plienis (1991), for example, found a significant negative correlation between maternal stress level and child developmental progress.

The abundance of factors that may contribute to outcomes for children with ASD enrolled in comprehensive treatment programs provides quite a challenge for researchers looking to develop high quality intervention programs for these children that will result in successful outcomes for those enrolled. Further research into the factors that may influence child outcomes will provide valuable information on the variables that mediate and moderate treatment effects and the kinds of intervention that are most efficacious, as well as the degree of both short-term and long-term improvements that can be expected in individuals with ASD.

Limitations of CTMs

Unfortunately, despite many published reports of positive child outcomes, these models are rife with limitations that clearly point to the need for more systematic and controlled data collection. To start, many previous investigations fail to incorporate behavioral observations of both social and adaptive skill measures, instead relying solely on parent reports, which may introduce bias into reports of child outcomes. Additional limitations of CTMs cited in the literature include lack of collected and reported treatment fidelity data, overuse of cognitive assessment data, failure to assess the core symptoms of ASD, difficulties measuring the effectiveness of parent components, and lack of social validity data (Corsello, 2005; Matson, 2007). Several of these limitations will be addressed in more detail below.

Treatment fidelity. Treatment fidelity can be defined as the degree to which an independent variable is implemented as intended (Gresham, Gansle, & Noell, 1993).

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Unfortunately, there appears to be a paucity of research addressing the treatment integrity of psychological interventions for children with ASD (Perpletchikova, Treat & Kazdin, 2007). Furthermore, program evaluation literature assessing the effectiveness of programs for children with ASD rarely, if ever provide information regarding treatment fidelity (Wolery and Garfinkle, 2002). This is surprising, as treatment fidelity or integrity data has important implications for the validity of the inferences drawn about an obtained effect. That is, if the intervention has not been implemented with high fidelity, then any outcomes observed cannot be reliably attributed to the intervention package, and measures that deal with questions of treatment effectiveness are uninterpretable. The extent to which researchers and clinicians are adhering to treatment protocols is critical; not only for the interpretation but the comparison between studies.

What could account for the absence of fidelity data in the autism treatment outcome literature? It is likely the cost of gathering such data. Correct implementation of treatment integrity procedures is time and resource intensive, which almost certainly has deterred researchers from adequately addressing integrity (Perpletchikova, Treat & Kazdin, 2007). In a meta-analysis of studies that evaluated the adequacy of treatment fidelity procedures implemented in psychotherapy, Perepletchikova and colleagues (2007) found that treatment fidelity was adequately addressed for only 3.5% of the evaluated interventions. In a more recent paper that cited both improvements and continued challenges in the outcome measures utilized for early intervention programs over the past 15 years, Matson and Rieske (2014) found that only 3 studies total since 1987 had published data regarding treatment fidelity.

When looking specifically at treatment fidelity data for CTMs for children with

ASD, detailed descriptions or treatment manuals exist for only a select few of the many identified treatment programs (e.g., LEAP, ESDM), which poses a problem for maintaining the integrity of these programs over time (Jordan et al., 1998). Of the CTMs reviewed in the literature to date, only the LEAP model, a recent evaluation of the TEACCH model, and a behavioral model known as STAR (Strategies for Teaching based on Autism Research) have included quantitative data on measures of treatment fidelity in published research (Mandell et al., 2013; Strain & Bovey, 2011; Welterlin, 2009). Furthermore, the data presented in these studies did not reflect acceptable levels of treatment fidelity. It took almost 2 years before teachers implementing the LEAP intervention reached 80% fidelity, and clinicians implementing the STAR program only reached 57% fidelity after 8 months (Mandell et al., 2013; Strain & Bovey, 2011). The importance of monitoring treatment implementation cannot be understated, particularly while in naturalistic settings, as a means of ensuring appropriate implementation of manualized procedures as well as preventing treatment drift (Charman & Howlin, 2003).

To conduct appropriate analyses of treatment fidelity, several practices are recommended (Wolery& Garfinkle, 2002). First, program personnel must plan data collection before implementing intervention activities and continue it for the duration of the program. The purpose of measuring treatment implementation is to make adjustments when implementation is incorrect or inconsistent, so providing direct feedback to staff is critical. For elements such as teaching practices, regular observations and direct systematic data collection may be necessary. It is also important to evaluate the treatment integrity procedures themselves, which may include ensuring the accuracy of the obtained integrity data via inter-rater reliability scores, appropriately training raters, and

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controlling for staff reactivity (Perpletchikova, Treat & Kazdin, 2007).

Cognitive Assessment. An additional limitation of CTMs is that they tend to focus their determination of outcomes primarily on measures of intellectual functioning. The use of such measures as part of an assessment battery has historically been considered appropriate because many children with autism have delays in intellectual functioning and because intelligence tests have been shown to have good psychometric properties with this population (Rutter, 1983). However, it is necessary for independent examiners to administer these tests, and because such tests are more difficult to administer to children with autism than to typically developing children, further precautions may be advisable such as assessing inter-examiner reliability, internal consistency of children's responses (e.g., Volkmar, Hoder. & Cohen. 1985), and correlations with other measures (e.g., Freeman. Ritvo, Bice, Yokota, & Ritvo. 1991). Moreover, the National Research Council (2001) stated that since intelligence is a factor that is expected to be relatively stable over time, it may in fact be insensitive to actual changes in functioning in children with ASD. As such, it may not be a useful indicator of intervention or program efficacy on its own. Furthermore, many studies use changes in IQ as a perceived indicator of symptom "recovery;" that is, if children make great gains in IQ as a result of the intervention, it was said that these children "recovered" from the disorder. This has been observed primarily in behavioral treatment packages (e.g., Lovass, 1987; Hayward et al., 2009). However, this issue is clearly very problematic since the primary objective of intervention for ASD is to improve *symptoms* of ASD, and without a direct measure of these symptoms it is inappropriate to conclude that participants made a recovery of any kind. Therefore, it is recommended that additional

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outcome measures should be utilized when evaluating CTMs that assess children's functioning in areas besides intelligence; such as the core symptoms of ASD, language, social development, adaptive skills, and repetitive behaviors (Smith 1999).

Parent components. A critical review of program evaluation measures used in early childhood programs (Wolery, 2002) revealed that family outcomes tend to be less well developed and are measured with less sophistication than child outcomes. The review indicated that this is likely because many programs work extensively with parents and families, yet never utilize any parent outcome measures. It is necessary for programs to clearly define their goals for parents (i.e., training, support) and utilize matched outcome measures accordingly. For those programs that seek to reduce parent stress levels via weekly support groups, rating scales that measure family functioning or stress levels over time are appropriate. Additionally, programs should carefully consider a family's needs before starting intervention programs; a recent review of early childhood programs for children with ASD indicated that out of several studies that include families, most involve them in intervention implementation but do not provide family-centered social support (Schertz et al., 2011).

Social validity. The process of social validation is a critically important step in the much broader, but interrelated, enterprise of empirically validating effective educational or therapeutic outcomes (Foster & Mash, 1999). Unfortunately, it is an area that has received very minimal attention in the autism research literature (Callahan et al. 2010). Social validity can be generally defined as consumer satisfaction with the goals, procedures, and outcomes of programs and interventions (Alberto and Troutman 2008; Wolf 1978). It refers to the need to show that an intervention will be accepted and viable

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if implemented in a community setting (Schwartz & Baer, 1991). It also involves documenting the social importance of treatment goals and outcomes. Whether or not a particular intervention—or a comprehensive treatment model—receives widespread social validation can determine the extent to which the intervention or model is adopted and implemented within schools, homes, and clinics (Gresham et al. 2004; Kazdin 1981; Kern & Manz, 2004). Thus, ratings of social validity can provide an important indicator of the preferences of autism service providers for particular intervention components and for program models comprised of many such parts.

Assessments of social validity are particularly important as researchers transport their interventions to community settings and attempt to extend treatment applications to various populations (Foster & Mash, 1999). In fact, American Psychological Association (APA) guidelines for developers of psychological interventions (Task Force on Psychological Intervention Guidelines, 1995) explicitly include issues relating to social validity in their second "clinical utility" axis. This relates to evaluations of "the ability (and willingness) of practitioners to use, and of patients to accept, the treatment in question, and to the range of applicability of that treatment" (Task Force on Psychological Intervention Guidelines, 1995, p. 13).

Unfortunately, very few data have been collected in previous studies on the social validity of comprehensive treatment programs for children with ASD. The LEAP program researchers (Strain & Bovey, 2011) specifically designed a Scale of Intervention Compatibility (SIC) to determine teachers' satisfaction with the LEAP program. Results indicated teachers had very favorable ratings of their experience with the LEAP replication process (Strain & Bovey, 2011). An additional investigation by Callahan and

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colleagues (2010) investigated the social validity of evidence-based practices common within the ABA and TEACCH comprehensive treatment models (CTMs) for students with autism spectrum disorders. Results indicated that the teachers, parents, and administrators showed no clear preference for the interventions associated with either the ABA model or the TEACCH model. Further, the autism treatment components that were determined to be inherent within both the ABA and TEACCH approaches were rated as more socially valid than either approach alone (Callahan et al., 2010). Clearly, more research in this area is warranted and future CTMs should investigate social validity data not just from teachers, but also from parents of children involved in the program.

All of the above limitations in part reflect the tremendous scope required in carrying out research concerning comprehensive intervention programs. Clearly, further research in the area of comprehensive early behavioral interventions for children with ASD is warranted, especially those that specifically address those limitations noted above.

From research to practice

In the absence of a plethora of information about successful and empirically grounded treatments, families of children with ASD are at the mercy of service providers when it comes to getting treatment for their child. Thus, it is the responsibility of psychologists and other related professionals to be knowledgeable about the effectiveness of the various treatment approaches to ASD, and to work towards making effective services and treatments widely available for children with ASD in every community (Rogers, 1998). This raises questions about the elements of successful intervention approaches, the implementation feasibility of comprehensive programs by public

agencies, and the overall ability of research based programs to translate into successful applied practices.

Due to the promising results present in the literature regarding many CTM programs for children with ASD, early intervention practitioners will inevitably seek to replicate these research-based interventions. Research has suggested that interventions that target various areas of need, such as social skills, language acquisition, nonverbal communication, and behavior management can greatly improve the lives of children with autism (National Research Council, 2001). Unfortunately, many public service providers receive limited guidance on how to reconcile those interventions within the realities of professional practice recommendations (i.e., required early childhood curriculum) and the limited resources available to public agencies (Schertz et al., 2011).

In the last two decades, the relationship between effective research and clinical practice and the accompanying difficulties with making a successful transition from one to the other have experienced a surge of national interest. For example, granting agencies such as the National institute of Mental Health (NIMH) are recognizing the need to tailor treatments to clinical practice realities by studying treatment dissemination as well as the realities of administering treatment in applied clinical settings (Addis, 2002). The central promise of evidence-based research is that it will enhance clinical outcomes by capitalizing on actuarial approaches to treatment (Wilson, 1995). This approach is guided by the general premise that the use of evidence-based practices will improve the quality of clinical practices by guaranteeing that services are solidly research based.

However, there are many obstacles to the successful real-world adoption of evidence-based practices. Many scientifically validated policies and practices fail to meet

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their stated outcomes in practice because they do not gain widespread acceptance, are not effectively implemented, or result in unintended consequences that undermine any desired outcomes. The Wing Institute has identified three components required in order to successfully translate research to practice. First, there must be successful development of an intervention in a controlled setting. Next, there must be an analysis of the requirements necessary for completing the intervention in an applied setting, and finally, there must be an analysis of the social validity of an intervention, which will predict its acceptance and successful implementation.

Unfortunately, most comprehensive treatment programs for children with ASD never complete all three steps. As noted above, few CTMs to date have actually published any data on treatment fidelity (Mandell et al., 2013; Strain & Bovey, 2011; Welterlin, 2009), and most CTMs do not get measures of social validity or treatment acceptability from parents or clinicians. Further, most CTMs take place in clinic or laboratory settings that are highly controlled, highly staffed, use large amounts of resources, and are funded by various research grants (e.g., LEAP, Lovaas, Denver model). These potentially efficacious programs may not prove effective in public service settings, especially when the efficient use of time and money is considered.

Overall, there is clearly a need for manualized and replicable evidence-based early childhood intervention programs for children with ASD that effectively translate from research to practice. In addition, these programs must be able to be implemented in community or school-based settings, have good treatment acceptability from parents and teachers, evaluate children's functioning over a wide range of areas using multi-modal

assessment measures, and attempt to address the many methodological limitations of previous investigations of comprehensive programs for children with ASD.

The Sprouts program

The Autism Program of Illinois (TAP) is a state-wide initiative to provide services and support to children with autism spectrum disorders and their families. The program was established in 2003 and has since grown to include several clinics across the state of Illinois. The Autism Program- Illinois State University Affiliate Site is one such clinic, and provides services to children with autism and their families in Bloomington-Normal and the surrounding area. TAP at ISU is staffed primarily by graduate students in the school psychology program at ISU who are supervised by licensed psychologists, and it serves as an integral part of their training experiences towards their advanced degrees. TAP provides services to children and adolescents in a variety of areas, including social skills training, individual therapy, in-school therapy, consultation services, sibling and parent support groups, and early intervention services.

The Sprouts program is a semi-intensive, therapeutic early intervention service provided through TAP at ISU for children ages 3-5 that present with a diagnosis of an Autism Spectrum Disorder. The Sprouts program arose from the need to provide more intensive services to the growing numbers of young children in the Bloomington-Normal community diagnosed with ASD. Since its inception in the summer of 2008, Sprouts has grown and evolved into a multi-disciplinary program that provides comprehensive, individualized, and evidence-based treatment to young children with autism spectrum disorders.

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Similar to other CTMs described in the literature, the Sprouts program is based on a multi-component foundation of evidenced-based behavioral principles administered within a developmental approach to treatment. It is an eclectic model that draws upon several critical components identified in the CTMs reviewed above. For example, Sprouts incorporates at least 30 minutes of a one-on-one discrete trial behavioral format into its treatment protocol each day (Lovaas, 1987). In addition, Sprouts utilizes naturalistic teaching strategies and incidental teaching similar to the LEAP program (Hoyson et al., 1984; Strain & Bovey, 2011) and it employs a developmental approach to treatment similar to that of the Denver model (Roger & DiLalla, 1991), particularly during free play activities. Sprouts also utilizes a wide variety of other evidence-based techniques grounded in the principles of ABA, including pivotal response training, shaping and chaining, prompting, visual supports and strategies, the picture exchange communication system (PECS), and positive behavior support. Table 1 below outlines comparisons between Sprouts and other branded CTMs described herein.

Table. 1

Comparison of popular CTM models with Sprouts

Program/ Author	Model	Hours per week	Format	Implementer	Adult or Child directed
Sprouts	Eclectic	12.5	Group & 1:1	Graduate student clinicians	Adult & Child
UCLA	Behavioral	40	1:1	Student clinicians	Adult
LEAP	Behavioral	15	Group	Teachers	Adult & Child
ESDM	Developmental	15-20	Group	Students & Trained staff	Child
DIR/Floortime	Developmental	Varies	1:1	Parents	Child
TEACCH	Eclectic	Varies	Group	Parents & Trained Staff (varies)	Adult

In addition, when compared to Levy's (2006) essential components for an early childhood program for children with ASD, the Sprouts program addresses each of the components identified by Levy as follows: parent involvement, intensive behavioral intervention, multicomponent early interventions, and duration of intervention. For example, parents of children enrolled in the Sprouts program participate in a training and support group that meets one hour each week. Furthermore, children enrolled in Sprouts at age 3 may remain in the program until they go to kindergarten at age 5, providing them with an intensive early intervention experience that is significant in duration. In addition, similar to other CTMs (i.e., Strain & Bovey, 2011) the intensity of the Sprouts treatment package is not simply defined by hours per week of service delivery, but rather it also considers the number of meaningful opportunities to respond, functionality of goals and

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objectives targeted, competence and fidelity of clinicians to deliver the interventions adequately, and the use of data-based decision making. For more detailed information about the Sprouts program, including its primary goals, mission statement, and curriculum, refer to the official program manual in Appendix A.

One important goal of the Sprouts program is its attempt to start bridging the gap between research and practice. Although implemented in a university-based setting, the Sprouts program was designed based on other programs described in the literature and as such represents an effort to replicate specific components of programs found to be efficacious in the literature (i.e., LEAP, Lovaas, ESDM). In addition, the Sprouts program itself receives no funding used to provide services or gain resources, and staff are either university employees or graduate students.

The Current Study

With the increasing ability to diagnose ASD in very young children combined with the knowledge that early intervention is critical to development, the onus is on clinicians and researchers to identify appropriate programs to meet the needs of these young children with ASD and their families. Thus, the current investigation examines outcomes for children enrolled in one comprehensive early childhood treatment program (Sprouts) provided through The Autism Program, Illinois State University Affiliate Site. Specifically, this study systematically assessed the cognitive, adaptive, social, and autism-related changes in functioning for all enrolled children with ASD over a 9-month period of intervention via various assessment measures designed to capture progress over time and across multiple domains of functioning. Additionally, measures of parent's stress levels, the program's treatment fidelity, and treatment acceptability ratings were

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collected and reported. Specifically, the following research questions were addressed in this investigation.

1. *Do children enrolled in the Sprouts early childhood program make observable and measurable gains in the program's targeted areas of communication, social skills, and adaptive functioning that exceed what would be expected given their current developmental trajectory?*

Consistent with previous literature that demonstrates the effectiveness of comprehensive early behavioral intervention programs for children with ASD, it was hypothesized that children in Sprouts would make significant gains in the program's targeted areas of communication (e.g., Rogers & DiLalla, 1991; Strain & Bovey, 2010), social skills (e.g., Boulware, Schwartz, Sandall, & McBride, 2006), and adaptive functioning (e.g., Dawson et al., 2010; Welterlin 2009), as measured by changes in standard scores over time on a variety of standardized assessment measures, including the Preschool Language Scales (PLS-5), Social Responsiveness Scale (SRS-2), and the Vineland Adaptive Behavior Scale (VABS).

2. *Do children enrolled in the Sprouts early childhood program make significant gains on measures of cognitive ability?*

It was hypothesized that children in the Sprouts program would make mild to moderate gains over time on measures of cognitive ability, as evidenced by changes in scores on the Mullen Scale of Early Learning. Previous literature on CTMs that have demonstrated significant increases in IQ scores over time, such as Lovaas's (1987) seminal study, measured child cognitive gains over a 2-year span of treatment, whereas the current study measured change in IQ scores over only a 9-month period. This

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hypothesis is commensurate with literature that posits duration of treatment may affect child outcomes (Jordan et al., 1998; Howlin, 1997).

3. *Does the symptom picture of autism change following enrollment in Sprouts?*

Consistent with previous studies that have documented significant changes in children's display of autism-related symptomology over time (e.g., Greenspan & Wieder 1997;Lovaas, 1987; Strain & Bovey, 2010), it was hypothesized that children in the Sprouts program would exhibit reductions in severity of autism symptoms over time, as measured by changes in scores on both the Childhood Autism Rating Scale (CARS-2) and the Autism Diagnostic Observation Schedule (ADOS).

4. *Do parents of children enrolled in the Sprouts program exhibit reduced stress levels over time while their children are enrolled in the Sprouts program?*

It was hypothesized that parents would demonstrate decreased stress levels over time as measured by reduced scores on the Parenting Stress Index, presumably due to the high levels of support provided by the parent component of the Sprouts program. Previous literature in this area has demonstrated that parents of children enrolled in comprehensive treatment programs typically display reduced stress levels over time (e.g., Rogers & DiLalla, 1991; Strain & Bovey, 2011).

5. *Is the Sprouts program effectively implementing its specified program components as outlined in the Sprouts program manual?*

It was hypothesized that the Sprouts program would maintain high levels of program fidelity over time, with the goal of reaching 80% of all program components implemented, as measured by frequent completion of treatment fidelity observation scales. This hypothesis was commensurate with one of only very few studies in the

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literature to publish solid quantitative data on treatment fidelity, which found that 90% of LEAP practices were in place after 2 years of having fidelity procedures in place and subsequently coaching staff on weak areas of implementation (Strain & Bovey, 2011).

6. *Does the Sprouts program demonstrate good social validity for parents of children enrolled?*

It was hypothesized that parents would have favorable ratings of their experiences participating in the Sprouts program, as measured by the FFPS completed at the end of their child's enrollment in the Sprouts program. This hypothesis was consistent with data from previous studies on the social validity of CTMs (Callahan, 2010; Strain & Bovey, 2011).

CHAPTER III

RESEARCH DESIGN

Participants

Participants were 8 children enrolled in the Sprouts early childhood program from September 2012-June 2013. Inclusionary criteria included those children between 3-5 years of age at program entry who received a diagnosis of ASD from an independent clinician or pediatrician prior to starting the Sprouts program. Diagnoses were further confirmed by the researchers; with all participants meeting criteria for a diagnosis of an Autism Spectrum Disorder on both the Autism Diagnostic Observation Schedule (ADOS) and Childhood Autism Rating Scale, 2nd edition (CARS-2). No minimum cognitive, verbal, or adaptive skill level was required. All participants remained enrolled in the Sprouts program for the duration of the intervention period (9 months). Six parents out of the eight child participants elected to participate in this study, and filled out rating scales as outlined below.

Design

The current study is a program evaluation that utilized a longitudinal within-subjects design with repeated measures. Child participants were evaluated over the course of 9 months at program entry (baseline) and again at program exit (follow-up) using the same collection of multi-modal measures. Parent stress levels and satisfaction with treatment services were also measured via pre and post assessments over the course of treatment.

Procedure

Recruitment. Participants were recruited via The Autism Program, Illinois State University Affiliate Site. Flyers were distributed to parents of children enrolled in the Sprouts program. Interested families contacted the researchers either by phone or via email and appointments were set up to review informed consent documents. Researchers met with interested families to review informed consent documents, and families were given the option to sign documents for permission for their child's outcome data to be used in the study at that time, or they could contact the researcher to set up an appointment at a later time. After securing parental consent, outcome data for all participating children was systematically gathered and analyzed by researchers upon program entry and again at the conclusion of the 9-month treatment period.

Treatment Implementation. The Sprouts program is a semi-intensive, therapeutic early intervention service provided through TAP at ISU for children ages 3-5 that present with a diagnosis of an Autism Spectrum Disorder. Sprouts serves as a supplement to the children's participation in Early Childhood/Early Learning programming through their public school. Sprouts also provides a valuable training experience for undergraduate and graduate clinicians studying a variety of disciplines such as school psychology, speech and language pathology, and nursing, as these students work as assistants in the classroom. Graduate students in the school psychology doctoral program at ISU serve as the lead therapists in the classroom. All staff are extensively trained at the beginning of each semester.

Currently, the Sprouts program serves 8 children ages 3-5 with ASD and provides 12.5 hours of intervention per week. In addition, each child enrolled also attends their

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public school early childhood program, which ensures all children are receiving at least 25+ hours of early intervention each week. Sprouts runs from 8:30-11:00am every weekday morning, and much like a typical preschool program it includes structured daily activities such as centers, welcome circle, music, small group, a social group activity, and free play. In addition, Sprouts is a unique setting in that each child also receives individual therapy from a clinician trained in ABA therapy for 30 minutes three days a week and individualized speech and language intervention for 30 minutes two times per week. In addition, a parent support group is an essential component of the Sprouts program and occurs for 1 hour each week. Parents are subsequently encouraged to work on all techniques discussed outside of parent group and to go to each other for social support. For more details about the Sprouts program, please see the program manual in Appendix A.

Data Collection: During the year, children were administered a set of standardized assessments designed to measure autism-related symptoms, communication abilities, social skills, adaptive functioning, and cognitive capacity at entry and again at exit of the Sprouts treatment period by trained members of the research team. Assessments were presented in various orders to participants at each testing time to avoid order effects, and breaks were taken as necessary when the child appeared fatigued. Parent participants also filled out specific rating scales as outlined below at program entry and again at exit in regards to their stress levels, program satisfaction, as well as their child's observed progress in several areas.

