

## **Social skills interventions for preschoolers with Autism Spectrum Disorder: A description of single-subject design studies**

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### Abstract

Social skill development is one of the primary areas of intervention for young children with Autism Spectrum Disorders (ASD). The purpose of this article was to conduct a retrospective review of social skills intervention research for preschool children with ASD. A review of 17 single-subject design studies from twelve journals (1999-2006) was conducted. We assessed information concerning the features of social skills interventions, the elements of single subject designs utilized across studies, and the overall success of interventions for social behaviors. A comparison with a review conducted by Vaughn et al. (2003) revealed some important common elements of interventions such as reinforcement, modeling and prompting, providing converging evidence from group design studies and single subject studies.

Keywords: Autism Spectrum Disorders, Social Skills, Intervention, Preschool

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The term, Autism Spectrum Disorder (ASD), is commonly used to identify a family of disorders, including, Autistic Disorder, Asperger's Disorder, or Pervasive Developmental Disorder Not Otherwise Specified, in the Diagnostic Statistical Manual–IV, Text Revision (DSM-IV TR; American Psychiatric Association, 2000). An individual with ASD exhibits deficits in core areas including social development and social skills, language and communication skills, and repetitive, ritualistic, stereotyped behaviors. Across the ASD spectrum, the expression of these deficits ranges from mild to severe.

### *Social Skills Deficits in ASD*

The primary deficit of ASD is social impairment (Romanczyk, White, & Gillis, 2005; Weiss, 2001; Weiss & Harris, 2001a). We use the term, social impairment to refer to any deficit or limitation or delay in social awareness, social competence, and social development. We define social skills as behaviors each person learns to facilitate awareness of his/her social environment and social contingencies, to be able to solve social problems (i.e., demonstrate social competence), and other behaviors that are developmentally appropriate.

Social skills deficits are common to all individuals with an ASD, are pervasive, and typically manifest at a very young age. The DSM-IV-TR (APA, 2000) lists the impairments in social interaction as: 1) deficits in nonverbal behaviors (e.g., eye-to-eye gaze, recognition of facial expressions, use of gestures to regulate social interaction), 2) failure to develop peer relationships appropriate to the child's developmental level, 3) lack of spontaneous seeking to share enjoyment and interests (e.g., failure to show, bring, or point out objects of interest), and 4) lack of social or emotional reciprocity (e.g., unable to or does not respond to emotions or social interactions from others).

ASD is a heterogeneous disorder, meaning that one individual with ASD will have differing areas of social impairment with differing levels of severity from another individual with ASD.

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Additional examples of social impairment observed in children with ASD include difficulties initiating social interactions, responding to the social initiations of others, initiating or responding to joint attention, and recognizing emotions in self. Areas of social impairment frequently observed in preschool age children with ASD include social play, dramatic play, friendship-seeking behavior, and cooperative play. Poor motivation to learn social behaviors or to engage in social activities is also commonly observed in children with ASD. These comprise only a fraction of social skills observed in individuals with ASD.

The extant literature suggests that early social impairments greatly impact future relationships, employment, independent living, and other mental health issues (e.g., anxiety, depression) (Bellini, 2004; Strain & Schwartz, 2001; Tantam, 2000). Thus, there should be an emphasis for intervention to occur early and to focus on the development of social skills in order to build social interactions and relationships. Unfortunately, it remains unclear as to *which* social skills are important to teach that will lead to better outcomes in areas related to social impairment for children with ASD. An issue that remains elusive and is of equal importance is to determine the specific types of interventions that effectively teach social skills.

#### *Normal Social Skills Development in Preschoolers*

Typical social development in preschool age children (i.e., ages two through five) involves the development of social interactions with peers and development of play behaviors. For all children, play begins with nonsocial or solitary play, when a child is content to play alone with toys/objects with or without the engagement of others in the same play activity. Children then develop parallel play, which is when a child plays with the same toys as another child, but does not necessarily interact with the other child (Rubin, Fein, & Vandenberg, 1983).

Children begin to form their first friendships between three and four years of age. At this age, children begin to increase cooperative and interactive play with peers and develop increased self-regulation (a necessary skill in order to play well with others). Children begin to understand turn-taking and simple rules to games in small groups. By the age of five, a child's social communication skills are more complex, for example, children will tell jokes, share a variety of experiences with others, and take turns in conversations (American Academy of Pediatrics, 1999).

Social skills interventions for children in the preschool age range focus on the improvement of behaviors related to social interactions with peers, including play skills (e.g., engaging in pretend play, sharing, turn-taking, etc). Other examples include, social communication skills (e.g., initiating and responding to others verbally or nonverbally), socio-emotional skills (e.g., affect recognition, empathy), and friendship skills. For children with ASD, focusing on age-appropriate skill development is important, but becomes difficult given the limited skill repertoires and difficulty in learning for children with ASD.