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Measures

Multimodal assessments were utilized in the current study to determine child outcomes. Specifically, child outcomes were assessed using standardized assessment measures, rating scales, and behavior observation checklists. The Autism Diagnostic Observation System (ADOS) and the Childhood Autism Rating Scale, second edition (CARS-2) were used to verify diagnosis upon entry, and also tracked changes in autism symptom severity over the course of the program. Cognitive, communicative, adaptive, and social outcomes were additionally targeted. The Mullen Scales of Early learning (MSEL) was used to track cognitive ability over time, the Vineland Adaptive Behavior Scales (VABS) measured overall adaptive functioning, and the Preschool language scales (PLS-5) measured communication ability. In addition, portions of the observation-based Assessment of Basic Language and Learning Skills, Revised (ABLLS-R) were utilized to further assess each participant's social skills within a group setting, and the Social Responsiveness Scale, second edition (SRS-2) provided parent ratings of their child's social skills. In addition, parents filled out demographic information regarding race/ethnicity and a detailed account of other services their child was receiving outside of the Sprouts program (e.g., occupational therapy, feeding therapy) in order to provide additional information on those contextual variables that might influence treatment outcomes.

The impact of the program on parent stress levels and satisfaction with the Sprouts treatment program was measured using the Parenting Stress Index (PSI) and the Family Professional-Partnership Scale (FPPS), respectively. Details about each assessment measure and rating scale are outlined below.

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Communication Skills. *Preschool Language Scales, 5th edition (PLS-5).* The PLS-5 (Zimmerman, Steiner, & Pond, 2002) provides a comprehensive assessment of children's receptive and expressive communication competence. The PLS-5 is extensively used in clinical and research contexts because it is highly sensitive to change, child behavior during testing, and has excellent psychometric properties. Test-retest reliability exceeds .90 as does internal consistency. In terms of validity, PLS-5 discriminates between children with ASD, hearing impairments, and speech delays. The PLS-5 was used in the current study in order to determine if there are changes in each child's scores that are more or less than would be expected given their projected developmental trajectory. In addition, standard scores were evaluated for significant differences from baseline to follow-up. The standard scores from the expressive communication and auditory comprehension subtests were also compared with the expressive and receptive language subtest standard scores on the Mullen Scales of Early Learning in order to obtain scores in these areas using more than one outcome measure.

Social Skills. *Social Responsiveness Scale, second edition (SRS-2).* The Social Responsiveness Scale, second edition (SRS-2) (Constantino, 2012) is a 65-item rating scale for parents and teachers that identifies social impairments in children ages 2.5-adult that are associated with autism spectrum disorders (ASDs) and quantifies its severity. Internal consistency for the SSRS is .96 and 6-week test–retest reliability is .90.

Raters evaluate symptoms using a quantitative scale representing a range of severity. In addition to a total score reflecting severity of social deficits in the autism spectrum, the SRS-2 generates scores for five treatment subscales: Social Awareness, Social Cognition, Social Communication, Social Motivation, and Restricted Interests and

Repetitive Behavior. In the current study, the SRS-2 was filled out by each participant's parents in and the total score T-score was used to assess for changes in the severity of the child's social impairments over time. Individual subtest T-scores were also compared over time to assess for reductions in T-scores.

Adaptive functioning. *Vineland Adaptive Behavior Scales (VABS).* The VABS (Sparrow et al., 1984) is a structured parent interview that assesses social, communication, motor, and daily living skills in individuals aged 0-90. It provides age-equivalent and standard scores for several subscales; primarily adaptive functioning. The VABS are particularly useful in assessing an individual's daily functioning. The Vineland is widely regarded as the instrument of choice for assessing adaptive functioning in children with autism (Newsom and Hovanitz, 1997). Test-retest reliability coefficients are reported in the low .80s to mid .90s. The internal consistency ranges from good to excellent (mostly high .80s to mid .90s). This measure was used in the current study to assess for changes in each participant's adaptive behavior skills over time. Specifically, the standard scores from each child's Adaptive Behavior Composite were compared from baseline to follow-up.

Cognitive functioning. *Mullen Scales of Early Learning (MSEL).* The MSEL (Mullen, 1995) is a standardized developmental test for children from birth to 68 months of age. There are 5 subscales: fine motor, visual reception, expressive language, and receptive language, and a composite representing general intelligence. The Mullen's yields an Early Learning composite standard score with a mean of 100 (SD of 15) that can be used as an index of overall cognitive ability. The Mullen has good internal reliability (.91) and test-retest reliability (.95). Compared to other available measures of

cognitive and developmental functioning, the Mullen was specifically chosen for the current study because of its brief administration time and frequent use in previous research on CTMs for children with ASD. The MSEL was used in the current study to assess changes in cognitive ability scores over time, using the Early Learning composite standard score. In addition, individual subtest scores were evaluated to detect changes in each child's scores that are more or less than would be expected given their projected developmental trajectory.

Autism symptoms. *Autism Diagnostic Observation Schedule (ADOS).* The Autism Diagnostic Observation Schedule (Lord et al., 1999) is a semi-structured, standardized observation-based assessment of communication, social interaction, play, and restricted and repetitive behaviors. It presents various activities that elicit behaviors directly related to a diagnosis of ASD. By observing and coding these behaviors, information is obtained that informs diagnosis, treatment planning, and educational placement. The ADOS includes four modules, each requiring just 40 to 60 minutes to administer. The individual being evaluated is given only one module, selected on the basis of his or her expressive language level and chronological age. A standardized severity score based on codes within each domain can be calculated to compare autism symptoms across modules. For each module, algorithm scores are compared with cutoff scores to yield one of three classifications: *Autism, Autism Spectrum,* and *Non-spectrum*. The difference between the *Autism* and *Autism Spectrum* classifications is one of severity, with the former indicating more pronounced symptoms.

Although the ADOS was not initially designed as an outcome measure, it has been recommended for measuring changes in effectiveness of treatment in children with

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ASD (Aldred et al. 2004; Owley et al. 2001). For the current investigation, the use of the ADOS was twofold. First, the overall classification scores were used to verify an ASD diagnosis at baseline. In addition, changes in classification scores over time were assessed for each child, both for overall classification and for the specific scores in the sub-areas of Communication, Social Interactions, and Stereotyped Behaviors and Restricted Interests.

 Childhood Autism Rating Scale, 2nd edition (CARS-2). The CARS-2 (Schopler et al., 2010) is a behavior rating scale, filled out by parents or teachers, designed to aid in the diagnosis of ASD. The CARS-2 is composed of 15 4-point scales on which a child's behavior is rated on a continuum from within normal limits (1) to severely abnormal (4) for his or her chronological age. Total raw scores are then converted to T-scores and used to categorize a child on a continuum ranging from non-autistic, to mild to moderate autism, to severe autism. The CARS-2 is purported to be an initial aid in the classification process, but is not considered a valid diagnostic assessment tool, as the results will be subject to parental biases and prior beliefs and knowledge about their child's functioning level. The authors report a variety of reliability and validity studies, all with acceptable findings. Internal consistency (coefficient alpha) is .94. Validity of CARS-2 ratings across different disciplines was tested by having 18 raters from five disciplines use the CARS after reviewing the manual. In comparing the ratings with those of 'expert clinical directors,' a coefficient alpha of .81 was found, indicating that valid CARS-2 ratings can be made by professionals from different disciplines with little training in autism. This measure was filled out by the participant's parents in the current study in order to provide an estimate of the children's level of severity of autism. CARS scores were evaluated

over time for significant changes in each participant's Total Symptom Level T-score. In addition, the current study also examined changes over time in overall classification level (i.e., non-autistic, to mild to moderate autism, to severe autism).

Parent stress. *Parenting Stress Index (PSI).* The Parenting Stress Index (PSI) (Abidin, 1990) is designed for the early identification of parenting and family characteristics that fail to promote normal development and functioning in children, children with behavioral and emotional problems, and parents who are at risk for dysfunctional parenting. It can be used with parents of children as young as one month old. The PSI identifies dysfunctional parenting and predicts the potential for parental behavior problems and child adjustment difficulties within the family system. The PSI manual reports satisfactory internal consistency reliability data; yielding scores of .90 for the child domain, .93 for the parent domain, and a strong .95 for the total scale. Test-retest reliabilities on total stress score range from .65 for a 1-year interval to .96 for an interval of 1-3 months. These data are consistent with expected patterns reflecting the situational nature of parental stress. The PSI consists of 120 items and takes less than 30 minutes for the parent to complete. It yields a Total Stress standard score, plus scale scores for both Child and Parent Characteristic subscales, which pinpoint sources of stress within the family. The PSI was utilized in the current study to evaluate parent's stress levels at baseline and follow-up, and evaluated if stress levels significantly decreased during the time their child was enrolled in the Sprouts program.

Social validity. *Family Professional-Partnerships Scale (FPPS).* The FPPS (Summers et al., 2005) is an 18-item scale developed to assess the extent to which families of children with disabilities age birth through 21 are satisfied with the

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relationships they have with professionals serving families and their children with disabilities. It is designed to assess the quality of the interaction between children with disabilities, their families, and the service providers who serve them. Psychometric analyses revealed that the Partnership Scale and Subscales have sufficient internal consistency. Cronbach's alpha for Child-Focused Relationships was .94 and for Family-Focused Relationships was .92. Participants respond to each of 18 items on a five- point Likert scale: (1) never; (2) occasionally; (3) sometimes; (4) often; and (5) very often. Higher scores indicate more satisfaction. The FPPS was utilized in the current study as a measure of the social validity of the Sprouts program via parent's ratings of satisfaction with the program.

Behavioral observations. *Assessment of Basic Language and Learning Skills, Revised (ABLLS-R).* The Assessment of Basic Language and Learning Skills- Revised (ABLLS-R) (Partington, 2006), is an assessment tool, curriculum guide, and skills-tracking system used to help guide the instruction of language and critical learning skills for children with ASD or other developmental disabilities. It provides a comprehensive review of 544 skills from 25 skill areas including language, social interaction, self-help, academic and motor skills that most typically developing children acquire prior to entering kindergarten. The ABLLS-R assesses the strengths and weaknesses of an individual child in each of 25 skill sets. Each skill set is broken down into multiple skills, ordered by typical development or complexity. The ABLLS-R is conducted via direct observation of the child's behavior in each skill area. The instructor will provide a stimulus to the child (verbal, hand-over-hand, non-verbal, etc.), and, depending on what the child does (the behavior), determines their skill-level. For the purpose of the current

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study, only the skill area assessing social interactions was implemented and utilized. Since the ABLLS-R is designed to measure a child's change in functioning over time compared to themselves, it does not provide normative data. Rather, it does provide criterion-referenced scores in each domain with higher scores indicating higher levels of ability. In this study, specific items from the ABBLS social interaction assessment were utilized and data was gathered at baseline and again at follow-up. Improvements over time on this measure of social interactions were examined for each child.

Treatment integrity/fidelity. Treatment integrity/fidelity checks were used to ensure the essential components of the Sprouts treatment program were implemented as stated. Treatment integrity procedures were developed based on Perpletchikova and colleague's recommendations for implementation of treatment integrity procedures (2007), and the rating checklist utilized was developed by the primary researcher and loosely based on the one developed for use in the LEAP program (Strain & Bovey, 2011).

Research assistants were extensively trained prior to conducting observations: first, coding videos of daily activities, followed by in-classroom observations using the checklist while receiving immediate feedback from the primary researcher. Once trained to 90% reliability, clinicians conducted 30-minute observations during the Sprouts treatment day 3-4 times a week for 9 months on a variable interval schedule in order to evaluate adherence to the stated Sprouts quality program indicators, as specified in the program manual. A detailed checklist was used to determine treatment fidelity across several different curricular areas, and observers rated each item 1-5 based on observed implementation. A rating of 1 indicates that implementation of an item was not

completed, a rating of 3 indicates partial implementation was observed, and a rating of 5 indicates full implementation was observed. An example of the treatment fidelity checklist can be found in Appendix B. Consistently low ratings in any area alerted the primary researcher to need for additional training in that area for all primary Sprouts clinicians. In addition, inter-observer reliability percentages were also calculated in order to ensure observer reliability during treatment integrity observations throughout the intervention period.

CHAPTER IV

ANALYSES

The current study examined the outcomes for young children enrolled in one

behaviorally based, comprehensive early childhood treatment program (Sprouts)

provided through The Autism Program Illinois State University Affiliate Site.

Specifically, this study assessed the cognitive, communicative, adaptive, social, and

autism-related changes in functioning for enrolled children with ASD over a 9-month

period of treatment (Sept 2012-June 2013). The study utilized a longitudinal, within

subjects design with repeated measures to conduct a comprehensive program evaluation.

Consents were received for eight children out of nine possible participants; six

males and two females. Average age at program entry for these eight participants

(baseline) was 49 months; average age at program exit (follow-up) was 57 months. All

children had previously been diagnosed with a medical or educational diagnosis of

autism, and diagnoses were further confirmed in this study, as six children met the

criteria for autism and two for autism spectrum disorder as measured by the ADOS, and

all children evidenced symptoms of autism as measured by the CARS (three with mild to

moderate symptoms, two with severe symptoms, and one with minimal symptoms). All

participants attended Sprouts regularly, adhering to the program requirements of having

less than 5 unexcused absences (unexcused does not include illness) throughout

enrollment in the program. Additionally, all children were enrolled in half-day early

childhood education programs offered through the public schools, and a few of the

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children received additional therapy services. Table 2 displays summary demographic information of the eight participants. Table 3 presents detailed individual demographic information. As noted below, parent data was only received from caregivers for six of the eight participants.

Table 2.

Sprouts participant demographic information summary

Characteristic	
Mean age at entry, range (n= 8)	49 mos (37-63)
Diagnosis at entry	# of participants
ADOS	
Autism	6
Autism Spectrum	2
CARS (n= 6)*	
Minimal Symptoms	1
Mild to Moderate Symptoms	3
Severe Symptoms	2
Race/ethnicity	
Caucasian	4
Asian	2
Ethiopian	1
Bi-racial	1
Additional Therapy hours received	
Early Childhood Education/Pre-school services (2.5 hrs/day)	8
Floortime Play Therapy (3 hrs/monthly)	2
Speech Therapy (1 hr weekly)	4
Occupational Therapy (1 hr weekly)	2
Music Therapy (1/2 hour weekly)	1

*Note: CARS parent data was only received for 6 of the 8 participants

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Table 3.

Sprouts demographic information- detailed

	Age at entry (mos)	Gender	Race	ADOS total score/ classification (at entry)	CARS total score/ classification (at entry)	Additional therapy hours
Child 1	52 mos	M	Biracial	11 – Autism Spectrum	45 – Mild/ Moderate	ECE OT Floortime
Child 2	42	M	Ethiopian	25 – Autism	63 – Severe	ECE
Child 3	58	F	Caucasian	20 – Autism	46 – Mild/ Moderate	ECE Speech Music therapy
Child 4	37	F	Caucasian	21- Autism	N/A*	ECE Speech
Child 5	49	M	Asian	9- Autism Spectrum	34 – Minimal	ECE OT Floortime
Child 6	63	M	Asian	19 – Autism	N/A*	ECE
Child 7	48	M	Caucasian	21 – Autism	52 – Severe	ECE Speech
Child 8	46	M	Caucasian	15 – Autism	41 – Mild/ Moderate	ECE Speech

* Note: CARS parent data was only received for 6 of 8 participants

The current investigation specifically set out to answer six questions regarding the impact of the Sprouts program on participants over time, as well as overall program effectiveness (as listed previously, under *The Current Study).* Results will be presented in response to each of these six questions. Table 4 below presents an overview of group outcomes that will be referenced throughout this section.

Table 4.

Sprouts participant outcomes after 9 months of intervention

| | Baseline | | Follow-up | | |
	M	SD	M	SD	Δ
CARS*[c]	46.83	9.9	36.33	15.4	10.5**
ADOS [d]	17.63	5.5	13.63	4.9	4***
PLS-5 (Total Language)[a]	27.71	10.1	30.86	10.5	3.15
Expressive language [a]	26.71	9.1	28.71	9.2	2
Receptive language [a]	28.14	11.9	32.57	12.4	4.43**
Mullens					
ELC[b]	58.75	19.7	62.75	17.5	4
Visual Reception[a]	30.0	17.45	37.5	18.13	7.5
Fine motor[a]	29.63	11.22	42.75	15.64	13.12***
Receptive Language[a]	24.13	12.92	35.5	14.78	11.37***
Expressive Language[a]	26.00	11.28	32.5	11.02	6.5***
SRS-2*[c]	72.5	8.7	61.00	9.3	11.5***
VABS*[b]	70.33	8.3	82.83	15.6	12.5**

Abbreviations: CARS = Childhood Autism Rating Scale; PLS = Preschool Language Scale; SRS-2 = Social Responsiveness Scale; VABS = Vineland Adaptive Behavior Scales

Δ= Mean differences between baseline and follow-up data

[a]Age (months) equivalent

[b]Standard score

[c]T-score

[d]Raw score

*Data only collected/received for six of the eight participants

**$p \leq .05$, ***$p \leq .01$ comparing Δfrom baseline to follow-up

The first research question posed asked: *"Do children enrolled in the Sprouts*

early childhood program make observable and measurable gains in the program's

targeted areas of communication, social skills, and adaptive functioning that exceed what

would be expected given their current developmental trajectory?"

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Communication. Improvements in participant's communication skills from baseline to follow-up were measured using the Preschool Language Scales, 5th edition (PLS-5), and the language-related subtests on the Mullen Scales of Early Learning (MSEL). Results for these standardized and norm-referenced assessments are summarized in Table 4. Two-tailed, paired-sample *t* tests were used to determine significant changes in performance on these measures. Results indicated that the children exhibited a significant increase in both expressive language skills, $t(7) = -3.59$, $p < .01$, and receptive language skills, $t(7) = -4.53$, $p < .01$, from baseline to follow-up as measured by the Mullen Scale of Early Learning (MSEL). Similarly, there was a significant increase in participants' performance on the PLS-5 receptive language subtest from baseline to follow-up, $t(6) = -2.43$, $p = .05$. There were no significant differences on total language scores, $t(6) = -1.549$, $p = .172$, or expressive language scores, $t(6) = -.851$, $p = .427$, from baseline to follow-up on the PLS-5.

Developmental trajectory comparisons were also conducted to compare expected developmental rates with and without intervention. The expected trajectory for each participant is estimated based on developmental level at intake, with the assumption that without intervention, the same rate of development would continue. Specifically, developmental trajectories at baseline were calculated by dividing each participant's age equivalent score at intake by the child's chronological age in months. This rate of development at baseline was then multiplied by the participant's age at follow-up to yield the expected score at follow-up should the current trajectory continue without intervention. If the actual rate of change is greater than the expected rate of development, the intervention is said to have a positive effect on the child's development.

Overall trajectory changes observed for the Expressive and Receptive Language subtests on the MSEL are illustrated in Figures 1 and 2 below. Additionally, individual participant trajectories across Expressive and Receptive Language subtest of the MSEL are displayed in Figures 3 and 4, respectively.

Overall, on the Expressive Language subtest of the MSEL, participants increased from an average age equivalence of 26 months at baseline, to an average of 33 months at follow-up. Without intervention, it was expected that participants' expressive language level would improve to an age equivalence of 30 months. This indicates that participants' exceeded what was expected without intervention by 3 months, which represents a 4% overall increase in developmental rate attributable to the intervention. To calculate the overall increase in developmental rate attributable to the intervention, participants' developmental rate at baseline was subtracted from their new developmental rate at follow-up.

At the individual level, 7 of the 8 participants on the MSEL Expressive language subtests improved their scores from baseline to follow-up. In addition, 4 of the 8 participants on this subtest actually exceeded their expected score given their current developmental trajectory. Individual gains above what was expected without intervention ranged from 2-10 months.

As a group, on the Receptive language subtest of the MSEL participants increased from an average age equivalence of 24 months at baseline, to an average of 36 months at follow-up. Without intervention, it was expected that participants' receptive language level would improve to an age equivalence of 28 months. This indicates that participants' exceeded what was expected without intervention by 8 months, representing a 14%

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overall increase in developmental rate attributable to the intervention. At the individual level, all 8 participants on the MSEL Receptive language subtests improved their scores from baseline to follow-up. 7 of the 8 participants on this subtest actually exceeded what was expected given their current developmental trajectory, with scores ranging widely from 1-22 months above expected gains.
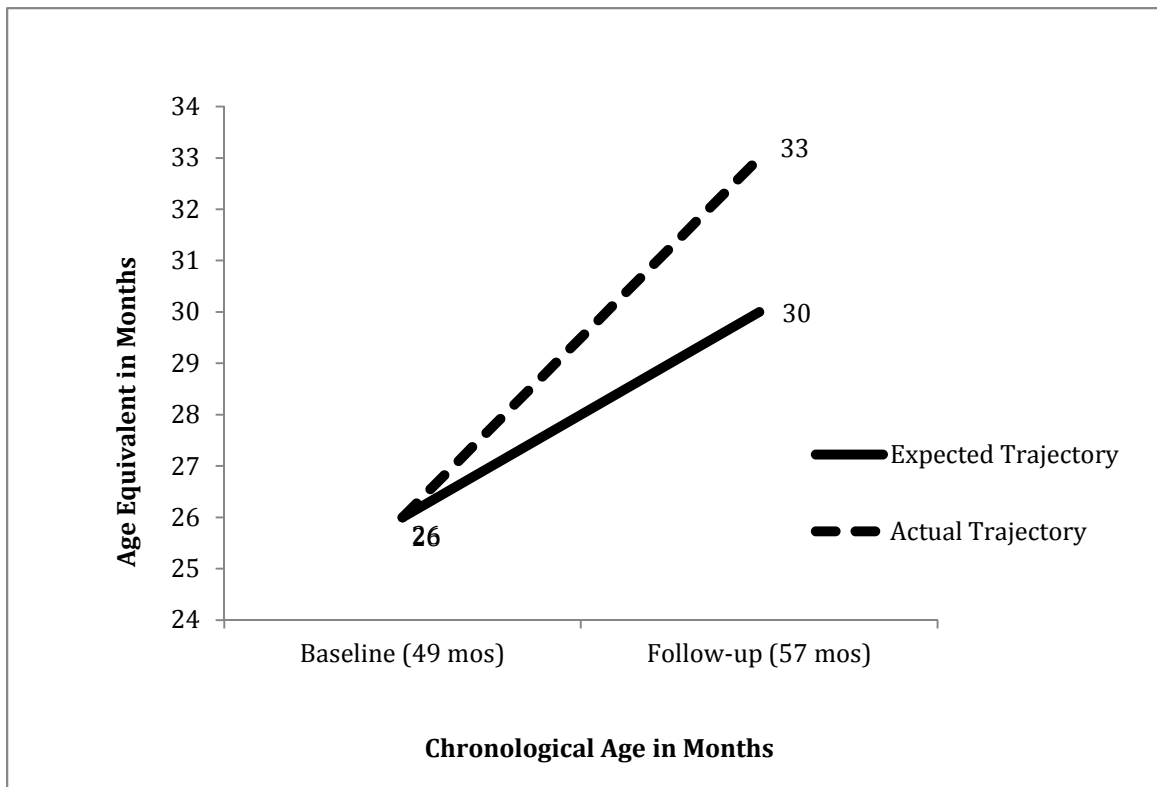

Figure 1. MSEL Expressive Language Trajectory (group)

Figure 2. MSEL Receptive Language Trajectory (group)

Figure 3. Individual participant trajectories- MSEL Expressive Language

Figure 4. Individual participant trajectories- MSEL Receptive Language

Overall group trajectories for Expressive, Receptive, and Total Language scores for all eight participants on the PLS-5 are illustrated in Figures 5, 6, and 7 below. Additionally, individual participant trajectories across each subtest for the PLS-5 are displayed in Figures 8, 9, and 10, respectively. The Expressive language subtest on the PLS-5 yielded an overall average age equivalence of 26 months at baseline and 29 months at follow-up. Without intervention, it was expected that participants' expressive language level would improve to an age equivalence of 30 months. This indicates that overall averages on this subtest did not exceed what would be expected given no intervention, and represents a 2% decrease in developmental rate over time. On an

individual level, however, 5 of the 7 participants for whom data was collected on this subtest made gains from baseline to follow-up. Further, 3 of the 7 participants actually increased their developmental rate from baseline to follow-up, with gains ranging from 2-4 months above what was expected without intervention.

On the Receptive language subtest of the PLS-5, participants increased from an average age equivalence of 28 months at baseline to 33 months at follow-up. Without intervention, it was expected that participants' receptive language level would improve to an age equivalence of 31 months. This indicates that participants' exceeded what was expected without intervention by 2 months, representing a 1% overall increase in developmental rate attributable to the intervention. Individually, 6 of the 7 participants for whom data was collected on the PLS-5 Receptive Language subtest made gains from baseline to follow-up. 4 of these 7 participants actually exceeded expected scores given their current developmental trajectory, with individual gains ranging from 2-7 months above what was expected without intervention.

Finally, the Total Language score on the PLS-5 yielded an average age equivalence of 28 months at baseline, and 31 months at follow-up. Without intervention, it was expected that participants' total language level would increase to an age equivalence of 30 months. This indicates that participants' exceeded what was expected without intervention by 1 month, representing a 1% overall increase in developmental rate attributable to the intervention. Individually, 6 of the 7 participants made gains from baseline to follow-up, and 3 of these 7 participants actually increased their developmental rate from baseline to follow-up on Total Language, with individual gains ranging from 2-6 months above what was expected without intervention.
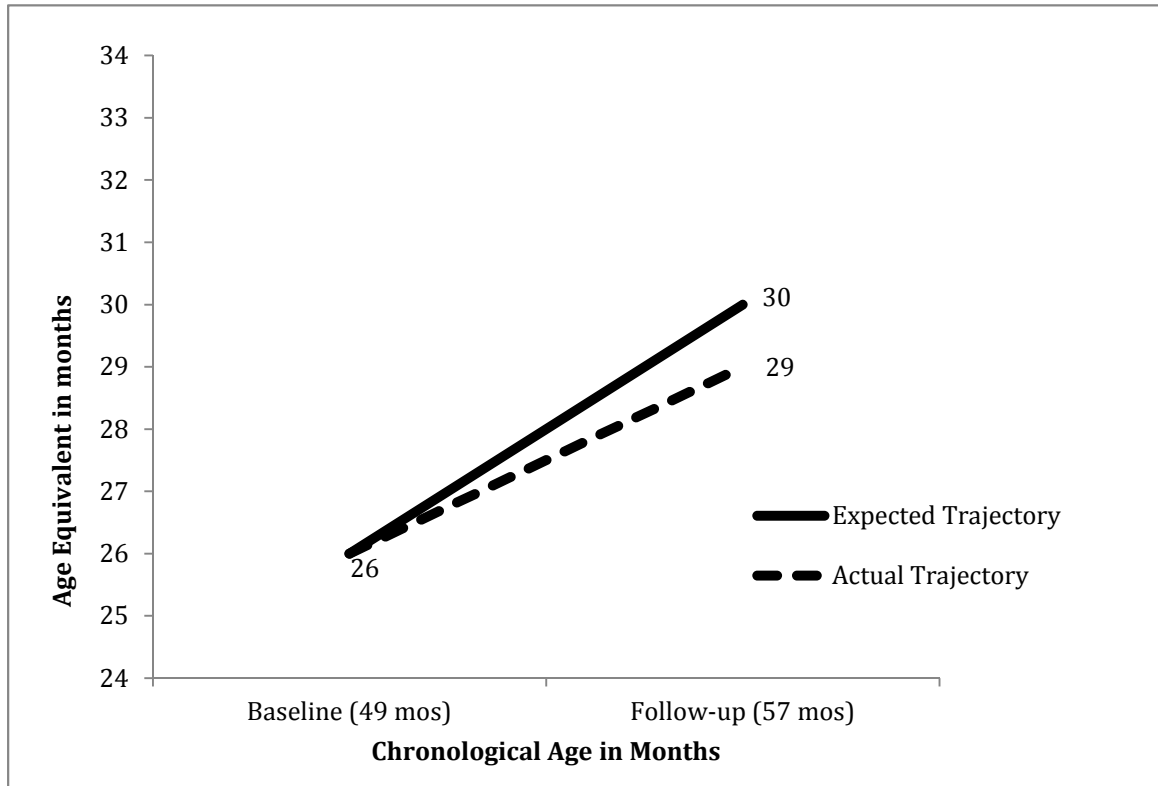
Figure 5. PLS-5 Expressive Language Trajectory (group)
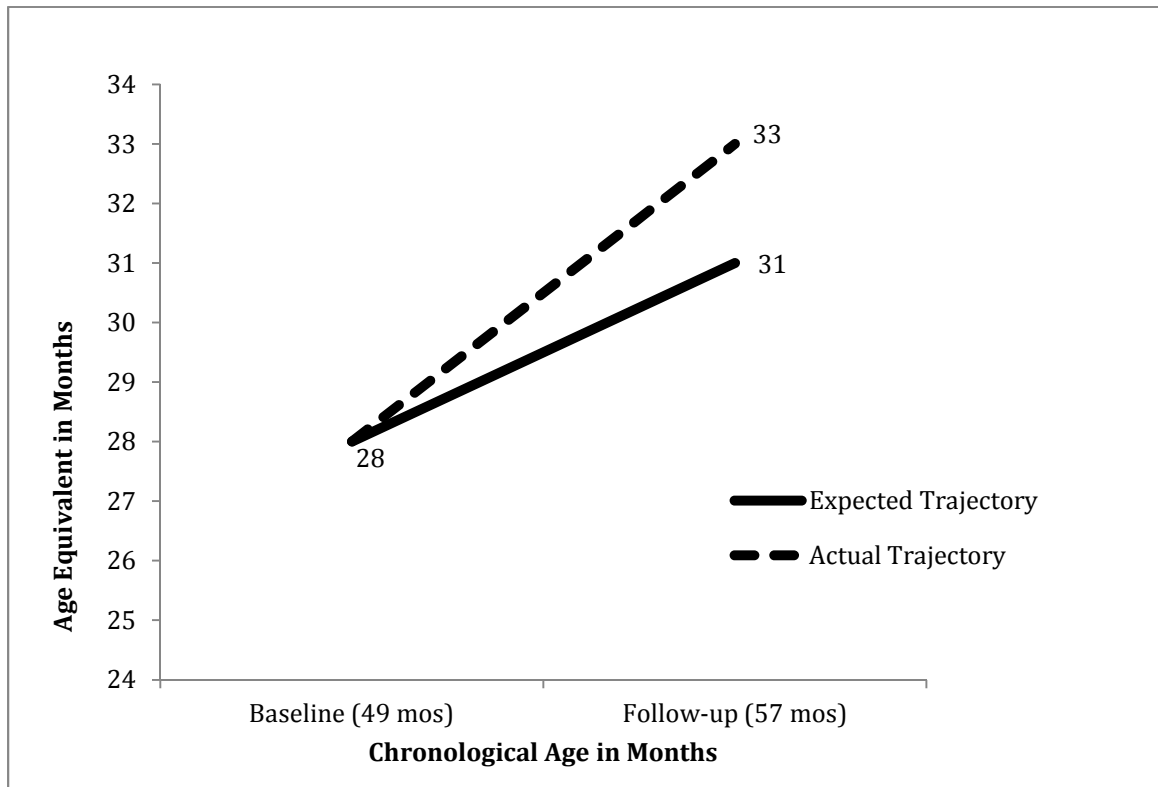
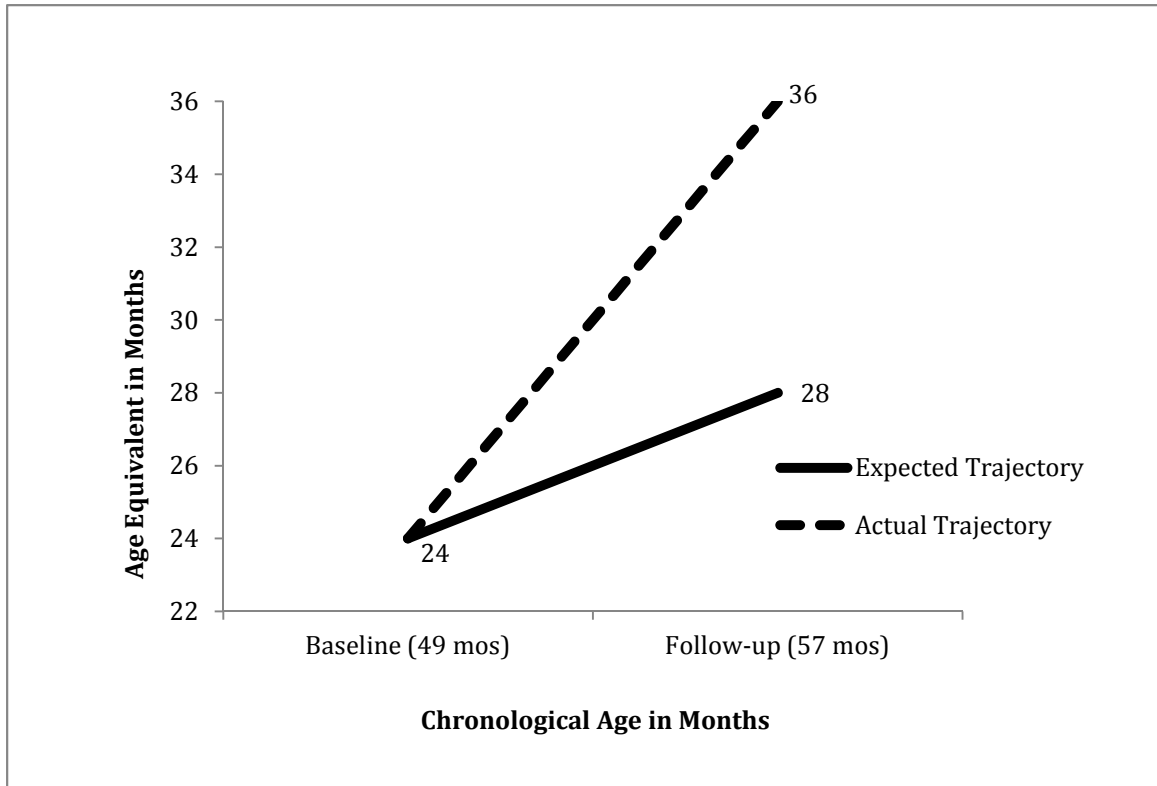*Figure 6.* PLS-5 Receptive Language Trajectory (group)
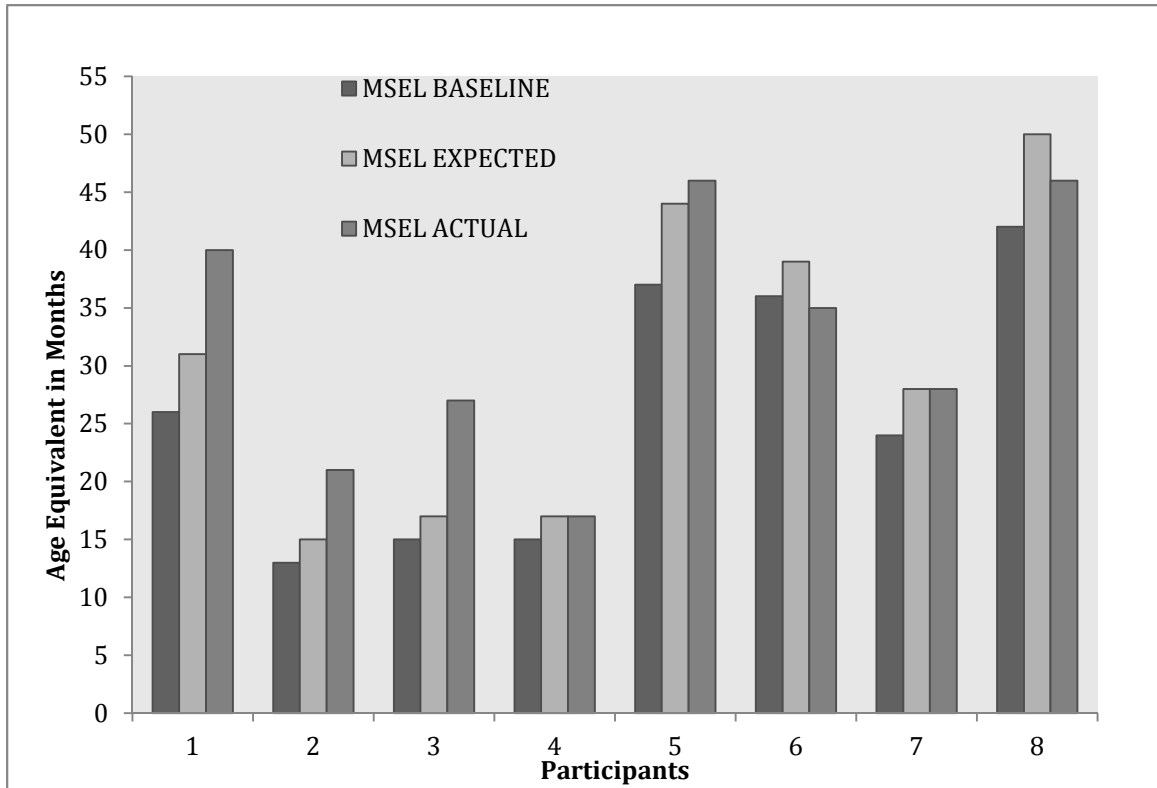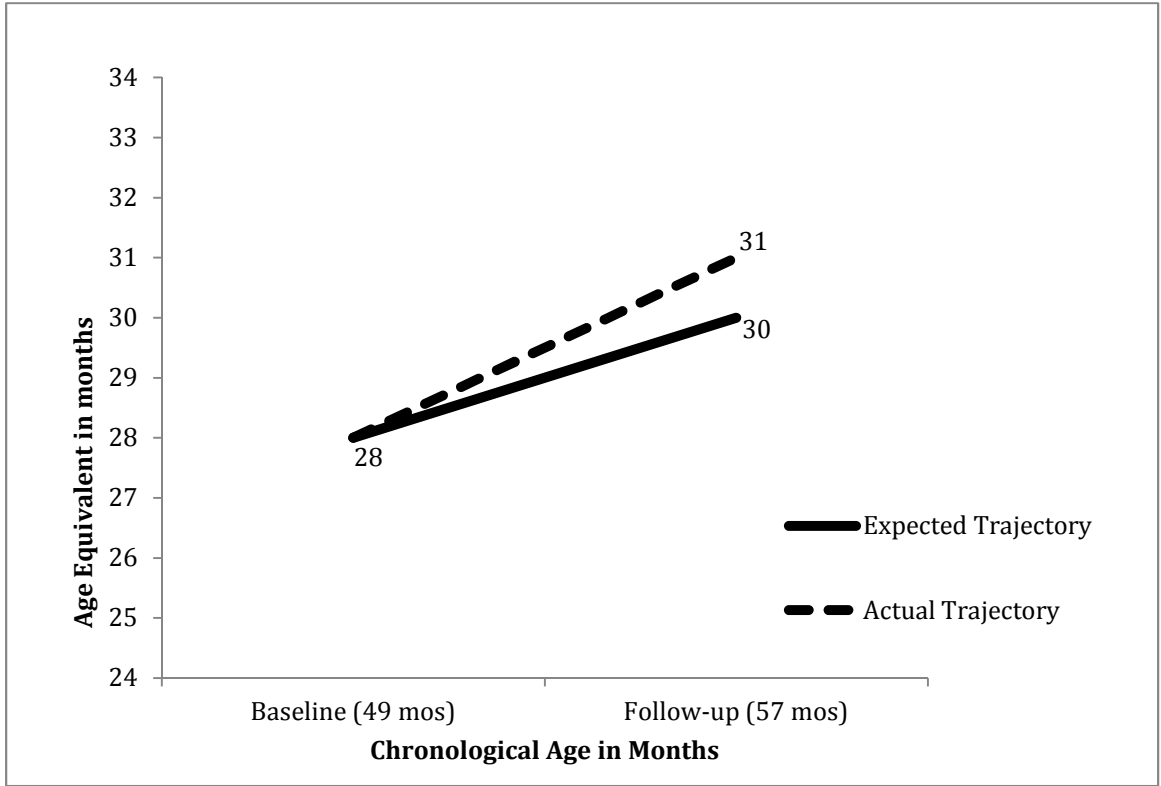
Figure 7. PLS-5 Total Language Trajectory (group)

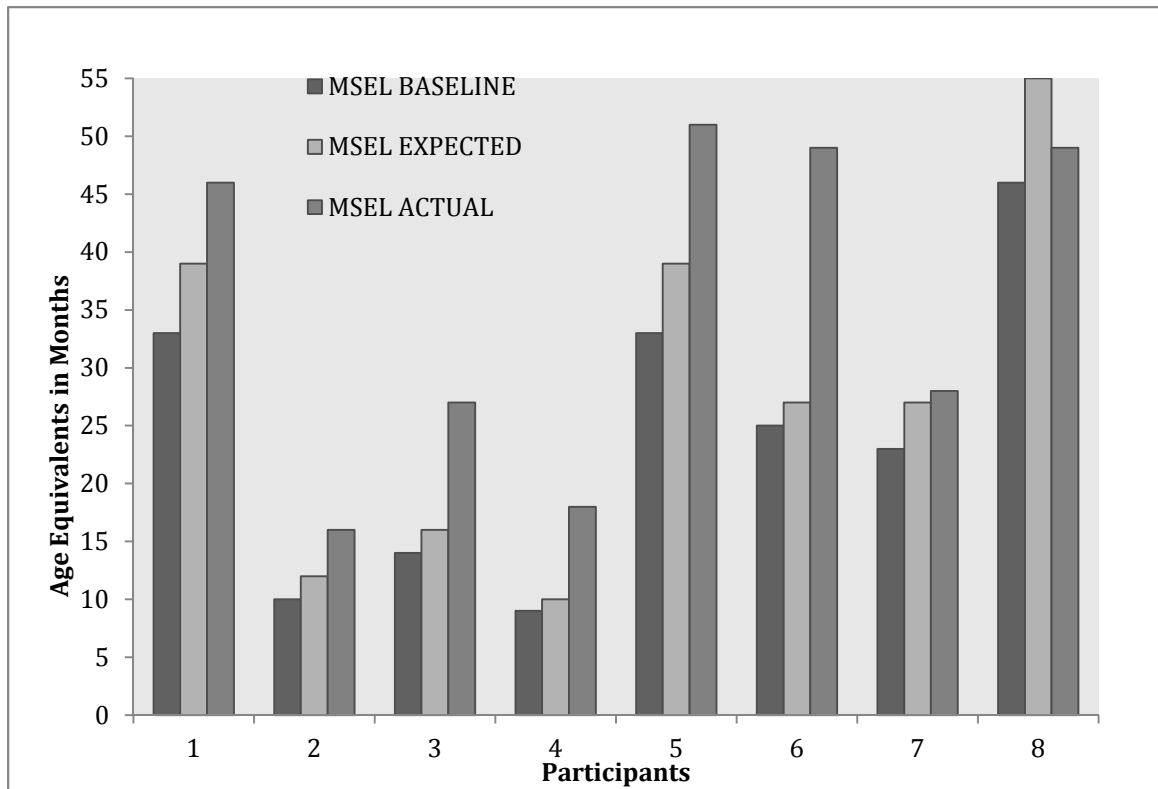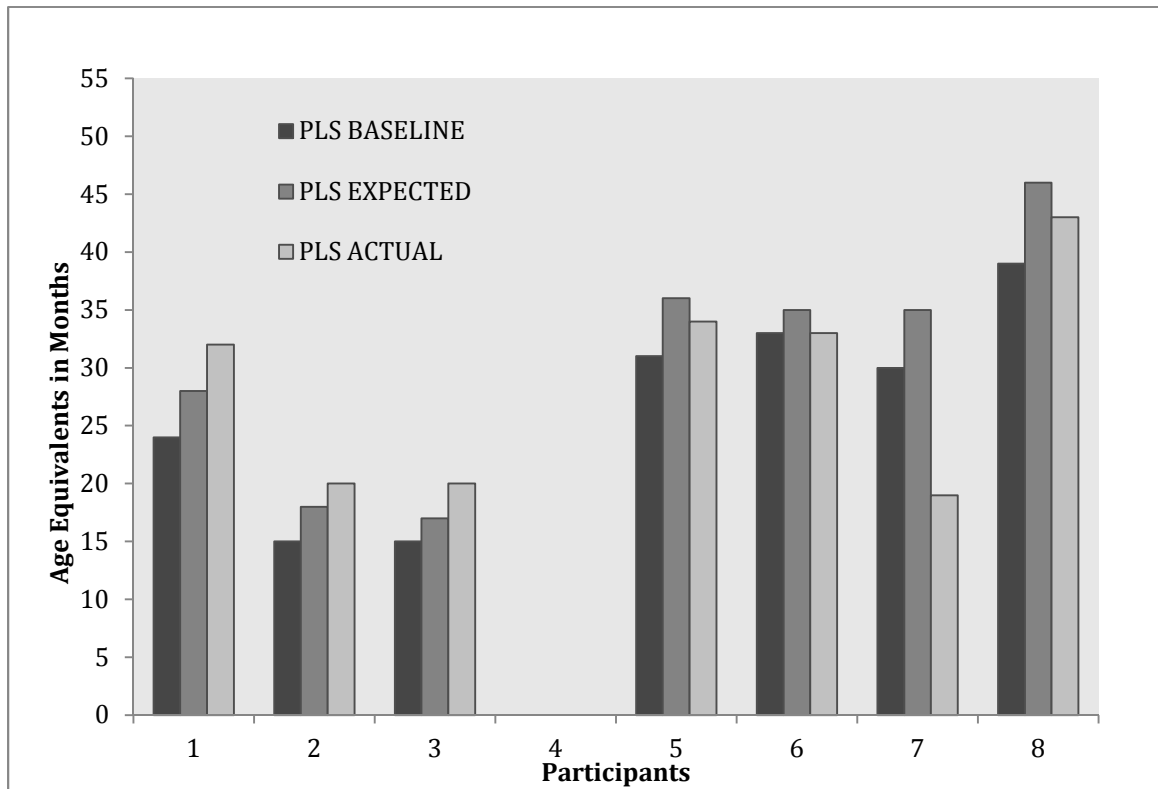*Figure 8.* Individual participant trajectories- PLS-5 Expressive Language
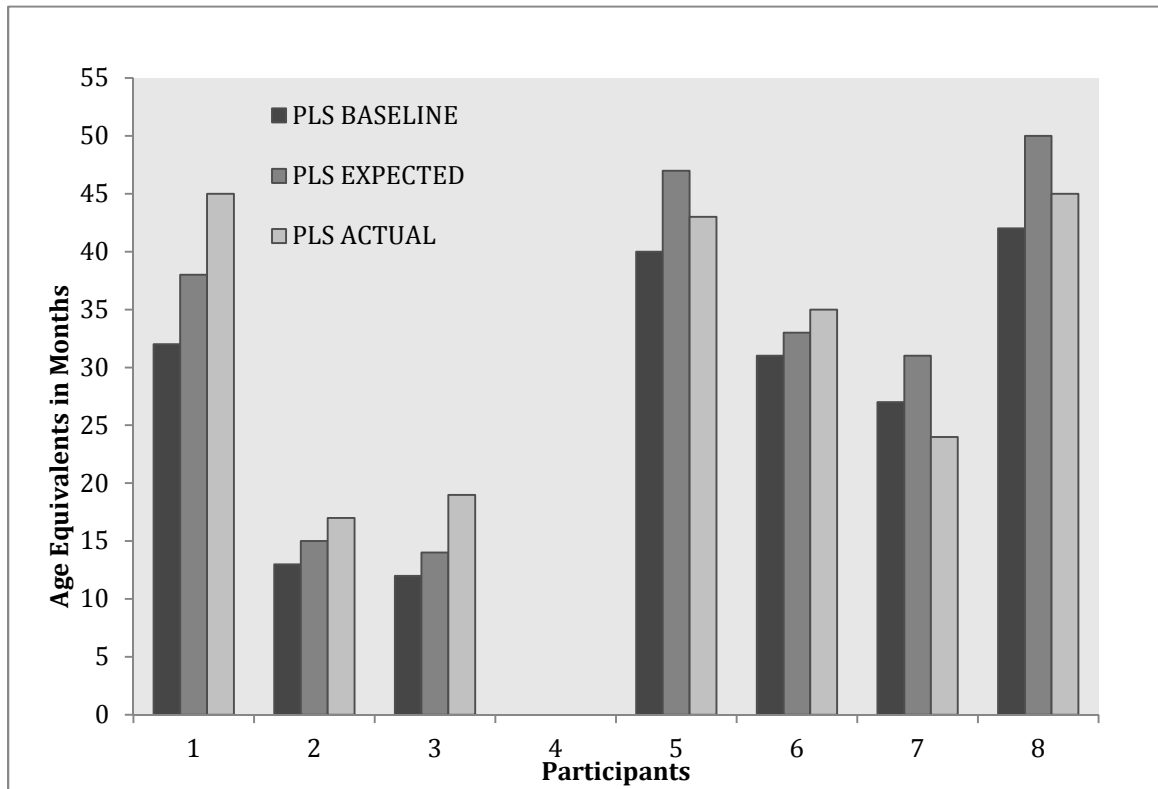
Figure 9. Individual participant trajectories- PLS-5 Receptive Language
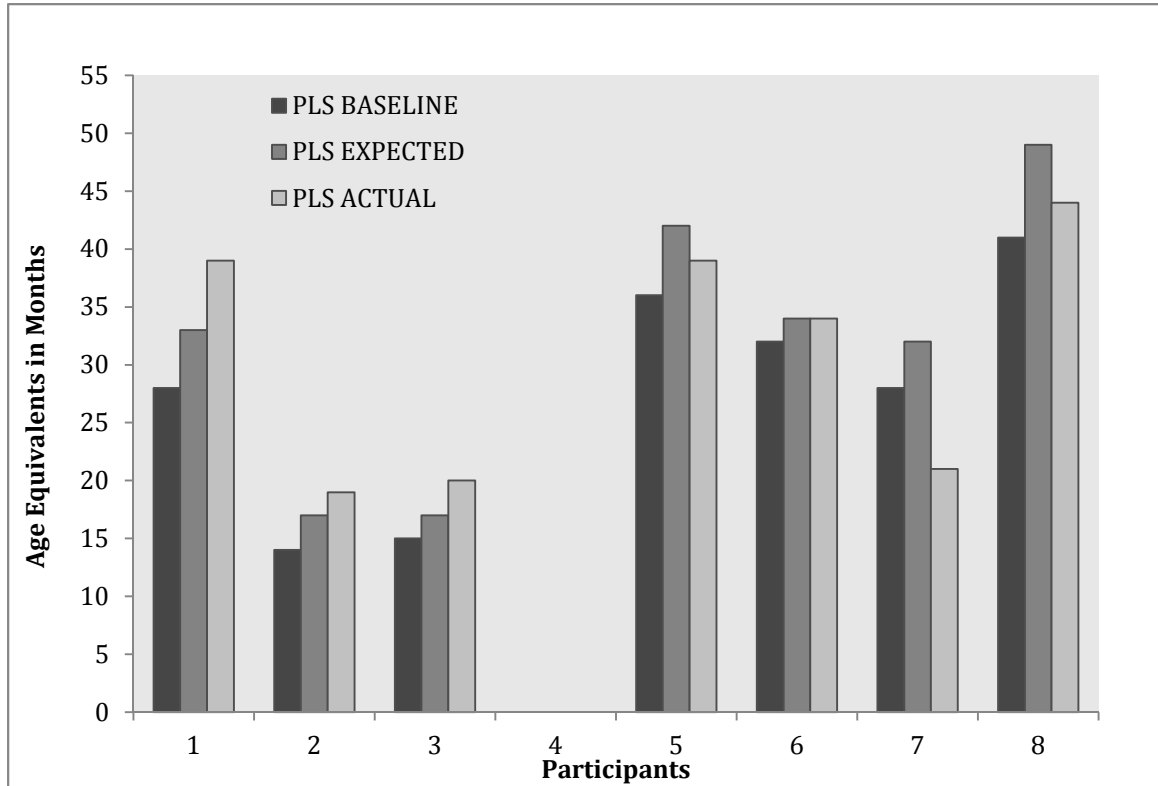
Figure 10. Individual participant trajectories- PLS-5 Total Language