#### *Recent Review of Literature*

In a review of social interventions by Strain and Schwartz (2001), conclusions are made suggesting that there is plentiful research demonstrating the efficacy of teaching children with ASD specific social behaviors, including initiating and responding to social interactions. These authors identify the need to examine issues related to generalization and maintenance of social behaviors. In addition, the authors propose the use of eco-behavioral assessments (i.e., examining the behavior in applied contexts such as the classroom). Strain and Schwartz also emphasize the importance of social validity, in terms of evaluating the acceptability of an intervention by family members/caregivers and teachers and whether these interventions would be sustainable outside of the research setting.

There is a literature base to provide potential targets for social skills interventions (Terpstra, Higgins, & Pierce, 2002; Weiss & Harris, 2001a; Koegel & Koegel, 1995). However, the specific interventions that are successful for preschool children with ASD have not been fully confirmed nor endorsed by the majority of professionals across disciplines.

In an effort to examine key features of social skills interventions for preschool children with developmental disabilities, including ASD, Vaughn, Kim, Morris Sloan, Hughes, Elbaum, and Sridhar (2003) reviewed 23 group design studies from 1975 to 1999. Vaughn et al. (2003) found 10 categories or features important in social skills interventions. These included prompting (i.e., verbal or physical prompting of a social skill), rehearsal/practice, play-related activities (to elicit social skills), free-play generalization, reinforcement of appropriate social skills, modeling of social skills, social skills-related storytelling, direct instruction of social skills, imitation, and time-out (to decrease inappropriate behaviors).

Vaughn et al. (2003) calculated effect sizes for the studies reviewed and found that the studies with the greatest effect sizes included the following four features in the interventions: modeling, play-related activities, rehearsal/practice and/or, prompting procedures. It should be noted that the other categories listed in the previous paragraph were not necessarily associated with negative outcomes. For the 23 studies reviewed, there was an average of 3.4 categories of interventions included in each study. The authors stated that incorporating a free-play generalization phase is helpful in determining whether the above categories of intervention facilitated the generalization of the targeted social skills to new settings, peers, and social-related activities.

### *Single Subject Research*

Behavioral science not only aims to understand the nature of the determinants of behavior, but also how to apply these principles in order to change dysfunctional behavior through intervention. Interventions derived from empirical findings traditionally have been evaluated using two types of research designs. The two major types of research designs that meet the standards of scientific research methodology are single subject and group designs.

Single-subject and group designs provide valuable information. Both designs examine functional or causal relationships between an independent variable (e.g., an intervention) and a dependent variable (e.g., behavior) and to control for threats to internal and external validity. Operational definitions of the intervention and the targeted behavior(s) are also fundamental aspects of both designs.

Despite some methodological similarities, single-subject and group designs possess several important differences. First, group design studies measure dependent variables (DVs) before and after the intervention, whereas single subject design studies measure the DV(s), continuously and over time, including before (i.e., baseline) during, and after the intervention. This is especially helpful when a timely assessment of the effects of an intervention is warranted (e.g., determining the precise dosage of a medication).

Second, group designs require random or quasi-random assignment of participants to experimental and control conditions (to help control for threats to internal validity). Single subject designs, however, do not require the random assignment of participants. In other words, there are no “participant requirements”, per se, in single subject design studies. Single subject designs typically include between three to eight participants, on average, with each participant serving as his/her own control. This latter characteristic of single-subject designs eliminates the need for experimental and control groups. This is a major advantage when a social skills training intervention occurs in a classroom

of preschool children with ASD. As these children present with a heterogeneous skill set and, most likely, varying levels of functioning, it is difficult to obtain an adequate control sample.

Third, group design studies allow for statistical analyses that yield estimates of the causal effects of the intervention (e.g., Analysis of Variance). These analyses are not possible with single subject design studies. Rather, visual inspection of the data is utilized, which also permits inferences to be drawn about causal relationships between the independent IV(s) and DV(s). There are specific criteria established to guide the visual inspection process.

Single-subject designs can be particularly useful when conducting research in applied settings, which is often the case in the evaluation of interventions for individuals with ASD. As mentioned above, single-subject research provides for the examination of the effects of an intervention at the individual level. Important aspects of single subject research designs include: a) the demonstration of a functional relationship between treatment and behavior change; b) DVs are operationally defined; c) repeated measurement of the DVs over time; d) the illustration of social validity of the intervention; e) the use of methods for evaluating procedural fidelity and external validity; f) a description of the baseline phase with sufficient data collected to evaluate effect of the IV; and g) a thorough description of the participants and setting, to allow for replication (Horner, Carr, Halle, McGee, Odom, & Wolery, 2005). For a more comprehensive description of single subject research designs used in special education research, please see Horner et al., (2005).