Social skills. Changes in the participant's social skills over time were measured in two ways; via the Social Responsiveness Scale, second edition (SRS-2), and through direct behavioral observations via the Assessment of Basic Language and Learning Skills- Revised (ABBLS-R). The SRS-2 includes parent ratings of their child's social skills at baseline and again at follow-up. Results for this norm-referenced assessment are summarized in Table 4. Two-tailed, paired-sample *t* tests were used to determine significant changes in performance on this measure. SRS-2 results indicated that the participants exhibited a significant increase in social interaction skills from baseline to follow-up; $t(5) = 4.415$, $p < .01$.

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The ABBLS-R utilizes a skills-tracking system that involves scoring children in various skill areas using a task analysis of necessary components needed to complete each skill area successfully. The current investigation utilized specific components from the Social Interactions portion of the ABBLS-R to observe six of the eight participants during unstructured play during the Sprouts day at baseline and follow-up. Observations of each skill were scored on a 0-2 scale, with specific criteria outlined for each score (i.e., 0 = no demonstration of the skill, 1 = some demonstration of the skill, 2 = mastery of the skill). Figure 11 below illustrates the overall group changes in scores over time across each item on the ABBLS social interaction scale. On average, participants displayed an observable increase in their social skills across all ABBLS-R items in the current study. Additionally, Figure 12 depicts the average scores for each participant across all items on the ABBLS-R Social Interactions Scale from baseline to follow-up. All participants displayed an increase in their scores on the ABBLS-R Social Interactions scale from baseline to follow-up. An average increase in scores of .77 across all participants from baseline to follow-up was observed.

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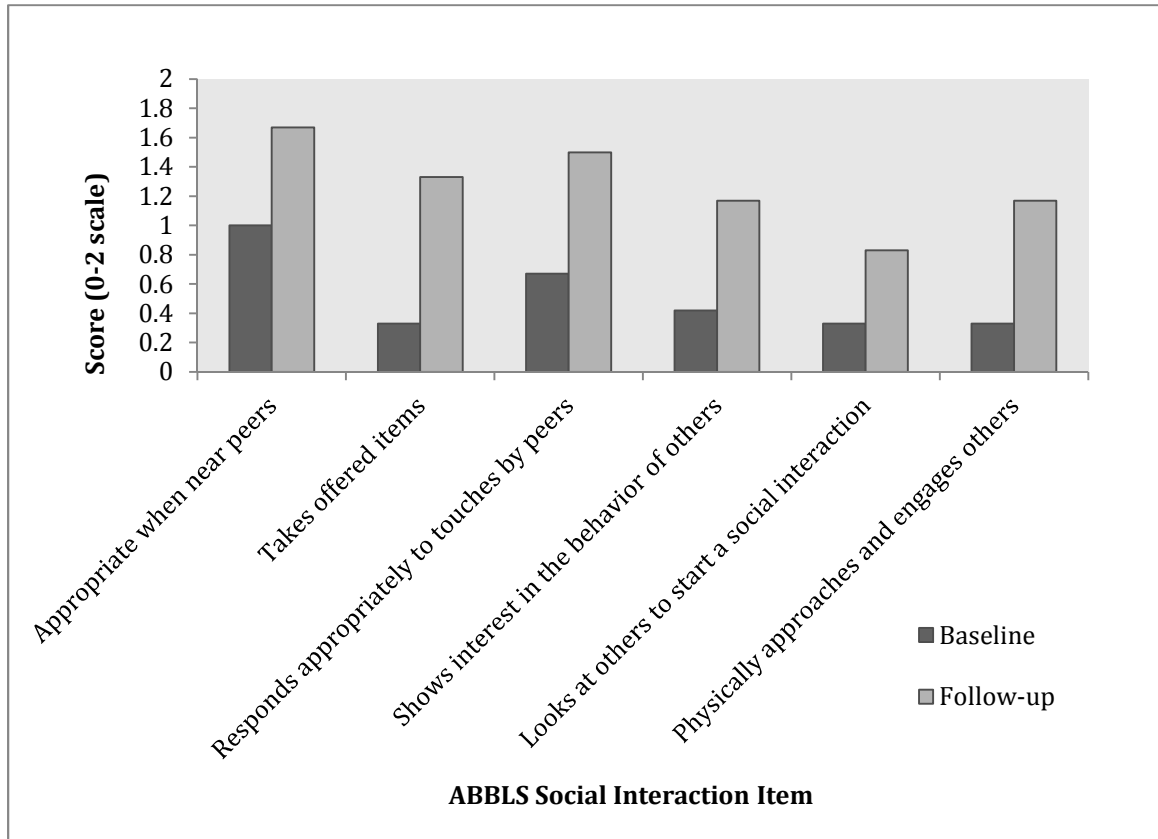
Figure 11. ABBLS Social Interactions- overall group scores across items
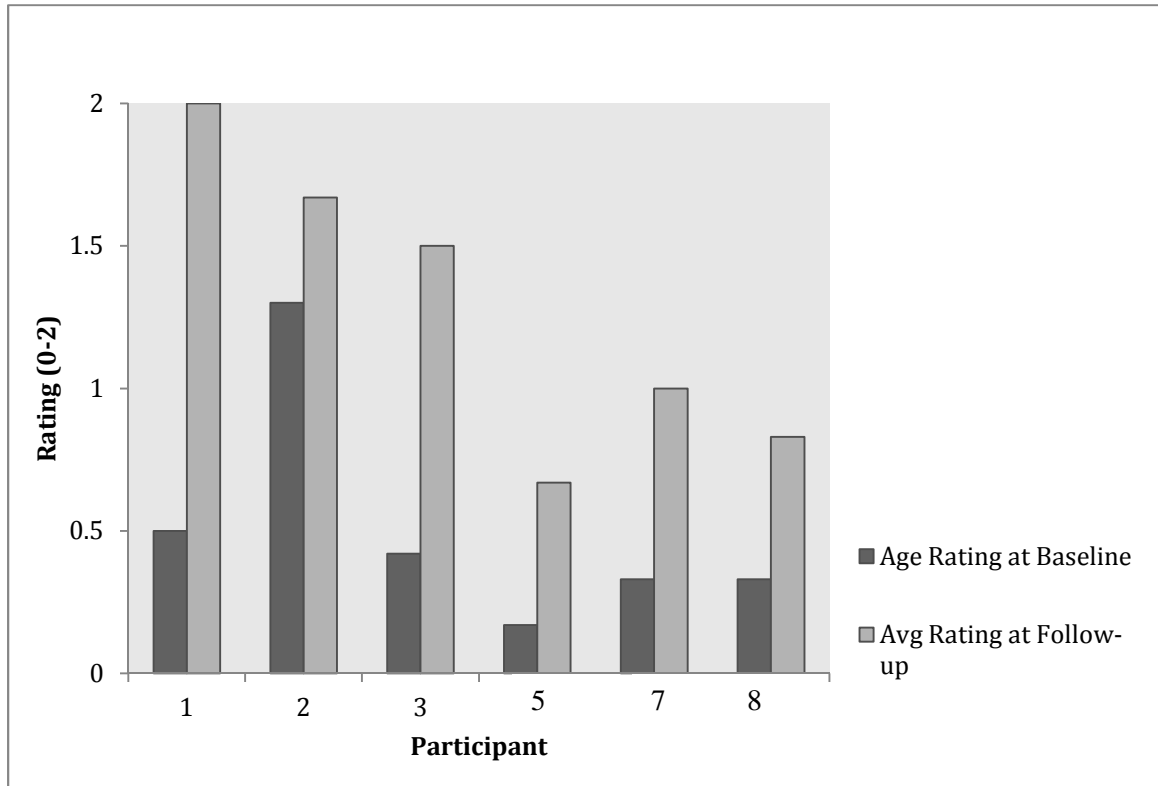
Figure 12. Individual participant scores- ABBLS Social Interaction Scale

Adaptive Functioning. Adaptive functioning skills were assessed using the Vineland Adaptive Behavior Scales (VABS). Changes in each participant's adaptive behavior skills over time were measured at baseline and again at follow-up via parent ratings. VABS rating scales were only returned from caregivers of six of the eight participants. Overall group results for the VABS are summarized in Table 4. A two-tailed, paired-sample *t* test was used to determine significant changes in performance on this measure. Results indicated that according to parent ratings, participants exhibited a significant increase in adaptive functioning skills from baseline to follow-up as measured by the VABS, *t* (5) = -3.16, *p* = .02. Additionally, individual participant scores on the VABS rating scale from baseline to follow-up are displayed in Table 5 below. All six

participants for whom data was collected on the VABS displayed improvements in their

adaptive behavior skills as indicated by their standard scores from baseline to follow-up.

Two of the six participants actually changed adaptive level classifications from "low" to

"moderately low" from baseline to follow-up (child 2 and 7), and two additional

participants changed adaptive level classifications from "moderately low" at baseline to

"adequate" at follow-up (child 1 and 8).

Table 5.

Vineland Adaptive Behavior Composites for individual participants

Participant (n=6)	VABS Baseline (standard score)	Baseline Adaptive level	VABS Follow-up (standard score)	Follow-up Adaptive level
1	75	Moderately low	99	Adequate
2	57	Low	70	Moderately Low
3	67	Low	68	Low
5	74	Moderately Low	81	Moderately Low
7	68	Low	74	Moderately Low
8	81	Moderately Low	105	Adequate

To answer the second research question, *"Do children enrolled in the Sprouts*

early childhood program make significant gains on measures of cognitive ability? data

from the Mullens Scale of Early Learning were utilized. Specifically, improvements in

participant's overall cognitive ability from baseline to follow-up were measured using the

Mullen Scales of Early Learning (MSEL). The MSEL yields an Early Learning

Composite (ELC) standard score, which is an estimate of overall cognitive ability. In

addition, age equivalent scores are provided for each of four subtests: Visual Reception,

Fine Motor, Receptive Language, and Expressive Language. Results for this standardized

assessment are summarized in Table 4. A two-tailed, paired-sample *t* test was used to determine significant changes in cognitive ability over time. Results indicated that the participants did not exhibit a significant overall increase in cognitive ability; *t* (7) = -.804, *p* = .448. However, it is notable that 4 of the 8 participants scored well below the floor of the test at baseline (standard score of 49), and although they made improvements over time, such improvement could not be accurately reflected in these participants' standard scores at follow-up due to how low their baseline scores were. Therefore, the above results likely underestimate the true magnitude of participants' gains in cognitive ability over time.

Developmental trajectory comparisons were also conducted for the MSEL subtests to compare expected developmental rates with and without intervention. Overall trajectory changes for all eight participants on the Visual Reception and Fine Motor subtests of the MSEL are displayed in Figures 13 and 14. Expressive and Receptive Language trajectories are illustrated in Figures 1 and 2 above. Further, individual participant trajectory data across the Visual Reception and Fine Motor subtests are displayed in Figures 15 and 16 below.

Overall, on the Visual Reception subtest of the MSEL, participants increased from an average age equivalence of 30 months at baseline, to an average of 38 months at follow-up. Without intervention, it was expected that participants' visual reception ability would increase to an age equivalence of 35 months. This indicates that participants' exceeded what was expected without intervention by 3 months, representing a 5% overall increase in developmental rate attributable to the intervention. At the individual level, 5 of the 8 participants for which data was collected on the MSEL Visual Reception subtest

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improved their developmental rate from baseline to follow-up. Those 5 participants also increased their developmental rate from baseline to follow-up, improving beyond what would be expected without intervention. Individual gains above what would be expected without intervention varied considerably from 3-38 months.

The Fine Motor subtest on the MSEL yielded an average age equivalence of 30 months at baseline, increasing to 43 months at follow-up. Without intervention, it was expected that participants' fine motor skills would increase to an age equivalence of 35 months. This indicates that participants' exceeded what was expected without intervention by 8 months, representing a 14% overall increase in developmental rate attributable to the intervention. At the individual level, all 8 participants on the MSEL Fine Motor subtest increased their developmental rate from baseline to follow-up. Individual gains above what was expected without intervention ranged from 5-19 months. Please see above for trajectory results for the Receptive and Expressive Language subtests on the MSEL.
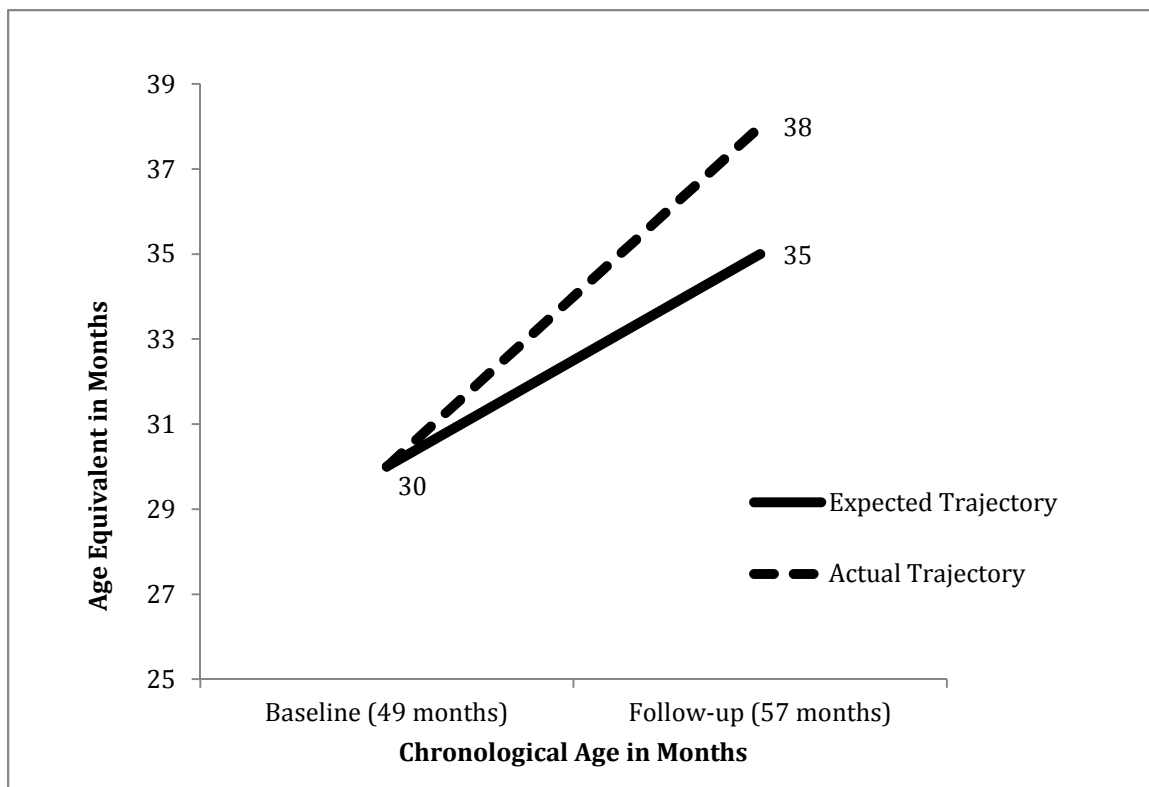
Figure 13. MSEL Visual Reception Trajectory (group)
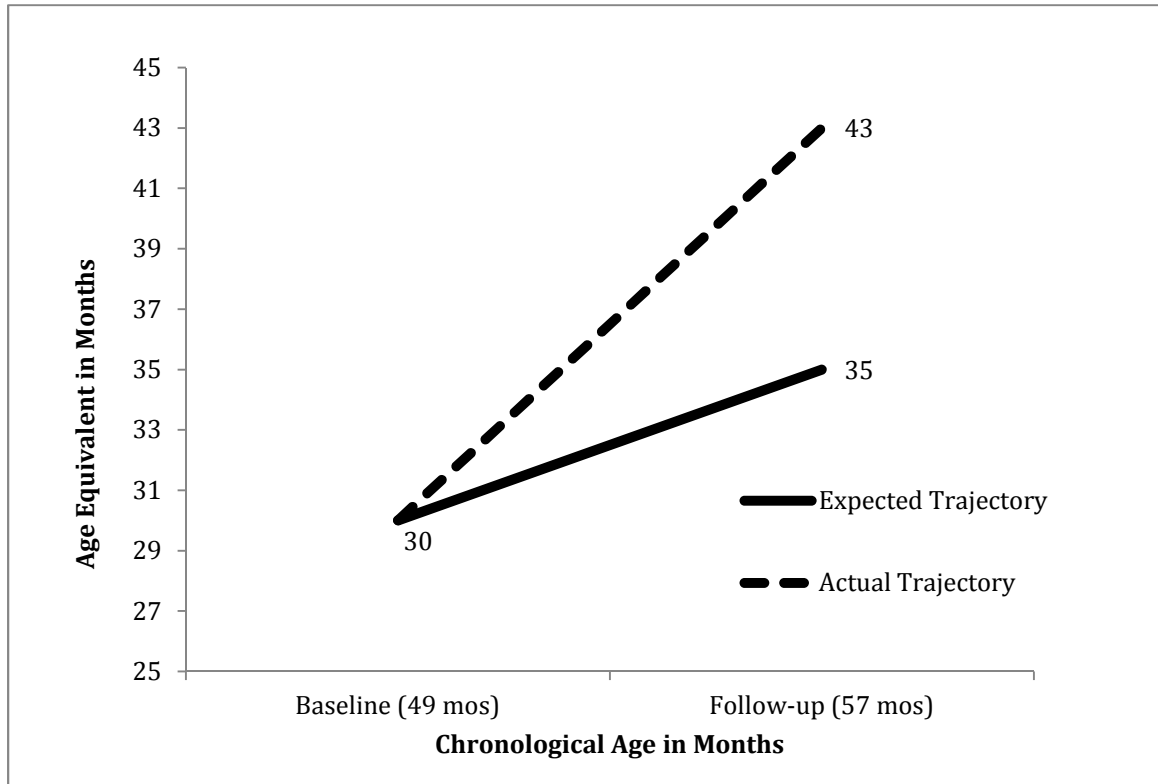
Figure 14. MSEL Fine Motor Trajectory (group)
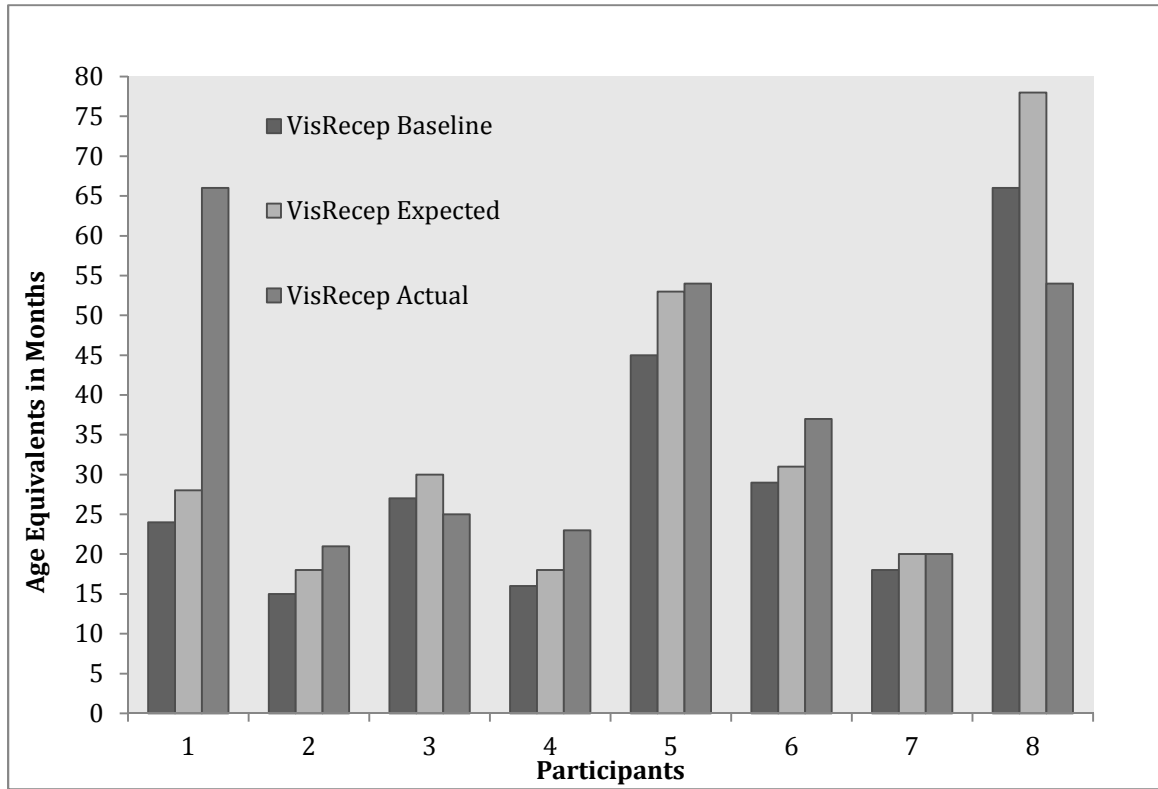
Figure 15. Individual participant trajectories- MSEL Visual Reception
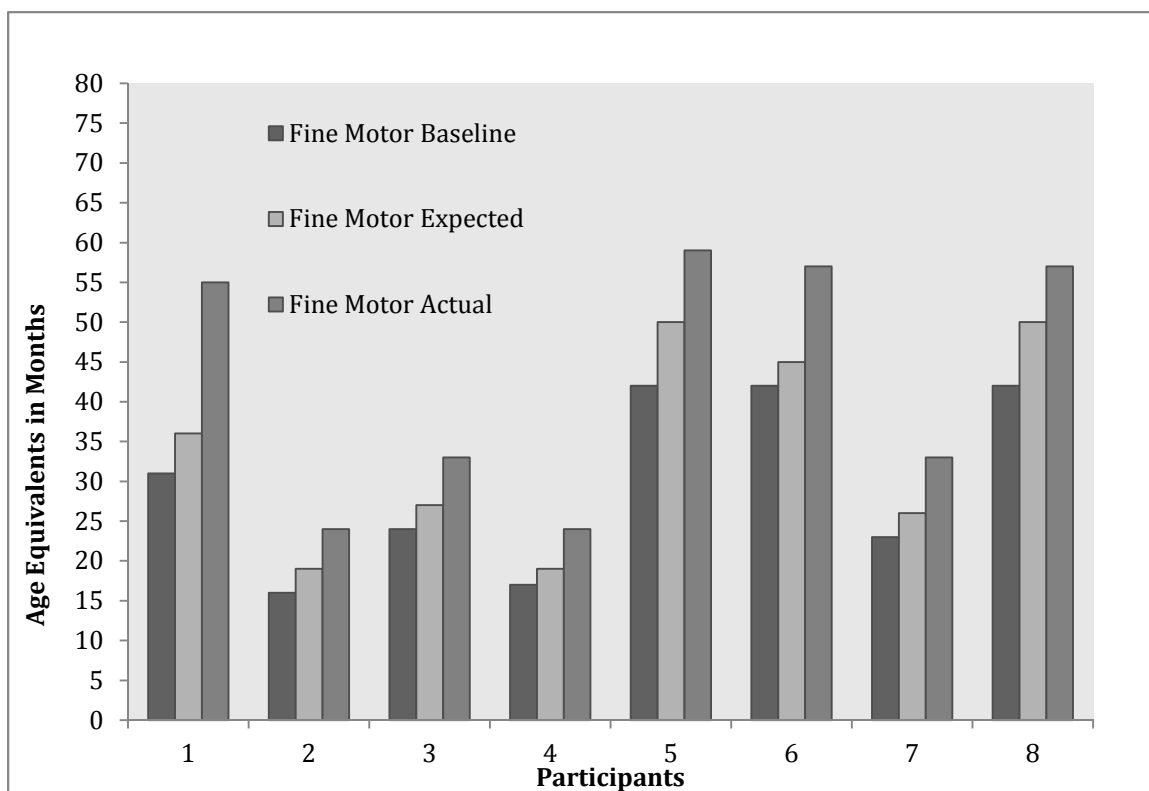
Figure 16. Individual participant trajectories- MSEL Fine Motor

To answer the third research question, *"Does the symptom picture of autism change following enrollment in the Sprouts program?"* two measures were used. Specifically, **c**hanges in the participant's autism-related symptoms over time were measured using the Autism Diagnostic Observation Schedule (ADOS), as well as the Childhood Autism Rating Scale, Second Edition (CARS-2). The ADOS is a structured observation system that was completed by trained Sprouts clinicians with each participant upon entry and again at exit of the Sprouts program. The CARS-2 was filled out by 6 of the 8 participant's parents at baseline and again at follow-up in regards to their perceptions of their child's display of autism symptoms.

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Results for both of these standardized and norm-referenced assessments are summarized in Table 4. Two-tailed, paired-sample *t* tests were used to determine significant changes in performance on these measures. Results indicated that overall, participants exhibited a highly significant decrease in autism symptomology from baseline to follow-up as measured by the ADOS, $t(7) = 3.802$, $p < .01$. According to parent ratings, participants also exhibited a significant decrease in autism symptomology from baseline to follow-up as measured by the CARS-2, $t(5) = 3.168$, $p < .05$.

At the individual level, 7 of the 8 participants exhibited reductions in the overall severity of their autism symptoms from baseline to follow-up as indicated by their ADOS raw scores. One participant (child 8) changed classifications from "Autism" to "Autism Spectrum" from baseline to follow-up. Figure 17 below displays the individual changes in ADOS total scores over time.
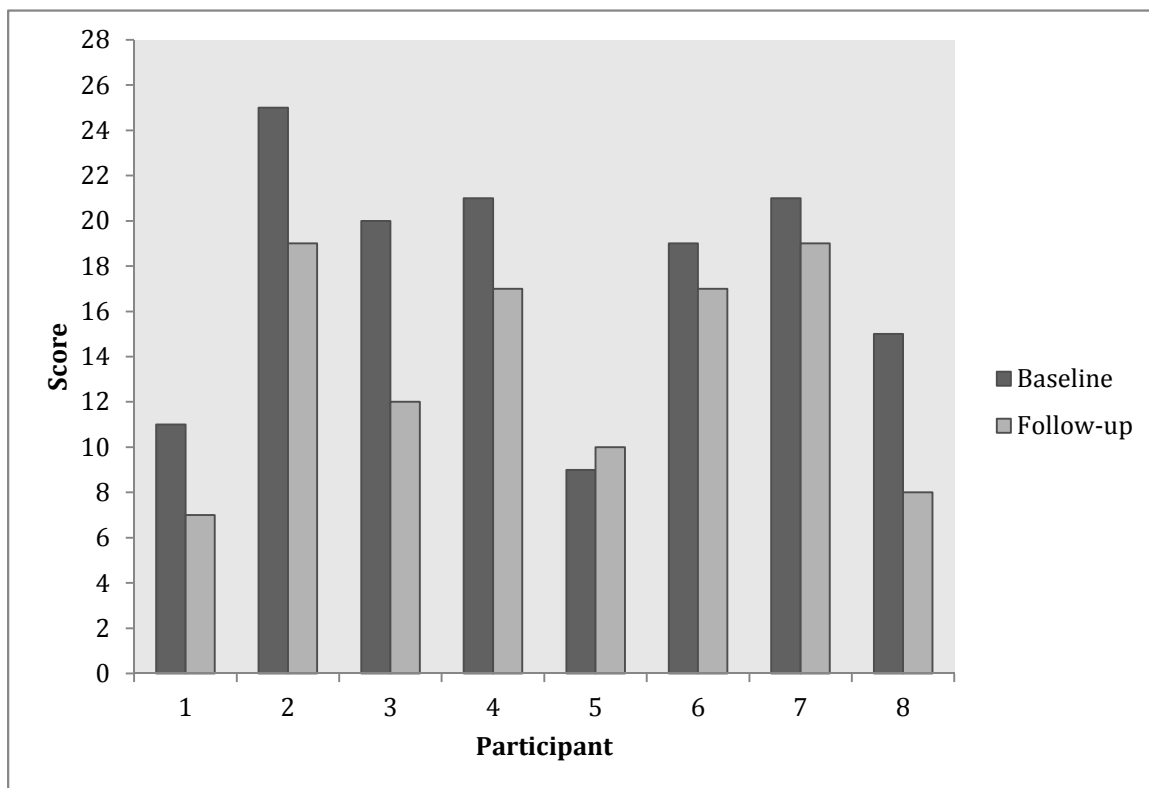
Figure 17. Individual participant scores- ADOS Total Scores (raw scores)

*Note: Higher scores = higher level of impairment

The ADOS total scores are comprised of scores from both the communication and social interaction sections of the ADOS modules. Participant's scores on the communication and social interaction sections of the ADOS at the individual level are displayed in Figures 18 and 19 below. On average, there was a 2-point decrease in severity level over time for all participants on the communication section of the ADOS. At the individual level, 5 of the 8 participants exhibited improvements in their social communication skills from baseline to follow-up. One participant (child 8) changed classifications from "Autism" to "Autism Spectrum" from baseline to follow-up. On the social interaction section of the ADOS, there was an average overall decrease of 3 points

in severity level across participants over time. At the individual level, 7 of the 8 participants increased their social interaction skills from baseline to follow-up. Three participants changed classifications; two from "Autism" to "Autism Spectrum" (child 3 and child 8) and one from "Autism Spectrum" to "No diagnosis" (child 1).
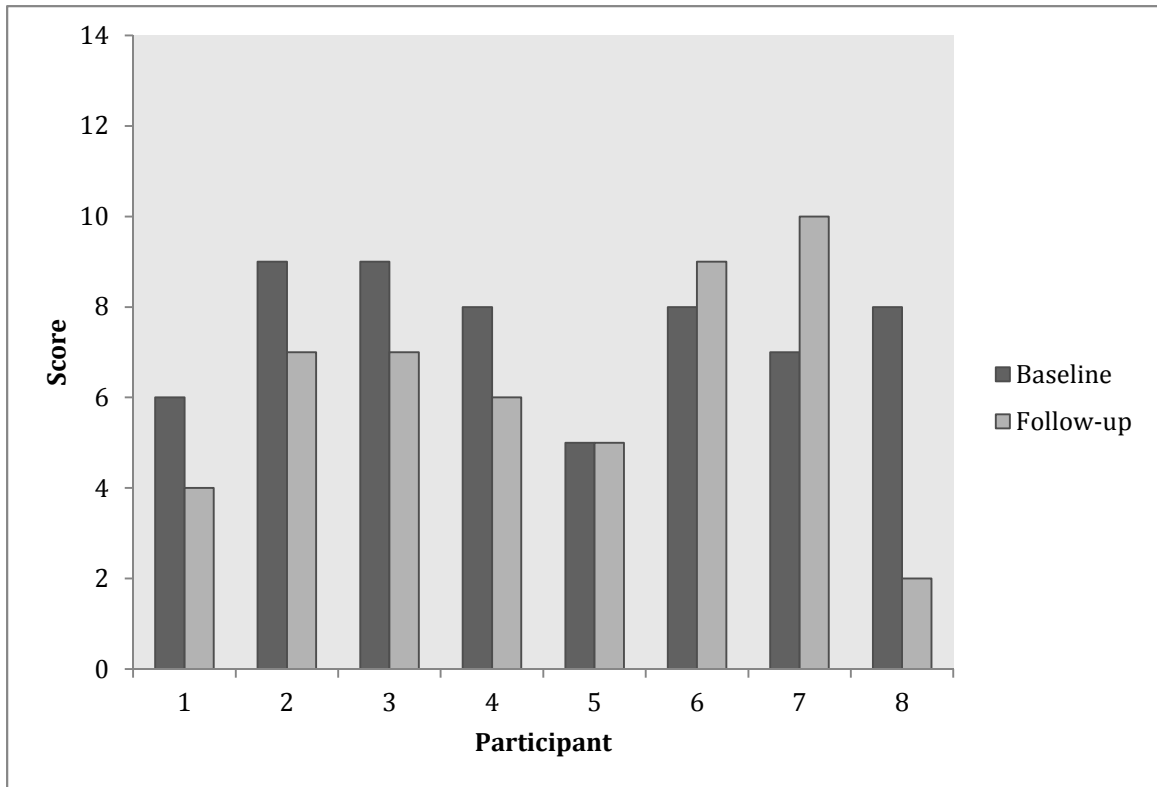
Figure 18. Individual participant data- ADOS Communication Scores (raw scores)

*Note: *Autism cut-off = 4; Autism Spectrum cut-off = 2*
* **Higher scores = higher level of impairment*
* ***ADOS Communication assesses children's social communication skills*
*   (pointing, vocalizations directed towards others, stereotyped use of words or*
*   phrases, gestures, etc)*
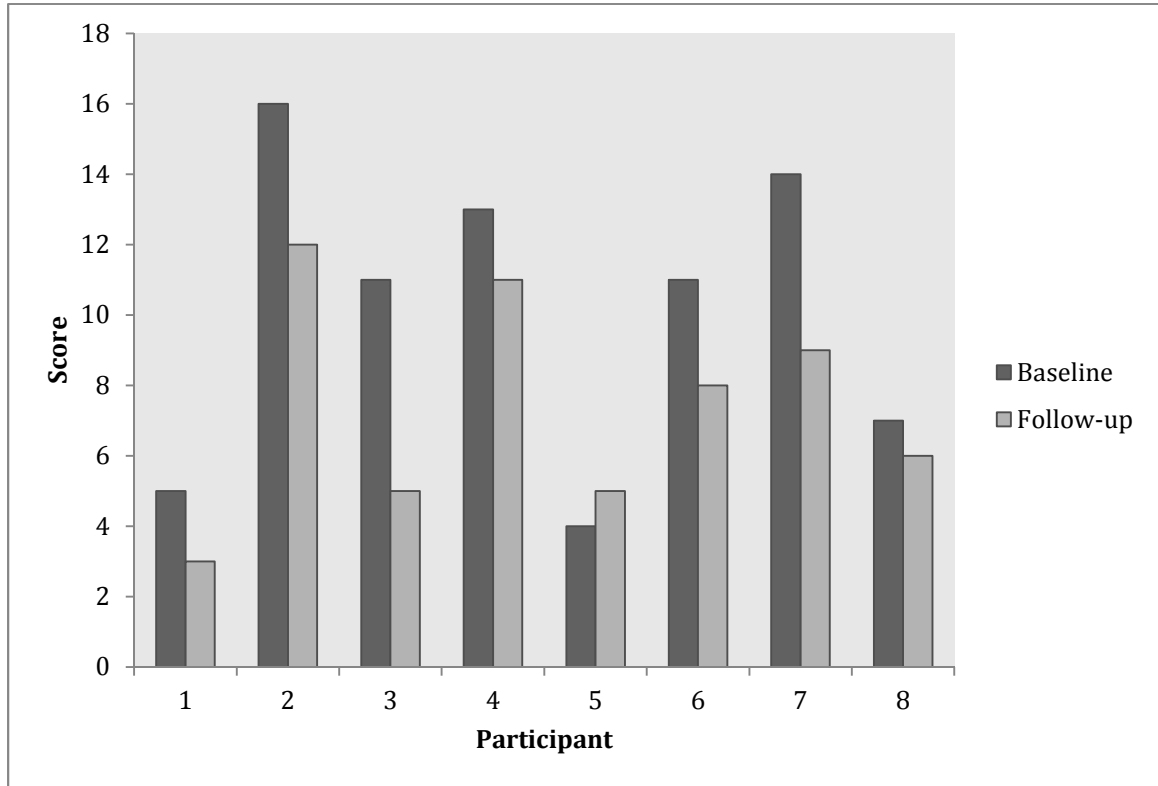
Figure 19. Individual participant data- ADOS Social Interaction Scores (raw scores)

*Note: *Autism cut-off = 7; Autism Spectrum cut-off = 4*
*   ** Higher scores = higher level of impairment*
*   ***ADOS social interaction section assesses eye contact, shared enjoyment, joint*
*   attention, showing of items, etc*

     Additionally, individual participant scores on the CARS-2 rating scale from baseline to follow-up are displayed in Table 6 below. Completed scales were received from caregivers for six of the eight participants. All six participants for whom parent report data was collected on the CARS-2 displayed reductions in autism symptomology as indicated by their T-scores from baseline to follow-up. Three of the six participants changed symptom classifications from Mild/Moderate at baseline to Minimal at follow-up (child 1, child 3, and child 8).

Table 6.

CARS-2 scores (T-scores)

Participant (n=6)	CARS Baseline (T-score)	Baseline Classification (symptom level)	CARS Follow-up (T-score)	Follow-up Classification (symptom level)
1	45	Mild-Moderate	20	Minimal
2	63	Severe	60	Severe
3	46	Mild-Moderate	38	Minimal
5	34	Minimal	33	Minimal
7	52	Severe	48	Severe
8	41	Mild-Moderate	27	Minimal

To answer the fourth research question, "*Do parents of children enrolled in the Spouts program exhibit reduced stress levels over time while their children are enrolled in the Sprouts program*?" parents completed self-report measures of stress at the beginning of their child's involvement and at the end. Specifically, changes in the participants' parents' stress levels associated with caring for their child (n = 6) from baseline to follow-up were measured via the Parenting Stress Index, fourth edition (PSI-4). Two-tailed, paired-sample *t* tests were used to determine significant changes over time on this measure. Results of the parent-administered rating scale, $t(5) = 3.875$, $p = .012$, indicated that there was a significant decrease in parent's stress levels from baseline (M = 88.00, SD= 16.08) to follow-up (M = 77.33, SD = 13.47).

To answer the fifth research question, *"Is the Sprouts program effectively implementing its specified program components as outlined in the Sprouts program manual?"* measures of treatment integrity were obtained. Specifically, treatment fidelity ratings were collected multiple times each week by trained research assistants to ensure the essential components of the Sprouts treatment program were being implemented as

stated in the program manual. For each activity, ratings were completed in five areas: organization/use of visuals, general teaching strategies, communication skills, social skills, and behavior management techniques. Each item was scored on a 1-5 scale according to observed implementation level (1= no implementation, 3 = partial implementation, 5 = full implementation). Ratings were compiled at the end of every month with the goal of each activity reaching a minimum of 80% compliance with manual objectives. Feedback was provided to Sprouts staff members in monthly meetings, and additional training/coaching of staff members in any identified problematic areas occurred as necessary.

Treatment fidelity results are presented in Table 7 and Table 8 below. Results indicate that 80% or greater treatment fidelity was observed for 4 of the 8 Sprouts daily activities (table-top, welcome circle, small groups 1 and 2) after initial review of fidelity ratings in December. Upon additional staff coaching and training, 80% or greater treatment fidelity was observed for 7 of 8 activities (all except Free Play) in March, and all 8 activities reached an 80% or greater implementation of program manual objectives by the conclusion of the program in June. Inter-observer agreement was calculated for approximately 20% of the observations completed from September- June, and 81% agreement was observed.

Table 7.

Treatment fidelity summary for table top, welcome circle, and small group

Activity:	% compliance with Sprouts manual objectives (Sept-Dec 2012)	% compliance with Sprouts manual objectives (Jan-Mar 2013)	% compliance with Sprouts manual objectives (Apr-June 2013)
Table Top	81%	92%	90%
Organization/Visuals	*91%*	*100%*	*100%*
General Teaching	*86&*	*91%*	*89%*
Communication	*65%*	*94%*	*85%*
Social Skills	*81%*	*89%*	*89%*
Behavior management	*82%*	*90%*	*93%*
Welcome Circle	83%	95%	94%
Organization/Visuals	*88%*	*97%*	*97%*
General Teaching	*80%*	*95%*	*97%*
Communication	*79%*	*96%*	*96%*
Social Skills	*87%*	*93%*	*94%*
Behavior management	*83%*	*94%*	*91%*
Small Group 1	81%	88%	88%
Organization/Visuals	*84%*	*82%*	*79%*
General Teaching	*84%*	*92%*	*94%*
Communication	*89%*	*85%*	*85%*
Social Skills	*65%*	*83%*	*82%*
Behavior management	*86%*	*94%*	*95%*
Small Group 2	87%	91%	91%
Organization/Visuals	*85%*	*85%*	*86%*
General Teaching	*88%*	*94%*	*96%*
Communication	*88%*	*96%*	*89%*
Social Skills	*85%*	*91%*	*90%*
Behavior Management	*89%*	*88%*	*90%*

Table 8.

Treatment fidelity summary for music, large group, snack and free play

Activity:	% compliance with Sprouts manual objectives (Sept-Dec 2012)	% compliance with Sprouts manual objectives (Jan-Mar 2013)	% compliance with Sprouts manual objectives (Apr-June 2013)
Music	71%	86%	91%
Organization/Visuals	90%	*94%*	96%
General Teaching	73%	*90%*	92%
Communication	61%	*77%*	85%
Social Skills	58%	*83%*	89%
Behavior management	75%	*85%*	92%
Large Group	71%	86%	90%
Organization/Visuals	90%	*90%*	92%
General Teaching	73%	*90%*	92%
Communication	61%	*84%*	85%
Social Skills	58%	*85%*	88%
Behavior management	75%	*82%*	90%
Snack	76%	83%	89%
Organization/Visuals	68%	60%	79%
General Teaching	82%	100%	97%
Communication	86%	93%	94%
Social Skills	73%	90%	83%
Behavior management	78%	70%	89%
Free Play	62%	75%	84%
Organization/Visuals	60%	76%	82%
General Teaching	63%	84%	93%
Communication	59%	78%	85%
Social Skills	57%	65%	72%
Behavior management	69%	73%	87%

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To answer the sixth research question, "*Does the Sprouts program demonstrate good social validity for parents of children enrolled?"* Measures of social validity for the Sprouts comprehensive treatment program were collected from parents at the time of their child's exit from the program via the Family-Professional Partnership Scale (FPPS). The FFPS has parents rate their responses on a 1-5 scale with 1 = very dissatisfied and 5 = very satisfied. Results indicate that parents (n =7) were very satisfied with the services their child was receiving from the teachers at Sprouts, with the average rating for all items falling at 4.57 or higher. Table 9 below displays parents' responses to the FFPS. Results indicate parents expressed high levels of satisfaction with the Sprouts program and teaching staff overall. The average ratings across items ranged from 4.57 to 4.86, indicating high levels of satisfaction among Sprouts parents.

Table 9.

Family Professional Partnership Scale

	Parent 1	2	3	4	5	6	7	8	*AVG across items*
How satisfied are you that your child's teachers...									
Provides information	5	5	4	N/A	5	5	5	5	*4.86*
Skill level	5	5	5	N/A	5	5	5	4	*4.86*
Level of service	5	5	5	N/A	5	5	5	4	*4.86*
Advocates	5	5	5	N/A	5	4	4	4	*4.57*
Praises	5	5	5	N/A	5	5	5	4	*4.86*
Communication/ Availability	5	5	5	N/A	5	4	4	4	*4.57*
Respect	5	5	5	N/A	5	5	5	4	*4.86*
Identifies strengths/weaknesses	5	5	5	N/A	5	5	5	4	*4.86*
Collaborates	5	5	5	N/A	5	4	4	5	*4.86*
Discloses	5	5	4	N/A	5	4	4	5	*4.57*
Utilizes safety procedures	5	5	5	N/A	5	5	5	4	*4.86*
Avoids jargon	5	5	5	N/A	5	5	5	4	*4.86*
Confidentiality	5	5	5	N/A	5	5	5	4	*4.86*
Incorporates family values	5	5	5	N/A	5	5	5	4	*4.86*
Appropriate goals	5	5	5	N/A	5	5	5	4	*4.86*
Dependable	5	5	5	N/A	5	5	5	4	*4.86*
Listens	5	5	5	N/A	5	5	4	4	*4.71*
Good rapport	5	5	5	N/A	5	5	4	4	*4.71*
AVG across participants	*5*	*5*	*4.9*	*N/A*	*5*	*4.8*	*4.7*	*4.2*	

*Note: FPPS is scored on a 1-5 scale: 1 = very dissatisfied, 2 = dissatisfied, 3 = neither, 4 = satisfied, 5 = very satisfied
**FPPS data was not collected for the parent of participant 4

CHAPTER V

DISCUSSION

The current investigation examined the cognitive, adaptive, communicative, social and autism-related outcomes for eight children enrolled in an early childhood intervention program for children age three to five with autism spectrum disorders. Additionally, measures of parent's stress levels, the program's treatment fidelity, and treatment acceptability ratings were also collected. With the recent increase in prevalence of autism (CDC, 2014), coupled with improvements in our ability to diagnose ASD in very young children, research on comprehensive treatment programs for children with ASD provides a critical avenue for identifying evidence-based intervention packages that can be implemented to groups of children in community settings. The strength of the outcomes in this investigation are examined not simply in terms of individual or group gains on standardized assessment measures over time, but also by changes to the long-term developmental trajectories of the children involved.

This study investigated changes in children's skill levels across several areas of development using standardized assessment measures, rating scales, and direct behavioral observations. Measures utilized were carefully chosen based on frequency of use in the literature and utility in tracking changes in scores over time. The current study further aimed to comprehensively assess participants across several domains of functioning, thus extending the results observed in previous studies with limited outcome data collected. Table 10 below illustrates comparisons in outcome measures utilized across programs.

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Table. 10

Comparison of outcome measures used across CTMs

Program	Cognitive	Communication	Adaptive Skills	Social Skills	Autism symptoms	Parent stress	Social Validity?	Treatment fidelity?
Sprouts	MSEL	MSEL subtests PLS-5	VABS	SRS-2 ABBLS items	ADOS CARS-2	PSI	YES-parents	YES
UCLA Lovaas (1987) Hayward (2009)	Variable measures BSID WPPSI	Reynell Developmental Language Scales	VABS		ADI-R (to confirm diagnosis only)			
LEAP Strain & Bovey (2011)	MSEL	PLS-4		SSRS-2	CARS-2		YES-teachers	YES
ESDM Dawson et al., (2010)	MSEL		VABS		ADI-R ADOS			
Floortime				FEAS	CARS-2			
TEACCH D'Elia (2014)	Griffith Mental development Scales (GMDS)	MacArthur Communication Developmental Inventory (CDI)	VABS		ADI-R ADOS	PSI		

Six separate research questions were evaluated in this study. The first research question posed; *"Do children enrolled in the Sprouts early childhood program make observable and measurable gains in the program's targeted areas of communication, social skills, and adaptive functioning that exceed what would be expected given their current developmental trajectory?"* It was hypothesized that children in the Sprouts program would make significant gains in these areas from baseline to follow-up as a result of the intervention package. Results indicated that participants did indeed exhibit significant increases in their receptive language skills, social skills, and overall adaptive functioning skills from baseline to follow-up over a 9-month intervention period, above what would be expected given their entering estimates of expected developmental progress. In general, these results are commensurate with those reported by other CTMs in the literature (e.g., LEAP, TEACCH, ESDM, Floortime), where gains reported exceed developmental expectations. Surprisingly, these similar positive results have been observed regardless of the theoretical orientation of the intervention program. Because outcome measures utilized across CTMs vary widely, direct comparisons of results from this study can be made to some (e.g., LEAP) but not all (e.g., Floortime) of the programs. Therefore, those comparisons that can be directly made regarding the communicative, social, and adaptive functioning gains observed in the current study are outlined below, while others are discussed more broadly.

Communication. Overall, participants in the current study made significant gains and increased their developmental trajectories above what would be expected without intervention on all language measures, with more robust findings for receptive language gains. The current investigation yielded an 11.3-point overall increase in receptive

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language ability, and a 6.5-point increase in expressive language scores over the 9-month intervention period. This is significantly above the 4-point increase that was expected in both areas given the participants' developmental trajectory at baseline. These gains are similar to those language gains observed in the most recent LEAP study (Strain & Bovey, 2011), which observed an 18.5 point increase in overall receptive language scores, and an 9.8 point increase in expressive language scores after 2-years of intervention. Similar results were reported in the Early Start Denver Model (Dawson et al., 2010) for participants' MSEL language subtest scores; with receptive language increasing 17.8 points and expressive language increasing 11.6 points after 1 year of intervention. It is especially notable that while the current investigation yielded similar findings to other CTMs in the literature, the Sprouts participants' gains were observed after only 9 months; compared with 1-2 years in most studies (Dawson et al., 2010; Strain & Bovey, 2011). Gains observed in the current study are further strengthened by the use of multiple assessment measures of communication/language development that yielded similar increases in scores and trajectories from baseline to follow-up (i.e., PLS-5 and MSEL).

Additionally, the lack of trajectory data presented in other CTMs makes it difficult to determine if the gains observed in those programs represent actual increases in participants' developmental trajectories over time, or if those gains would have been expected after 1-2 years as a result of developmental maturation. Positive increases in Sprouts participants' developmental trajectories from baseline to follow-up indicate that the participants made additional gains in communication ability (presumably due to the intervention) above and beyond what would be accounted for by natural development over time.

A likely reason for the significant language gains observed in the current study is that the development of language and functional communication skills are one of the three areas specifically targeted for intervention in Sprouts. That is, communication skill development is a target in each activity in the Sprouts day (i.e., opportunities to absorb language or request for desired items are present across story time, music, large group and snack) with particular emphasis on functional communication goals targeted during small group each day. Furthermore, the Sprouts participants receive one-on-one speech therapy for 30 minutes two times per week, and many of the children spend additional one-on-one therapy time during the week targeting functional communication skills as well. Although communication/language development is a stated goal of many CTMs in the literature, the exact methods used to help develop these skills and exact time spent in language-enriched activities are poorly defined in many program descriptions. While it is true that most CTMs report similar gains in this area, a lack of trajectory data and ill-defined program goals make it difficult to attribute child gains to the intervention package alone.

Social Skills. The assessment of participants' social skills were measured via parent ratings and direct observation, and significant gains were displayed across both measures and assessment modalities Although many CTMs do not include a measure of social skills ability (i.e., UCLA model, TEACCH, ESDM), the gains observed in social skills ability in the current investigation are commensurate with other studies of comprehensive treatment models. Specifically, the LEAP program yielded an average increase of 28 points on participants' social skills via the SSRS after 2 years of intervention (Strain & Bovey, 2011). The current study found a statistically significant

increase of 11.5 points on the SSRS-2, and over only a 9-month treatment period. It is particularly notable that the gains from the current study were observed even without the additional use of typical peers in the classroom, as in LEAP. This finding is surprising given research that cites the use of typical peers as agents to assist children with ASD in increasing their display of appropriate social skills (McGee et al., 1993; Schleien et al., 1995). However, it is likely that the functioning level of the children at baseline play a large role in their responsiveness to an intervention led by a typical peer. That is, children with ASD need to acquire certain entry-level skills (i.e., imitation, joint attention, increased levels of engagement) before they will benefit from more advanced interactions with peers. Although subject to individual variability, it appears likely that the children in the current study acquired these basic skills over the course of the intervention period, which accounted for the significant gains reported by parents on the SRS-2 and the increased scores in the ABBLS observational data; all this despite not having exposure to typical peers. In the current study, it is also likely that participants who mastered these entry-level skills served as peer models and played a role in the increased social development of the participants who exhibited lower levels of social skills.

The current investigation further extends previous research on CTMs with the additional use of direct observations of participants' social skills ability during intervention times, which helps to strengthen the validity of the parent ratings on the SRS-2, and also circumvents any bias introduced by relying solely on the use of parent ratings scales. Specifically, the use of specific items from the ABBLS enabled trained research assistants to observe child behaviors during intervention times and code changes in pro-social child behaviors from baseline to follow-up. Results indicated participants

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displayed increases in their social skills throughout structured play times during the Sprouts day. Direct observations of child behavior in regards to social skills have only been completed in one other known CTM to date. Project DATA for Toddlers is a CTM for very young children at-risk for ASD from birth to age 3 (Boulware, Schwartz, Sandall, & McBride, 2006). This CTM utilizes the Assessment, Evaluation, and Programming System for Infants and Children (AEPS), a criterion-referenced and curriculum-based observational assessment measure very similar to the ABBLS. That is, children are scored on specific items across various developmental areas with a 0 (does not pass), 1 (inconsistent performance), or 2 (passes consistently). Future studies should consider the use of more direct observations of child behaviors when examining changes in social skills and pro-social behaviors, which may be more reliable and valid than the use of parent ratings alone because it involves the direct coding of observable behaviors.

Adaptive functioning. Significant gains in overall adaptive functioning ability were observed in the current study via parent report on the VABS, and participants yielded an average increase on 12.5 points from baseline to follow-up. These impressive results mirror some gains described in the literature; primarily in intensive behavioral interventions with young children (e.g., Hayward, 2009). For example, participants receiving intensive ABA therapy (approximately 36 hours per week) based on the UCLA young autism project model (Lovaas et al., 1981) displayed a 6.1 increase in adaptive functioning skills as measured by the VABS after one year of intervention (Hayward, 2009). Surprisingly, however, the gains noted in the above study, as well as the current investigation, are significantly greater than those adaptive functioning results found in other CTMs. That is, Dawson and colleagues did not find significant increases in

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children's adaptive skills using the VABS, and actually observed a 3.5-point decrease in adaptive functioning skills after 1 year of the ESDM program (2010). Furthermore, a recent meta-analysis of the effects of the TEACCH model found negligible treatment effects on participants' adaptive behavioral repertoires measured via the VABS when results were combined across 13 studies using the TEACCH model of intervention (Virues-Ortega, 2013). In addition, adaptive functioning gains are not even reported in published LEAP or Floortime results, and this area does not seem to be a direct focus of these CTMs.

A likely reason for the greater adaptive gains observed in the Sprouts program compared with others is the program's specific focus on developing independence and functional skills. Increasing participant's independent functioning skills (e.g., toileting, dressing, feeding oneself, and following directions) is one of the three main goals of Sprouts as outlined in the program manual. As with communication skills, these skills are also specifically targeted throughout the Sprouts day (i.e., fostering independence by providing multiple opportunities for children to practice these skills, and utilizing least-to-most prompting procedures to assist with successful completion of adaptive tasks as necessary). In contrast, UCLA programs utilize a discrete-trial training method to teach self-help skills, which may make it more difficult for a child to generalize outside of treatment or trial-based sessions (i.e., Hayward, 2009; Lovaas, 1987). Neither ESDM nor TEACCH mention a specific focus on developing adaptive skills in their program descriptions, so it is unclear how adaptive functioning skills are addressed, if at all (Dawson et al., 2010; D'Elia, 2014). Therefore, the adaptive functioning gains observed in the current investigation should be considered substantial, and the structure,

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curriculum, and focus on the development of independence and functional skills in the Sprouts program clearly lends itself to positive intervention effects on participants' adaptive functioning ability.

For the second research question: *"Do children enrolled in the Sprouts early childhood program make significant gains on measures of cognitive ability?"* It was hypothesized that participants would exhibit only mild to moderate cognitive gains as measured by the MSEL from baseline to follow-up. This hypothesis was made because previous studies that have reported large gains in IQ have done so after 2 years of an intervention package, whereas the current study only spanned 9 months, and as such, less significant cognitive gains were expected. This hypothesis was confirmed, in that results of the current investigation found significant changes in cognitive ability on the age-equivalent subtest scores on the MSEL. However, these findings are mitigated due to the fact that minimal changes were observed in standard scores over time. Specifically, a 4-point increase in overall IQ from baseline to follow-up was observed for the participants in the Sprouts program. Although these findings differ from previous studies that found more significant increases in participants' IQ scores from baseline to follow-up (up to 20 points) (Dawson et al., 2010; Hayward 2009; Lovaas, 1987), the results of the current investigation are similar to those found in the LEAP model (Strain & Bovey, 2011) and the Children's Toddler School, a CTM for children with ASD under the age of 3 (Stahmer & Ingersoll, 2004), both of which observed more modest gains in IQ over time; 9 points and 7 points from baseline to follow-up, respectively.

One reason for this result could be that the MSEL norms are for typical development, and the current study found floor effects for many participants, which may

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have limited our ability to detect more significant effects on cognitive ability over time. Further, of those CTMs that reported more significant increases in IQ over time, many were reported after two full years of intervention, and most were strictly behavioral in nature and of high intensity; involving more than 30 hours per week of the intervention package (Dawson et al., 2010; Hayward 2009; Lovaas, 1987). In addition, some also utilized different outcome measures at baseline and follow-up (i.e, Lovaas, 1987), which limit the validity of the findings.

Still, Sprouts participants did increase their developmental rate across all four subtests of the MSEL as indicated by positive changes in their developmental trajectories over time. This means participants in the current evaluation made more gains in cognitive ability with intervention than would have been expected to occur naturally over time with maturation effects.

For the third research question: "*Does the symptom picture of autism change following enrollment in the Sprouts program?*" It was hypothesized that children in the Sprouts program would demonstrate reductions in severity of autism symptoms over time. The results confirmed this hypothesis, and participants in the Sprouts program displayed significant decreases in autism symptomology after 9 months of intervention, as evidenced by both parent ratings (CARS-2) and direct assessment of child behavior (ADOS), which strengthens the validity of the findings. Specifically, 7 of the 8 participants exhibited statistically significant reductions in the overall severity of their autism symptoms from baseline to follow-up as indicated by their ADOS raw scores. One participant (child 8) actually changed classifications from "Autism" to "Autism Spectrum" from baseline to follow-up. Further, three of the six participants for whom

data was collected on the CARS-2 changed classifications from Mild/Moderate at baseline to Minimal at follow-up (child 1, child 3, and child 8). These results are commensurate with several published studies on CTMs (Lovaas et al., 1987, Dawson et al., 2010, Pajareya & Nopmaneejumruslers, 2011; Stahmer & Ingersoll, 2004; Strain & Bovey, 2011) that cited similar improvements in participants' autism symptomology following early intervention services. However, these results are not without certain caveats or methodological limitations.

In terms of long-term changes in diagnostic categories, similar results have been reported for the Early Start Denver Model after 2 years of intervention (Dawson et al., 2010). However, in these results, changes in diagnostic severity were not reflected in significant differences in the ADOS severity scores, as they were in the current investigation. More specifically, although the diagnostic label may have changed for some children (i.e., "autism" to "autism spectrum"), the overall change in scores from baseline to follow-up was not significant. Similar findings were observed in a recent study investigating the effectiveness of the TEACCH model; the results in regard to autism severity level showed no significant group changes, yet a significant difference was observed for ADOS diagnostic classification level (Elias et al., 2014). The interesting pattern of results observed in these two studies appears to suggest that these children's scores at baseline were likely bordering the diagnostic distinction between "autism" and "autism spectrum," or "autism spectrum" and "no diagnosis." Thus, participants would not have to improve many points from baseline to follow-up to change diagnostic classifications, and as such, their overall differences in scores were not significant.

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Although studies of the UCLA Young Autism Project typically cite improvements or "recovery" in autism symptoms at follow-up; surprisingly, these studies do not include measures of autism symptoms as part of their assessment battery. That is, Lovaas (1987) utilized school placement and IQ as indicators of those participants who "recovered" after 2 years of treatment, however no diagnostic autism assessments were conducted. Furthermore, previous research has suggested that the biggest indicator of a child's school placement tends to be communication ability (Eaves & Ho, 1997; White et al., 2007), so clearly the use of school placement as an indicator of autism "recovery" is not an accurate depiction of diagnostic changes or symptom improvement.

Similarly, a more recent investigation of the UCLA Young Autism Project utilized The Autism Diagnostic Interview–Revised (ADI–R: Lord et al., 1994) to confirm the diagnosis of autism for each participant, however autism symptoms were not directly assessed at follow-up, and IQ and adaptive skills were the primary outcome measures utilized (Hayward et al., 2009).

In addition to overall reductions in autism symptom severity as measured by the ADOS, the current investigation also yielded a significant 10-point reduction in autism symptom severity on the CARS-2 from baseline to follow-up according to parent ratings. Other programs including LEAP (Strain & Bovey, 2011) and DIR/Floortime (Pajareya & Nopmaneejumruslers, 2012) similarly reported reductions in autism severity on the CARS-2 following intervention, albeit with slightly less impressive results (6 points, and 2.9 points, respectively). However, it is notable that unlike the Sprouts program, these other outcome studies did not include any additional observational measures of autism symptom severity (such as the ADOS).

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There could be several possible reasons for the variability in autism symptom reduction observed across CTMs in the literature. First, child symptom severity level at baseline likely plays a role, as well as the specific symptom areas in which participants score the lowest. For example, children who are verbal but struggle more with social interactions will have little to improve upon on assessments such as the ADOS or CARS-2, and therefore score changes from baseline to follow-up may be minimal. In contrast, if participants have limited communication skills, poor play/social skills, and engage in high levels of stereotyped behaviors at baseline, there is much more room for improvement across these three areas- all of which are measured on the ADOS and CARS-2. Future studies should consider more in-depth evaluations of the child characteristics at baseline that may lead to greater gains over time. This topic is discussed in additional detail below under *Child factors.*

Second, the specific goals targeted for treatment in each CTM likely play a large role in observed improvements in autism symptomology over time. For example, those programs that are developmental in nature (e.g., ESDM, Floortime) tend to focus more on early play skills and securing positive interactions between parent and child. As such, children are likely to display more improvements in social engagement over time, but independent communication skills may not yield as large of improvements as they would in a more behaviorally-based model (e.g., UCLA, LEAP), where communication skills may be systematically targeted and shaped up through the use of discrete-trial procedures. That being said, the positive and significant reductions in autism symptomology noted in the current study may be the result of the use of blended, or eclectic, intervention strategies that attempted to specifically target the reduction of

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autism symptoms through the use of both developmentally-focused (i.e., naturalistic teaching) and behavioral methods (i.e., discrete trial training formats). Although previous research has suggested that early intensive behavioral models may lead to the greatest child gains (i.e, Eikeseth et al., 2007; Howard et al., 2005), as mentioned above these behavioral models did not directly assess for changes in autism symptomology in their outcome measures.

In reference to the fourth research question: *"Do parents of children enrolled in the Spouts program exhibit reduced stress levels over time*?" It was hypothesized that parents would demonstrate decreased stress levels over time as evidenced by significant decreases in scores on the PSI. This hypothesis was confirmed, as results of the current study yielded a significant decrease in parent stress levels on the PSI from baseline to follow-up. This finding is most commensurate with studies on the effectiveness of the TEACCH model, (Elias et al., 2014; Welterlin et al., 2012) which similarly found that parents of children in the TEACCH program experienced decreased stress over time following their children's participation in TEACCH. LEAP studies, Floortime studies, and the Early Start Denver Model do not report on changes to parent stress levels over time, even though parent components are included in these intervention packages, and for some, parents are directly involved in the intervention implementation process.

This outcome points to several possible causal factors. That is, the parents of children in the Sprouts program participated in weekly parent support groups and met with Sprouts teachers regularly to discuss child goals, intervention plans, share data on outcomes, and bring up any questions they may have regarding autism or their child's treatment. As higher levels of parental stress have been found in the parents of young

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children with autism compared with other disabilities (Estes et al. 2009), it appears beneficial for parents to be not only involved in intervention strategies to help their children with ASD, but to have access to ample social support. Research has shown that adequate social support and active coping styles have been identified and associated with positive family functioning (Gabriels, 2001). Our findings on parental stress levels may also suggest that parenting stress may be a key factor in determining the effectiveness of early interventions for children with ASD. That is, it is possible that higher levels of parenting stress may have an adverse impact on child outcomes. Previous research provides some support for this claim (e.g., Osborne et al., 2008; Robbins et al., 1991), with results of one study indicating that high levels of parenting stress counteracted the effectiveness of the early intervention package (Osborne et al., 2008). Similarly, Robbins and colleagues (1991) noted a strong relationship between mother-reported stress levels and child progress after 12 months in a family-oriented program. Therefore, the reduced stress levels displayed by the Sprouts parents over time may have, in fact, played a part in maximizing the observed positive child outcomes.

Given that parenting stress seems to be related to child outcomes, it is also important to note that in many CTMs, parents may not have the opportunity to gain social support from other parents due to the more individualized nature of parent-staff interactions. That is, the weekly parent support group provided in Sprouts supplies parents with essential social support that research suggests may help alleviate stress levels. Specifically, previous research on the stress levels of parents with children with ASD has found that social support contributes to lower levels of maternal stress (Krauss, 1993), and is related to fewer depressive symptoms and happier marriages (Bristol,

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1984). Further, mothers have consistently cited informal support (i.e., family and friends) as more beneficial than formal support (i.e., psychological care), and have rated the most important sources of informal support as spouses and other parents of children with disabilities (Boyd, 2002; Bristol, 1984; Dyson, 1997; Krauss, 1993). In addition, in a review of studies examining the relationship between stress and social support for mothers of children with ASD, Boyd (2002) noted that the most pervasive finding in the literature was the benefit mothers described from joining parental support groups.

Based on the information noted above, and the decreases in parental stress levels noted in the current study, the use of parenting stress as an outcome variable should be taken into account when designing early interventions for ASD. It would clearly benefit more early intervention models to include a parent support group component, along with a measure for assessing changes in stress levels over time. This is especially important when it is further noted that many CTMs claim to include a parent component (e.g., Project DATA, LEAP) and many have parents implement intervention techniques, but few actually operationalize goals or attempt to track parent outcomes over time.

For the fifth research question; *"Is the Sprouts program effectively implementing its specified program components as outlined in the Sprouts program manual?"* It was hypothesized that the Sprouts program would maintain high levels of program fidelity over time, and would meet the goal of reaching 80% of all program components implemented as measured by the frequent completion of treatment fidelity observation scales. The results supported our hypothesis, and the Sprouts program was able to reach 80% or greater treatment fidelity across seven of eight activities implemented during Sprouts after 6 months of intervention, and all eight activities were able to reach 80% or

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greater by the end of the 9-month intervention period. Furthermore, it is notable that integrity ratings were relatively high early on in the intervention period; securing ratings above 70% for 7 of the 8 daily activities after the first 3 months. This finding is exceptional when compared to the very limited amounts of previous research that demonstrated that teachers must implement LEAP for at least 2 years to find the most robust treatment effects (Strain & Bovey, 2011). Further, fidelity ratings for the LEAP program were only at 53% after 1 full year of treatment implementation. Our findings gain even more support when it is noted that the current study utilized a fidelity scale that was loosely based on the one implemented in previous LEAP and TEACCH studies.

A more recent study examined the effects of fidelity on child outcomes after implementation of the Strategies for Teaching based on Autism Research program (STAR). STAR is an ABA-based intervention package that focuses on discrete trial training (Mandell et al., 2013). Over an 8-month span of intervention, teachers were observed for 30 minutes once per month. Results indicated that fidelity of intervention implementation reached only 57% after 8 months. Although child outcomes were generally positive, lack of adequate treatment fidelity data suggests that results were not attributable to the intervention package.

It is believed that the success of the Sprouts program in reaching 80% or more fidelity after only 9 months may stem from a combination of the frequency of fidelity observations conducted, as well as the quality and frequency of feedback and training provided to staff. That is, during the current investigation, trained and reliable research assistants collected data on the fidelity of implementation of the Sprouts program (as outlined in the program manual) 4-5 days per week, and across various daily activities.

More specifically, almost 140 fidelity observations were completed over the course of the 9–month intervention period, with results being collated and summarized for the staff, presented at monthly staff meetings, and corresponding feedback given to staff each month. This is compared to only one observation per month conducted for the previous studies that have reported on fidelity data (Hume et al., 2011; Mandell et al., 2013; Strain & Bovey, 2011). The knowledge that fidelity observations were being completed so frequently may have served as a prompt to staff to adhere to the program manual objectives more consistently throughout intervention implementation. Although the resources required to complete a more frequent schedule of fidelity observations may be a concern for some programs, the benefits outweigh the costs when it is considered that fidelity will likely be reached after a shorter period of treatment, thus allowing child outcomes to be considered valid because the program is being implemented as stated.

Overall, the use of fidelity measures in previous early intervention studies has been quite limited. Clearly, the use of these measures lends further support to the positive child outcomes observed, and allows more sound conclusions to be made regarding the effectiveness of the treatment package. It is recommended that further research on CTMs both include and report measures of treatment fidelity.

For the final research question; *"Does the Sprouts program demonstrate good social validity for parents of children enrolled?"* It was hypothesized that parents will have favorable ratings of their experiences with their child's participation in the Sprouts program. Findings were consistent with this hypothesis, as results demonstrated high social validity as evidenced by parent report on the FFPS regarding their satisfaction with the Sprouts teachers and general Sprouts program techniques. Parents indicated high

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levels of satisfaction with both the Sprouts teachers and program overall. This finding is similar to those reported in the literature (LEAP, TEACCH), which also reported high levels of parent satisfaction with the intervention package. However, previous research has suggested the possibility that parents would rate *any* intervention package as acceptable: in a comparison of an ABA-based and TEACCH models, results indicated that teachers and parents rated the acceptability of both models high, and showed no clear preference for the intervention components associated with either the ABA model or the TEACCH model. Furthermore, it was the treatment components that were determined to be inherent within both the ABA and TEACCH approaches that were rated as more socially valid than those from either approach alone (Callahan et al., 2010). Therefore, it appears that parents may be most satisfied with the basic tenets present in most early intervention programs; ensuring teachers are knowledgeable, experienced, qualified in autism, the use of evidence-based practices, the use of structured and specific curricula that target multiple areas of functioning, and use of visual materials and specialized strategies to teach new skills.

Additionally, it is also possible that the high social validity ratings by parents are related to perceived positive outcomes in their child's functioning level over time. As noted above, parents rated significant increases in their child's adaptive functioning skills, social skills, and autism symptoms as a result of the Sprouts intervention package. As the use of a measure of social validity has only been included in very few other investigations of the effectiveness of CTMs, it is necessary for future research to also include a measure of social validity, which highlights the importance of intervention acceptability.

Of particular interest when evaluating CTMs for young children with ASD are those specific factors that may affect child outcomes, either negatively or positively. The current study sheds light on some of these issues regarding both child factors and treatment factors, and these are discussed below.

Child factors. In the current study, although significant gains were observed overall, individual child outcomes varied. Specifically, all participants made gains in social skills, adaptive functioning skills, and fine motor skills. Seven of the eight children increased their developmental rate over time in receptive language ability, seven of the eight decreased their display of autism symptomology over time, five of the eight increased their developmental rate in expressive language ability, and five of the eight increased their developmental rate in visual reception skills.

That being said, there was one participant who did not exhibit gains in the majority of domains assessed (child 7). Gains that were observed for this participant- in the areas of social skills, adaptive functioning, and fine motor- tended to be minimal, and in some cases, this participant exhibited lower scores at follow-up than were observed at baseline, suggesting possible regression in skill level over time.

Outcome variability such as that observed in the current study has actually been frequently reported in early intervention research (e.g., Lovaas, 1987; McClannahan & Krantz, 1994; Olley, Robbins, & Morelli-Robbins, 1993; Weiss, 1999). For example, of the 19 children in Lovaas's (1987) seminal study, only 9 made significant progress. Little information exists on the other 10 children or the reasons for their poor outcomes. In fact, there currently exists very little insight in the literature as to why some children do not respond favorably to early intervention.

One investigation attempted to identify child "profiles" of responders and non-responders to early intensive behavioral intervention (Sherer & Schreibman, 2005). Results indicated that children with the most favorable treatment outcomes exhibited a moderate-to-high interest in toys, were tolerant of another person in close proximity to them, had low-to-moderate rates of nonverbal self-stimulatory behavior, and had moderate-to-high rates of verbal behavior at baseline. Children with the least favorable treatment outcomes exhibited very low rates of toy play, approach behaviors, and verbal behaviors at baseline. They further exhibited modest rates of avoidant behavior and nonverbal self-stimulatory behavior at intake. Another study examining predictors of child development over time in children with ASD found that those children who had better toy play skills and imitation ability at age 4 acquired communication and language skills at a faster rate than those with less developed toy play and deferred imitation skills (Toth, Munson, Meltzoff, & Dawson, 2006).

These studies suggest that there exists an important "starter set" of skills that likely set the stage for future development in a variety of areas. For example, in order to exhibit imitation skills, a child must child actively attend to the immediate environment, observe the events and actions taking place, then reproduce these events and socially-mediated actions at a later time. There must also be an active interest in people and/or things, representational thinking (forming and storing a mental representation), intact recall memory (calling up that representation at a later time), and both cognitive and motor planning skills in order to reproduce the action or event (Toth, Munson, Meltzoff, & Dawson, 2006). Unfortunately, the development of toy play, joint attention, and imitation skills are not the direct focus of most comprehensive treatment models. Future

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research should continue to explore those variables associated with children who are "non-responders" to treatment, as results may have important implications for the future of early intervention.

Although individual variability was observed across participants, in general, children who exhibited higher levels of autism symptoms at baseline appeared to make more gains over time (as evidenced by CARS and ADOS scores), compared to their counterparts with less severe baseline symptomology. Although the majority of findings examining the relationship between cognitive ability and treatment progress suggest a positive correlation between intelligence and progress, (e.g., Eikeseth et al., 2002, 2007; Hayward, Gale, & Eikeseth, 2009; Sallows & Graupner 2005), a recent investigation found that children enrolled in TEACCH classrooms with lower cognitive ability at baseline showed more improvement in autism severity level over time, compared to those children with higher cognitive ability at baseline (Boyd et al., 2014).

It is possible that the findings in the current study could be attributable to children with lower cognitive abilities likely having more severe deficits across several areas of functioning (social skills, language, autism symptoms) and thus more room for improvement. It may also suggest that some of the environmental, curricular, and behavioral supports used in the Sprouts program are more beneficial to children with greater cognitive impairments. For example, the Sprouts program makes frequent use of visual supports and strategies (i.e., PECS, visual schedules), which may assist lower functioning children in being able to have greater access the curriculum and communicate with teachers and peers. Furthermore, the Sprouts program aims to individualize its programming as much as possible, which may result in greater attention and focus for

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those lower functioning children than in other programs who ascribe to a more "one size fits all" treatment. In a similar fashion, TEACCH aims to organize the physical environment in a way that is consistent with the needs of the child (e.g., minimizing possible distractions), including the use of visual schedules of daily routines and visual materials, which may explain the commensurate results observed across studies.

Furthermore, age did not seem to be a moderator in our evaluation; that is, those children who were younger at baseline did not necessarily make more gains than those who were older. This finding is generally supported by research that found age at intake predicted neither treatment outcome nor gains in treatment (Hayward 2009). Similar findings have been reported by Eikeseth and colleagues (2002; 2007) and Lovaas and Smith (1988). Findings from a recent meta-analysis of TEACCH studies suggest that intervention effects are more variable at younger age, and gains may actually depend more on functioning level at baseline rather than age (Virues-Ortega, 2013).

Treatment factors. The results presented in the current investigation are even more impressive when the intensity of the intervention is considered. That is, at 13 hours per week, the Sprouts program itself is only considered semi-intensive. Many strictly behavioral programs posit that greater gains are observed when treatment intensity is high (greater than 30 hours per week), however there is much variability in the literature regarding this topic. That is, some studies have suggested that the number of treatment hours per week does not correlate with outcomes when the outcome in question is an IQ score (e.g., Luiselli et al., 2000). With the exception of the UCLA treatment programs, most of the branded CTMs described herein (e.g., LEAP, ESDM, Floortime) are considered semi-intensive, and provide 12-20 hours of intervention per week. These

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studies all cited improvements in children over time regardless of the number of treatment hours per week. In contrast, recent data on the effectiveness of TEACCH (Elias et al., 2014) indicate that very low intensity intervention (4 hours per week) may not be sufficient to observe differences between intervention groups and control groups. Thus, it appears likely that there is a specific dose-response relationship that peaks at a certain point of intervention intensity; however research has not yet identified the level of intensity at which optimal outcomes are observed.

Treatment package. The current treatment package utilized behavioral techniques within a developmental framework to provide individualized services to the children enrolled in Sprouts. The observed effectiveness of this "eclectic" treatment package indicates that eclectic models are capable of producing observable gains in a variety of skills. Although strictly behavioral models have been favored in the literature and have been shown in a few studies to surpass more eclectic models (e.g., Eikeseth, 2007), the outcome data from the Sprouts early childhood program suggest that the use of an eclectic model of intervention does not impede child progress. In fact, based on the evidence reviewed above, it appears as though the Sprouts model is particularly well-suited to address those areas in which other models may be lacking (i.e. lack of overall decreases in autism symptomology, lack of adaptive skill gains). Although the majority of early intervention outcome projects have focused on the use of a single technique, such as ABA (e.g., Lovaas, 1987), naturalistic/play-based teaching (McGee et al., 1999; McGee et al., 2000), or Floortime (Greenspan & Weider, 1998), it appears more practical to integrate and individualize various evidence-based intervention techniques. This is further beneficial when one considers that eclectic programs are more likely to be

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implemented in community-based settings. That being said, few studies have actually examined the efficacy of integrating best-practice treatment methods (e.g., Jacobson & Mulick, 2000). The current research on the Sprouts program provides some evidence that a combination of treatment techniques found to be effective, and designed with the best fit for the child and family in mind, leads to positive outcomes for children with ASD. This has significant implications for real-world applications and replications of the Sprouts program in community-based settings.

Research to practice. The need to span the gap between treatments developed in highly controlled research settings and services delivered in community settings has been identified as a critical area by the National Institute of Mental Health (Report of the National Advisory Mental Health Council's Behavioral, 2000; Report of the National Advisory Mental Health Council's Clinical, 1999). The current study helps to bridge the gap between research and practice by showing that a manualized early intervention program with an eclectic treatment package and semi-intensive level of treatment can be effective in improving the outcomes for enrolled children across a wide variety of developmental areas in a relatively short period of time (9 months). Furthermore, the high level of integrity observed in the current study indicates that the Sprouts program may more easily lend itself to effective implementation, especially when compared with fidelity data of other programs, which took up to 2 years to reach acceptable integrity levels (LEAP), or never reached acceptable levels (STAR). Although mimicking the integrity model utilized by the current study would require more resources (i.e., frequent integrity observations by trained observers), the benefits much outweigh the costs when one considers the more immediate effects on child outcomes and increases in

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developmental trajectories observed when an intervention package is delivered with high integrity.

General conclusions and considerations

Based on the results presented herein, the Sprouts program appears to be an effective early intervention program for increasing child gains in receptive communication, social skills, adaptive functioning skills, and reducing autism-specific symptomology over time. Particularly, while enrolled in the Sprouts program, all participants made gains in social skills, adaptive functioning skills, and fine motor skills. Seven of the eight children increased their developmental rate over time in receptive language ability, seven of the eight decreased their display of autism symptomology over time, five of the eight increased their developmental rate in expressive language ability, and five of the eight increased their developmental rate in visual reception skills; all demonstrated by their performance on standardized assessments, direct observations of behaviors, and parent report.

These data show that the Sprouts program was able to help the majority of enrolled children achieve meaningful outcomes in social skills, receptive language, cognitive development, and adaptive skills in a relatively short period of time (9 months). Compared to other early intervention CTMs, Sprouts participants made similar gains in certain areas (i.e., communication and social skills), and exceeded or extended the gains made in others (i.e., autism symptoms, adaptive functioning, parent stress levels, treatment fidelity ratings), but were less impressive in cognitive gains. Overall, the Sprouts program presents a more comprehensive picture of child gains and corresponding changes in developmental trajectories after 9 months of intervention than any other

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published CTM to date. Many previous studies of CTMs utilize and report on only a few select outcome variables (e.g., cognitive ability, adaptive functioning and language skills), while the current study combined all those presented in the literature to present a more complete picture of participant gains across several areas of functioning.

Similarly, the current study extended those results found in previous published literature on CTMs through its use of multiples measures of the same construct. That is, the current investigation utilized multiple measures of both expressive and receptive language ability (MSEL and PLS-5), as well as social skills (SSRS-2 and ABBLS), and autism symptomology (CARS-2 and ADOS). This lends further support and validity to those gains observed across both assessments (which were similar in magnitude), and the use of direct observations of child behavior in some assessments further strengthens parent or teacher reports of similar gains.

In addition, parents of child participants reported a decrease in their own stress levels following their child's enrollment in the program, and additionally reported high levels of social validity in regards to the Sprouts programming and teachers. Finally, the current study is one of only three known CTM outcome studies to include and consider treatment fidelity data, and is the first to demonstrate that the program was able to reach 80% fidelity in intervention implementation after just 6 months. This has important implications for future replication and practice, and indicates that although it may require more time and resources up front, conducting more frequent fidelity observations and feedback to staff appears to lead to higher levels of intervention integrity in a shorter period of time. Overall, the current data suggest that the Sprouts program accelerates

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overall child development in several areas and has the potential to be a viable model of service delivery for young children with ASD and their families.

Limitations and future directions

Although the gains displayed by participants enrolled in the Sprouts comprehensive treatment model are undoubtedly noteworthy, it is important to acknowledge several methodological limitations to this study. First, this is a program evaluation with data from a small sample of participants, which limits the generalizability of our findings. In addition, there was no control group for our study. Although positive changes in developmental trajectories were noted following intervention, we cannot say definitively whether this group of eight children with ASD would have made similar gains without intervention or with a different intervention. Common sense and clinical experience will lead most readers to suggest that a "no treatment condition" would not be an ethical or legal option for these children, but without an experimental design gains cannot be solely attributed to the intervention package alone. Similarly, some participants were enrolled in additional therapy hours while attending Sprouts, and all attended a public school early childhood placement, so it is difficult to proclaim that the observed gains were a result of the Sprouts intervention package alone.

Moreover, given that the Sprouts program is an eclectic model that contains several elements (i.e., ABA techniques, developmental perspective, 1:1 therapy, social skills training, parent training and support), it is difficult to determine which exact components were responsible or necessary for the children's gains. In all probability, it is likely that the combination of these elements contributed to the children's progress. This claim is supported by recent research that found that two groups of children made similar

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gains while enrolled in completely different comprehensive treatment programs; LEAP and TEACCH (Odom, 2014). However, further research in this area is warranted to determine if any specific components of CTMs that lead to greater child gains can be isolated.

Although quite comprehensive in nature, our assessment battery was lacking a measure of participants' behavioral difficulties, which presents another possible limitation. Our study did not directly assess participant's behavior difficulties nor report on improvements in these problems over time. Given that the Sprouts intervention package includes the use of behavioral management techniques as necessary, it may be important to further identify behavioral difficulties, specific behavioral interventions utilized, and child behavioral outcomes to more thoroughly assess outcomes of the intervention in future investigations/replications.

Future studies investigating the effectiveness of CTMs for children with ASD should consider several areas of evaluation. First, the literature is lacking in long-term follow-up studies to assess whether these children maintain their initial gains as they get older. Initial findings on this matter tend to yield disappointing or unclear findings; a follow-up study on children enrolled in the Children's Toddler School from age 2-3 indicated that autism symptomology and autism diagnoses remained stable over time, and social skills remained a weakness across the 29 children who ranged from age 4-12 at time of follow-up (Akshoomoff et al., 2010). Whether the children in the current study will sustain their gains over a longer term is an important question that will require follow-up study. One year follow-up data on the cohort of Sprouts participants described in this investigation is currently being collected.

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In addition, future studies should attempt to mimic a broad assessment battery such as the one utilized in the current investigation, as a more comprehensive picture of child gains over time lends more support and validity the efficacy of the intervention package. Similarly, the use of treatment fidelity measures should be an integral part of any early intervention program. Finally, although initial research has found negligible differences between the various types of CTMs (behavioral, developmental, eclectic), further investigations in this area are warranted and should attempt to isolate characteristics of these programs to see which appear to be most effective.

Outcomes of the current investigation provide preliminary support for the use of an "eclectic model" that combines techniques from the different theoretical approaches of other CTMs to more comprehensively target child outcomes. Therefore, it may not be that one program's techniques or theoretical viewpoint is better than another, but rather it is the unique blend of those components pulled from multiple early intervention programs and applied to treatment using an individualized perspective that is the true key to increasing developmental trajectories over time, and improving positive outcomes for young children with ASD.

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APPENDIX A

THE SPROUTS PROGRAM MANUAL

The Sprouts Early Childhood Program
Program Manual

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Rationale

The Sprouts program is a semi-intensive, therapeutic early intervention service for children ages 3-5 that present with a diagnosis of an Autism Spectrum Disorder (ASD). The Sprouts program arose from the need to provide more intensive services to the growing numbers of young children in the Bloomington-Normal community diagnosed with ASD. Since research indicates that intensive early intervention is the most effective way to see significant gains in young children's skill development, the need for an early childhood program specifically for children with ASD was evident. Since its inception in Summer 2008, Sprouts has grown and evolved into a multi-disciplinary program that provides comprehensive, individualized, and evidence-based treatment to young children with autism spectrum disorders.

Theoretical framework

The Sprouts program is based on a combination of behavioral principles administered within a developmental approach to treatment.

Research findings demonstrate that behaviorally-based early childhood intervention programs can positively impact the long-term developmental trajectories of young children with ASD. Sprouts employs primarily only those research-based practices listed as "Established" in the National Standards Project (NAC, 2009). This includes components of Applied Behavior Analysis, visual strategies, and naturalistic teaching strategies, to name a few.

ABA defined:
- Applied: principles applied to socially significant behavior
- Behavioral: based on scientific principles of behavior
- Analysis: progress is measured and interventions are monitored

Rather than being tied to specific procedures, applied behavior analysis includes any method that changes behavior in systematic and measurable ways (Sulzer-Azaroff and Mayer, 1991). Behavioral approaches emphasize acquisition of discrete skills, and interventions are evaluated in terms of whether they produce observable and socially significant changes in children's behavior.

The Sprouts program also employs a developmental framework in that each activity is highly differentiated to meet the needs of each child and attempts to use materials and tasks that fit each individual child's developmental level in a particular area.

Mission statement

Through the systematic implementation of specific evidence-based procedures, Sprouts strives to:

- Provide semi-intensive, supplemental services (in addition to the child's current educational programming) for children with Autism Spectrum Disorders using research-based methods
- Coordinate services with Early Childhood Education (ECE) teachers & other service providers (Speech, OT, etc)
- Implement individualized programs to help children reach individual goals targeted towards specific areas of need
- Structure activities in order to increase communication skills, social awareness, and foster each child's independence with functional routines needed for success in school
- Utilize activities that promote generalization of skill sets across environments
- Develop support among parents through weekly support group meetings and provide information and resources to parents in specific areas as needed
- Collect data on each child's progress with their specific goals in order to monitor progress and make data-based decisions about treatment
- Assist children & families with the transition from Early Childhood services to kindergarten

Program Goals

The primary goals and objectives for each child enrolled in the Sprouts program are as follows:

1. To increase independence with functional routines (i.e., going to the bathroom, washing hands, lining up)
2. To develop and increase functional communication skills
3. To develop social skills (including social awareness, interactions with peers and play skills)

These goals are tailored to each child's specific level. All curricular activities are constructed with these goals in mind, and are differentiated based on each child's individual level of functioning. The long-term goal for all enrolled children is towards inclusion of the children in Sprouts into kindergarten classes with typical children. The Sprouts programs focuses on certain prerequisite skills are needed for children with ASD to benefit from inclusion with typical peers, and the Sprouts program specifically aims to teach those skills. For those children who demonstrate the skills necessary for building successful interactions with typical peers, Sprouts helps arrange for alternate placements in the community that allow for the inclusion of these children in typical settings. Depending on the child's level of need, support is provided to the child in the alternative setting via consultation or one-on-one assistance in the typical classroom.

Staffing and Supervision

Sprouts is staffed by a lead teacher, an assistant teacher/small group leader, and 5-7 classroom assistants. Sprouts is unique in that it is staffed entirely by graduate students in the school psychology and speech and language pathology programs at Illinois State University, and undergraduate students in psychology, special education, nursing, and speech and language pathology programs. Graduate students with specific training serve as the lead teachers in the classroom, and undergraduates typically serve as assistants and one-on-one clinicians for the children.

All staff are extensively and specifically trained in evidence-based techniques and data collection procedures prior to the start of each semester. All graduate teachers hold a bachelor's degree in psychology from a four-year institution as well as have a minimum of one year of experience working with children with Autism Spectrum Disorders. All graduate teachers are trained in all intervention techniques through didactic instruction, practicum seminar courses, and hands-on experience.

Undergraduate classroom assistants complete a semester-long course during which they receive specific training in defining autism spectrum disorders, discrete trial training, Picture Exchange Communications System (PECS), reinforcer assessments, visual schedules, pivotal response training, how to evaluate individual treatment outcomes based on data, and how set up an effective learning environment for children with ASD. In addition, all staff receive 6-9 hours of training at the start of each semester specifically on Sprouts policies and procedures and evidence-based techniques. Additional training on specific interventions, data collection techniques and behavior support plans may occur throughout the semester as needed. In addition, all undergraduate staff receive specific feedback on their performance via two conferences held with graduate teachers both mid-semester and at the completion of Sprouts.

All Sprouts staff are highly supervised by a licensed clinical psychologist; graduate staff receive weekly group supervision from the clinical director, a PhD-level clinical psychologist with over 20 years experience working with children with ASD. In addition, all graduate staff receive additional weekly individual supervision from either the clinical director or an advanced graduate staff member (i.e., the lead teacher or program coordinator). Undergraduate staff meet with graduate teachers daily for 15-minute meetings before and after

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Sprouts to discuss any updates. They also meet bi-weekly with the graduate staff to discuss individual programming for specific children, behavior plans, and other issues that may arise during the week. Additional supervision meetings are scheduled as necessary.

Sprouts Program Overview

The Sprouts Early Childhood Program serves up to 9 children with ASD and provides 12.5 hours of intervention per week. In addition, each child enrolled also attends their public school early childhood program, which ensures all children are receiving at least 25+ hours of early intervention each week.

Sprouts runs from 8:30-11:00am every weekday morning, and much like a typical preschool program it includes daily activities such as centers, welcome circle, music, small group, a large group activity, and free play. In addition, Sprouts is a unique setting in that each child also receives individual therapy from a clinician for 30 minutes each day.

A central component of the Sprouts program is the existence of predictable daily routines, which are organized according to a visual schedule of activities. Each activity has a specific purpose and is highly structured. In addition, all activities are differentiated based on the individual developmental level of each child.

Sprouts Daily schedule		
Activity	*Time*	*Purpose*
Arrival: children hang up backpacks and wash hands	8:30	To foster the independent completion of functional routines needed for success in school and life (i.e., washing hands, taking off a coat, hanging up a backpack)
Table Top/Centers	8:30-8:45	Tasks meant to increase fine motor skills, pretend play, early literacy skills, and foster independent task completion using highly preferred items
Welcome Circle	8:50-9:00	Targets receptive and expressive identification of peers and teachers through a "who's here" activity, promotes engagement and functional skills (sitting on the carpet)
Story	9:00-9:10	Targets listening, engagement, attending, joint attention skills, early literacy skills
Individual therapy	9:10-9:40	Focuses on the individual needs and goals of each child using discrete trial training, pivotal response training, and play-based interventions where appropriate
Small group	9:10-9:40	Targets communication skills (asking for materials/reinforcers), targets parallel play and engagement with common materials as peers, provides exposure to sensory stimuli (i.e., paint, shaving cream), targets following multi-step directions and independent task completion
Music	9:40-9:50	Targets imitation skills, joint attention, engagement, turn-taking using instruments, social interactions, communication
Social group time	9:50-10:05	Targets identification of peers, social and play skill development, turn taking, following directions, and gross motor skills
Individual/Small group	10:05-10:30	See above
Snack	10:30-10:45	Provides opportunities to request desired food items using verbal or non-verbal communication methods (i.e., PECS). Also targets functional life skills (i.e,. feeding onself)
Structured free play	10:45-10:55	Targets individual play skills and social skills while engaging with various toys/games, also works on parallel play, pretend play, sharing, social interactions
Clean-up/Goodbye	10:55-11:00	Targets independent completion of functional routines needed for success in school and life; targets social and communication skills

Curriculum

The Sprouts curriculum is developed based on a combination of research-based practices for children with ASD, integration of activities that correspond with the Illinois Early Learning Standards, and use of developmentally-appropriate and reinforcing activities.

Unlike other early childhood programs, the Sprouts curriculum is not standardized; rather it is developed weekly by the Curriculum Coordinator. This flexibility allows for all activities to be based on the various skill levels of each child enrolled, as these change throughout the semester. In addition, as children with autism's reinforcers tend to change frequently, the Sprouts curriculum is such that those items considered highly reinforcing can be continuously incorporated into daily activities. Finally, incorporating new research-based techniques is a hallmark of the Sprouts curriculum.

The Sprouts curriculum is highly unique in that it is individualized to meet the various developmental levels of each child enrolled.

Commonly used evidence-based curricular activities include:

- *Storybook Based Curriculum*: is used to develop themes and activities. This focuses on developing emergent literacy skills with an emphasis on language development.
- *STAR (Strategies for Teaching Based-on Autism Research) Comprehensive Curriculum*: this is a structured intervention program typically used to teach children critical skills using Applied Behavior Analysis (ABA) instructional methods during individual time and small group activities.
- *ShoeboxTasks*: during centers these are typically used to address specific goals for each child. They are specifically made for children with autism to help develop fine motor skills.

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Data collection

A critical component of the Sprouts program includes the development of meaningful data collection systems that effectively track the progress of all children towards their individual goals.

Within the realm of early childhood programs, specifically those for children with ASD, specialized instruction related to children's individualized goals and objectives are usually embedded within the daily curriculum and activities. Thus, the need for effective data collection procedures across all settings is crucial.

In Sprouts, data is collected daily on each child's progress towards goals in both the classroom and individual settings. Specific methods of collecting data (i.e., frequency counts, rating scales, etc.) towards each child's goals are decided by the child's graduate program coordinator.

Commonly used methods of collecting data at Sprouts include: anecdotal daily progress notes, numerical rating scales, frequency counts of behavior, duration recordings, direct observations of behavior, and trial-by-trial data.

Data is frequently graphed and progress is discussed by the Sprouts staff at weekly group supervision meetings. In addition, graphs of child progress are shown in the child's progress reports, which are written and shared with parents twice each semester.

Parent Support and Training

Sprouts maintains that collaboration between families, schools, and other professionals is an integral part of effective treatment. Thus, parent participation is an integral part of the Sprouts program. The Sprouts parent education and support component consists of weekly mandatory 1-hour support and training groups, daily communication with the graduate staff in the classroom via home-notes and verbal discussion, frequent parent conferences to discuss data and progress, and weekly updates on each child's successes via Star Moments and classroom videos.

Support/training group
During the Sprouts parent group each week, the group leader discusses classroom issues, educates parents about topics relevant to ASD and special education, and provides support to families. In addition, the group leader helps parents choose specific goals for their children to work on at home, and provides specific skill training for families focusing on behavioral strategies, communication techniques, visual strategies, goal setting, self-help skills, and stress reduction.

A resource room is also available at the clinic that provides books, DVDs, and materials that parents can check out to learn about research-based treatments and techniques, school district information and policies, or to make materials such as visual schedules or PECS cards.

Homenotes
Each child has a note sent home each day that lets parents know how the day went and in which activities the child participated. In addition, each parent is encouraged to write a note back to the teachers each morning, so the staff is aware of how the child slept, what they did in the evening, and any other important information from parents. For an example of the daily home-note, see Appendix X.

Videos & Star Moments
Sprouts values an environment of positive energy and believes each child should be celebrated for the skills and successes they display each day. Thus, Sprouts praises each child's individual accomplishments and daily progress towards individual goals via the classroom Star Moments board. Staff write down "star moments" for each child throughout the day, and these are shared with both staff and parents during weekly parent group. In addition, Sprouts takes

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frequent pictures and videos of children's accomplishments and participation in daily activities throughout the week that are also shared during parent group.

Conferences
Parent conferences are held four times a year in order to update parents about their child's progress with individual as well as group goals and activities. During these 30-45 minute meetings with a graduate teacher, parents are presented with data on their child's progress as well as videos of the child engaging in classroom activities and a written report of progress. A copy of the child's progress report is also kept on file at the clinic.

Outside Service Coordination and Collaboration
Each graduate program coordinator also serves as the child's public school liaison. Their role is to communicate with the schools and other service providers the child has by collaborating with outside professionals, consulting with educators, attending relevant IEP meetings, and working towards consistency for the Sprouts children across all settings.

Sprouts Roles and Responsibilities

A variety of roles exist within Sprouts each year. Depending on available staff and resources, roles and responsibilities may change from semester-to-semester. Below are descriptions of roles commonly fulfilled during the Sprouts school year.

Program and Curriculum Coordinator:
- Responsible for the coordination of Sprouts services at the systems level, with an emphasis on collaboration with the Sprouts graduate team, including arranging and establishing service implementation, organizing the staffing and training of undergraduate students, communicating with supervisors in other disciplines participating in Sprouts, leading weekly Sprouts graduate staff meetings, and providing feedback and suggestions to teachers and assistants as necessary.
- Also responsible for the development and dissemination of the weekly Sprouts curriculum plan using relevant research in the field and available resources and materials.

Sprouts Parent Liaison:
- Responsible for primary parent communications, including the distribution of important announcements and updates regarding the Sprouts program as a whole. Also leads the weekly parent support/training group and serves as a liaison between parent inquiries and the Sprouts graduate staff.
- Responsible for sharing classroom videos and star moments with the parents each week.

Lead Sprouts Teacher:
- Responsible for providing consistency in leading the majority of classroom activities, including welcome circle, story, music, and large group.
- Facilitates classroom transitions, leads before and after-Sprouts meetings, and disseminates instruction and feedback to classroom assistants as necessary.
- Responsible for recording the Star Moments at the end of each day.

Assistant Teacher/Small Group Leader:
- Responsible for leading all small group activities, preparing the required materials each week, and providing instruction and feedback to small group assistants.
- Collaborates with the curriculum coordinator in the development and implementation of small group activities.
- Responsible for assisting classroom assistants in the appropriate implementation of behavior techniques and procedures during activities

Classroom Clinicians:
- Responsible for various daily set-up and clean-up tasks, as well as providing one-on-one assistance to the children during all classroom

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activities, implementing behavior support plans as instructed, collecting data for specific children, and preparing materials as requested.
- Responsible for the implementation of daily individual services to specified Sprouts children
- Responsible for daily in-class data collection for specified children
- Communicates with individual program managers weekly or as questions arise about the progress of the children and program implementation

Individual Program Coordinators:
- Responsible for the planning and development of specific children's individual programming. This includes the development of individual goals and behaviorally-based programs and materials to be implemented by program clinicians during daily individual sessions.
- Responsible for data management and progress monitoring of goals
- Responsible for the training of and weekly communication with individual program clinicians
- Responsible for the production and dissemination of individual behavior plans
- Responsible for writing progress reports and leading conferences with parents twice a semester to discuss their child's progress towards goals.
- Responsible for communicating with the child's early childhood school placement to successfully coordinate services across environments. This may require attendance at IEP meetings and occasional school observations

Sprouts Graduate Clinician
Daily Responsibilities

<u>Morning prep:</u>
Lead teacher:
- o Make sure homenotes are prepped for the day

Small group leader:
- o Make sure all materials are ready and in the small group bin
- o Make sure you have PECS cards of all materials
- o Make sure you have a completed model/example of the craft

<u>Morning meeting:</u>
Lead Teacher:
- o Go over general announcements (non-kid related)
- o Kid updates (one-by-one)
    - o Behavior updates
- o Curriculum overview for day (focus on small and large group)
- o Make sure visual schedules and transition boards are ready
- o Get out Ipod (for music) and camera

<u>Table Top/Centers:</u>
Lead Teacher:
- o Go to waiting area and help escort kids to classroom
- o Talk to parents as they come in
- o Make sure kids are engaged at table top
- o Help with behavior management if necessary
- o When 5, 3, and 1 minutes left, give warnings
- o At clean up time, count down "3, 2,1 stop. It's time to clean up" and play clean up song
- o ***During this time you can also get homenotes from the kids backpacks to see if there are any important notes from teachers. Also check for extra clothes, diapers, snacks, books, etc.*

Small group leader:
- o Go to waiting area and help escort kids to classroom
- o Talk to parents as they come in
- o Make sure kids are engaged at table top
- o Help with behavior management if necessary
- o Help give warnings if lead teacher is doing other things
- o Play "everybody on the rug" while kids are transitioning to circle
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<u>Welcome Circle- Hello Song:</u>
Lead Teacher:
1. Check classroom schedule; pick kids to help take off the schedule cards

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2. Sing the rules song; can also pick a child to help you sing and demonstrate the motions
3. <u>Who's Here:</u> go through the nametags and sing hello to each child, have them come up and put their nametag on the felt board
   a. During this time promote peer identification and engagement. Some kids can say hello to all the teachers and their peers.
   b. After all kids have put their names on the board, do some academic tasks such as counting all the nametags, saying who is a boy and who is a girl, or going over the day of the week

Small group leader/support clinicians:
   o Help with behavior management
   o **If a child is interfering with the lead teacher in any way, it is important to physically help them back to their seat

<u>Welcome Circle- Story:</u>
Lead Teacher:
   o Pick someone to help pass out the books
      o Promote peer identification by having them say the peer's name when they hand them the book
   o Promote engagement, joint attention, and pre-academic skills
      o Ask questions about the story as you read
   o Choose someone to collect the books after the story
      o Work on manners ("book, please") and peer identification

Small group leader:
   o Start setting up small group materials; put out introductory activity at the table so the kids have something to engage in when they get there
   o Make sure you are sitting at the small group table when the kids are transitioning over to you
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<u>Transition to Small group/individual</u>
Lead Teacher:
   o Make sure the boards are close by you
   o Make sure you have all the faces for them to match
   o Have each child match their face on the small group or individual schedule boards; individual usually goes first, then small group kids

Support clinicians:
   o Make sure you anticipate the transition; when your individual child matches their face; be ready to take them!

<u>Small group:</u>
Lead Teacher
   o Help with behavior management as necessary
   o Checking homenotes if didn't get to it in the morning

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- o Erase/prep homenotes
- o Look in on individuals (especially for high-needs children)

Small group leader:
1. Start with an intro activity to grab their attention when they come to the table (this is usually pre-academic and related to the story)
2. After 5-7 minutes, transition to the craft activity for the day
    a. Children must request materials either verbally or using PECS
    b. Use differentiation; for kids who are lower functioning, they do not have to complete the whole activity, just parts of it!
3. End with a sensory activity

Helpful Tips for small group:
- o Preparation is key! If you do not have your materials ready, you will lose your kiddos interest quickly.
- o Be flexible! If an activity is not working out; be prepared to switch to something you know the kids enjoy (have a plan B).
- o End the activity at least 3-5 minutes before everyone else comes back to help the transition to music go smoother.

Music Time:

Lead teacher
- o Know the songs, the words to the songs, and all the motions!
- o Promote imitation during this time; encourage the kids to imitate you.
- o Let the kids choose a song.
- o Can also bring out instruments to play with (make the kids request these)
- o Have fun!!

Small group leader
- o Assisting with behavior management.
- o Helping prompt the kids through imitation.
- o 5 minutes before music is over, set up for large group activity.

Large Group

Lead Teacher
- o Lead the activity
    - o Promote peer interactions, turn-taking, following directions, etc

Small group leader
- o Behavior management
- o Putting away materials
- o Playing the transition songs for after large group is done

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Snack
Lead Teacher
- o Help gather snacks for all the kids (going to the refrigerator, popping popcorn, getting extra snacks, getting cups or utensils)
- o May assist with snack depending on staffing
- o Focus on completing homenotes
- o Countdown to the end of the activity starting at 5 minutes

Small group leader
- o Help gather snacks for all the kids (going to the refrigerator, popping popcorn, getting extra snacks, getting cups or utensils)
- o May assist with snack depending on staffing
- o Focus on completing homenotes with lead teacher

Free Play
Lead Teacher & Small group leader
- o Make sure at least one clinician is at free play to help facilitate interactions between the kids
- o Focus on completing homenotes
- o Gather crafts in cubbies to be ready to send home
- o Collect PECS books, cups, Ipads, etc to be ready to send home
- o Get kids ready who need shoes put back on, etc.
- o Countdown to clean up starting at 5 minutes
- o Play clean up song and everybody on the rug to transition to goodbye circle (at least 2 clinicians should be assisting with clean up at free play area)

End of the Day
Lead Teacher
- o Check schedule
- o Hand out homenotes one at a time to kids who are sitting
  - o Promote academic skills by asking them what color their homenote is
- o Once all homenotes are passed out, assist clinicians in helping kids line up
- o Have kids line up on purple line; sing the "are you ready" song (lead teacher should be at the head of this line)
- o Lead the line out of the classroom and out to the parents!

Small group leader
- o Play goodbye song for lead teacher once the schedule has been checked
- o Help kids put their homenotes in their backpacks

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- o Promote independence; kids who are able should put their homenotes in their backpacks and zip them up independently
- o May need to stand by the door to block kids from running out early!
- o Sing "are you ready" song with lead teacher
- o Stand at the end of the line to make sure all kids get out of the classroom!

After-Sprouts Meeting
Lead Teacher
- o Make sure undergrads have completed after-sprouts responsibilities (cleaning, vacuuming, organizing, putting away craft materials, etc)
- o **Make sure individual rooms have been cleaned and materials put away**
- o As a team, discuss how the day went, and any issues that occurred
- o Be sure to have each clinician talk about how their individual session went that day
- o Go over Star Moments!!! **Write these down to be given to parents at parent group
- o **Fill out contact log for each child!**
- o Tell everyone any important information the parents told you about certain kids

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Parent Communication
All Graduate staff
- o Talk to parents in the waiting room to touch base about how the day went; make sure you talk about any aggressive behaviors that may have occurred (by their children or towards their children), or issues that happened during the day

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Guide to writing homenotes
Lead teacher and Small group leader
- o Sandwich your comments: start with something positive and end with something positive!
- o Anything negative should be phrased as nicely as possible, but BE HONEST
- o Aggressive behaviors should *always* be shared with parents
- o If you can't think of anything to write, check the star moments board and write one of those!
- o Make sure to note if they need more diapers or snack (and double check this to be sure!)
- o Ask Undergrads if they have anything to add or share in the homenote

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SPROUTS MANUAL APPENDICES

What I Did At School Today

Date: _____

In Class Today I:

Social group activity:_____
Craft: _____
Sensory:_____
Story:_____
For snack I ate:_____

Potty: Yes: No:
   In toilet!   In diaper/pull up   dry diaper/pull up   said "No thank
                                                                        you"

For individual I worked with_____
      We worked on:

 My favorite part was:_____

**Today I
was:**

Notes about my mood:

Notes from my Sprouts teacher:

What I did At Home:

I went to sleep at: _____

I slept (circle):   all night   part of the night

Fun things I did at home:

Important notes for my teachers:

Sprouts
Progress Report for Parents- Individual Therapy
(Date/Year)

Client:_____   Weeks of therapy: from _____to _____

General comments:

Goal #1:

Progress towards goal (specify classroom and/or individual):

Data/graph:

Goal #2:

Progress towards goal (specify classroom and/or individual):

Data/graph:

Goal #3:

Progress towards goal (specify classroom and/or individual):

Data/graph:

Identified Strengths:

Continued areas to work on this semester:

_____

Individual Program Coordinator

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Appendix C. Sprouts Curriculum Examples

Small Group Activities-at-a-Glance
Grow It!

Date: _____

Plan of Activities List
1. Introductory Activity
   o Watercolor painting
2. Craft Activity
   o Planting seeds!
3. Sensory Activity
   o Dirt/grass/flowers

_____

Treatment Goals:
- To develop and increase expressive communication skills (requesting necessary craft items)
- To develop and increase fine motor skills (watercolor painting)
- To gain exposure to sensory stimuli (dirt, grass, flowers)
- To provide exposure to pre-academic skills via a science-type activity (planting)
- To learn to follow a visual schedule of activities and follow steps to complete a craft
- To increase social interactions (opportunities for parallel and cooperative play when completing activities)

Materials needed:
- Small group visual schedule
- PECS cards of all materials
- Flower pictures to paint
- Watercolor paints
- Paintbrushes
- Small cups for water
- art smocks
- Styrofoam cups
- Egg cartons
- Dirt
- Seeds
- Plastic spoons
- Markers

BEFORE small group starts:
- *set out watercolor paints and various flower pictures so you grab the kiddos attention when they arrive at the table.*

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-   *Make sure you have an example of a plant cup made already for them to see. Make sure you have easy access to all the other materials you will need*

Suggested Small Group Procedure:

1. Start with all the kids at the small group table and let them choose a flower picture to paint. Demonstrate how to dip the brush in the water, then the paint, and then paint on the picture. Have the kids request the watercolor paint either verbally/via PECs. *If the water becomes a problem for some kiddos, you may need to take the cup and regulate when/how often they have access to it.*

2. After 7-10 min or as the kids lose interest, bring out the small group visual schedule and show them the plan of activities. Then, show them your cup and talk about how they are going to grow a plant just like in the story. *You may want to bring out the book in order to draw clearer connections.*

3. Let the kids choose if they want a cup or an egg carton. Have them request markers so they can decorate it.

4. When they are ready, help them scoop dirt into the cups using plastic spoons. Let them pour the seeds in/push them into the dirt. Make sure to prompt them to request all these materials.

5. As they complete the activity, have them place their cups on the windowsill and transition them to the sensory table by showing them the small group visual schedule.

Alternative activities/Important Reminders:

o   For certain kiddos, it is fine to just let them play with the dirt/soil.
o   Don't let anyone eat the soil!!
o   If there is extra time, you can also transition the group to the carpet and bring out instruments while waiting for music or snack to begin.

Monday Small Group Visual Schedule

1. Watercolor painting

2. Planting seeds

3. Sensory table

APPENDIX B

TREATMENT INTEGRITY CHECKLIST EXAMPLE

Date: _____   Observer: _____

Time: _____

Key:
5= Full and complete implementation (no issues)
4= Adequate implementation (1-2 minor issues)
3= Partial implementation (3 issues)
2= Lacking implementation (4-5 issues)
1=NO implementation/clearly needs improvement (5 or more issues)

Small Group 1

Small group Organization/Visual schedules

1. Visual schedule is easily visible and accessible to children and staff

    5   4   3   2   1

2. Schedule is addressed throughout small group and followed during each activity by the teacher

    5   4   3   2   1

3. Distracting stimuli are removed or reduced from the table as necessary (i.e., table should not be cluttered with materials)

    5   4   3   2   1

General Teaching Strategies

1. Adapts materials to meet children's individual needs:
    *   Enlarges and stabilizes materials for children with motor difficulties (if applicable)
    *   Uses materials that are highly interesting and reinforcing to the child

    5   4   3   2   1

2. Addresses **multiple** skills with each activity (i.e., works on communication, social skills, and fine motor/independence during craft or sensory)

    5   4   3   2   1

3. Follows a hierarchy of prompts when assisting children to reduce prompt-dependency (i.e., when gluing materials or painting, don't always do it for the child, encourages independence first before prompting)

    5   4   3   2   1

4. Uses modeling and imitation to assist with completion of crafts

        5   4   3   2   1   N/A

5. Provides children with opportunities to make choices about what activities they want to engage in at small group

        5   4   3   2   1   N/A

Communication skills

1. Encourages children's verbal and nonverbal communication by addressing and responding to most communicative attempts (even if the child is asking for snack or a toy)

        5   4   3   2   1

2. Requires children to request craft materials either verbally or via PECS

        5   4   3   2   1

3. Engages in parallel and self-talk to model language (i.e., talks about what materials the child is engaging with)

        5   4   3   2   1

4. Capitalizes on opportunities to increase communication whenever possible
   a. Sets up play to foster communication by using highly preferred materials and requiring children to request those materials
   b. Interrupts the child's activity to encourage continuous requesting of preferred items

        5   4   3   2   1

5. Integrates child's use of PECS into small group
   a. Ensures that PECS cards of all materials are readily available for use
   b. Teaches child to carry his/her PECS book to small group
   c. Encourages use of PECS to gain access to desired items

        5   4   3   2   1

Social skills

1. Encourages parallel engagement with peers in activities while at the activity

        5   4   3   2   1

2. Works on beginning social skills such as sharing or turn-taking (even if prompted)

        5   4   3   2   1   N/A

3. Considers peer placement during activities (i.e., put children next to each other who are more likely to interact; peers should be sitting next to one another, not next to teachers)

        5   4   3   2   1

4. Discusses peers in front of all children ("Bobby is using the red marker") and redirects a child's social initiations to peers (prompts these initiations if necessary)

        5   4   3   2   1   N/A

Behavior Management
1. Establishes clear consequences for behaviors (i.e., using nice hands chair for aggression)

        5   4   3   2   1   N/A

2. States rules and demands positively and avoids using word "no"
    (i.e., 'feet on floor' instead of 'no kicking')

        5   4   3   2   1   N/A

3. Frequently reinforces positive behaviors while ignoring negative ones (when appropriate)

        5   4   3   2   1

4. Gives appropriate directions
    *   Keeps direction short and specific
    *   Phrases directions as statements not questions
    *   States directions in calm, neutral tone of voice

        5   4   3   2   1

5. Uses interruption and redirection to teach desirable alternative behaviors
    *   Redirects disruptive behaviors into acceptable outlets

        5   4   3   2   1   N/A

Were the staff collecting data during Small group?   Y   N

APPENDIX C

RECRUITMENT FLYER

SPROUTS RESEARCH OPPORTUNITY

Sprouts Parents:
- o This fall, TAP at ISU is conducting a study to evaluate the effectiveness of the Sprouts early childhood program.

- o Specifically, we are examining the cognitive, adaptive, social, and autism-related changes in functioning for all participating children over a 12-month period of intervention.

WHO? Parents and children enrolled in the Sprouts early childhood program

WHAT? Researchers will analyze data collected on your child's goals to determine progress made over a 12-month period.

WHY? Research findings demonstrate that behaviorally-based early childhood intervention programs may positively impact the long term developmental trajectories of young children with ASD. This research could be very important in determining the components of effective intervention programs aimed at improving the outcomes of young children with ASD.

IF YOU ARE INTERESTED RECEIVING MORE INFORMATION ABOUT INCLUDING YOUR CHILD'S DATA IN THIS STUDY, PLEASE CONTACT LAURYN TOBY OR KARLA DOEPKE AT #309-585-0887. LAURYN CAN ALSO BE REACHED AT LAURYNTOBY@GMAIL.COM

**Your decision to participate or not will in no way effect your child's enrollment in the Sprouts program, nor will it effect their eligibility to receive other services at TAP.