#### *Current Review*

In this paper, we utilized the categories identified by Vaughn et al. (2003) in their review of group design studies to determine whether these categories were also included in single subject design studies. Vaughn identified modeling, play-related activities, rehearsal/practice and prompting as the features associated with the largest effect sizes and, thus positive results. Effect sizes were not calculated for this review, as this statistic is not typically utilized in single subject research studies due to the low number of participants.

The primary purpose of this review was to examine the state of the single subject research over the past five years for social skills interventions for preschool age children with ASD. A second purpose of this review was to assess whether the features of social skills intervention packages were similar in Vaughn et al's (2003) review of group design studies. A synthesis of the single subject research at this time is helpful in order to examine the status of interventions for social skills interventions and to identify areas that warrant attention for future research.

#### Method

We selected journal articles from PsychInfo and the search engine on the website for the *Journal of Applied Behavior Analysis*. Studies included in this publication were published between June 1999 and December 2006. Keywords utilized for this search included autism, ASD, Asperger's, handicapped, special education, language impairment, communication impairment, developmental delay, mentally retarded, social skills, joint attention, social referencing, imitation, friendship, and approach. Terms were entered alone and in conjunction with other terms, truncating the keywords when appropriate, i.e., *autis\** and *dev\**. We reviewed each article to determine if it met the inclusion criterion for this review, resulting in 17 studies. Articles came from many different journals (i.e., *Behavioral Interventions, Early Education and Development, Education and Treatment of Children, Educational Psychology in Practice, Development and Education, Focus on Autism and Other Developmental Disabilities, International Journal of Disability, Journal of Applied Behavior Analysis, Journal of Autism*

*and Developmental Disorders, Journal of Positive Behavior Interventions, Topics in Early Childhood Special Education, and Topics in Language Disorders).*

The criteria for inclusion used to select articles for review are presented below:

1. *Preschool Age.* At least half of the participants in each study were between the ages of 2 and 5.
- 1.2. *Design.* Only studies utilizing single subject designs were included. Group designs were excluded.
- 1.3. *Peer Review.* We only used articles that had been peer reviewed for this study in an attempt to include higher quality research.
- 1.4. *Social Skills.* Studies were included if they focused on increasing beneficial social behaviors or skills (e.g., joint attention, communication, appropriate eye contact, cooperative play, sharing, sociodramatic play, imitation, self-management, complimenting, initiating play, expressing sympathy, showing disapproval appropriately, showing appreciation, pretend play, group interactions, verbalizing requests).
- 1.5. *Diagnosis.* The majority of participants were required to have a diagnosis of an autism spectrum disorder (e.g., Autistic Disorder/Autism, Asperger's Disorder, PDD-NOS or pervasive developmental disorder.) Studies utilized various methods to diagnose the participants. Further information on diagnoses is available in Table 1.

#### Results & Discussion

Seventeen studies met criteria for inclusion in this study. Each of these studies used single subject research designs, however, the specific type of design used varied. The median age was 50 months. There were 41 males and 9 females in this study. This reflects a similar ratio to that of male to females in ASD. The total number of participants included in all of the reviewed studies was 50. Table 1 shows the participant demographics across the studies, including diagnoses, gender, and age.

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Table 1.  
Participant demographics across studies.

Reported Diagnoses	<i>n</i>
Autism	33
Asperger's Disorder	5
PDD-NOS	3
PDD	3
Developmental Disability/Delay	3
Comorbid Autism and PDD	2
Comorbid ASD with ADHD	1
Gender	<i>n</i>
Male	41
Female	9
Age	<i>months</i>
Mean (Standard Deviation )	53 (15)
Median	50
Range	29-90

*Note.* Two of the participants were diagnosed as having comorbid Autism and PDD. It is important to note that according to the DSM-IV TR the diagnosis of autism excludes the diagnosis of comorbid PDD and Autism (American Psychiatric Association, 2000). It is unclear as to why one article utilized this diagnosis.

### *Social Skills Interventions in Single Subject Design Studies*

We examined aspects of interventions included in single subject design studies and compared them to the data obtained in Vaughn et al.'s review (2003) of group design studies. Specifically, we examined the following aspects of social skills interventions: 1) who implemented interventions; 2) the length of the interventions; and 3) the categories of interventions most commonly used.

*Implementation of the interventions.* Vaughn et al. (2003) reported that mostly teachers implemented interventions, followed by researchers, therapists, parents, and one study with a peer who implemented the intervention. The studies we reviewed utilized several sources to implement the intervention as well. These include: peers ( $n=5$ ), video ( $n=5$ ), researcher/research assistant ( $n=4$ ), teacher/tutor ( $n=3$ ), parent ( $n=2$ ), and therapist ( $n=1$ ). In some studies, more than one person (or source) implemented an aspect of the intervention, hence the total number of sources that implemented the intervention is more than 17. In the studies reviewed, the interventions were mostly implemented by peers and with a video, which is different from Vaughn et al.'s findings. Based on our review of these studies, there did not appear to be a relationship between the person/source that implemented the intervention and the results of an intervention.

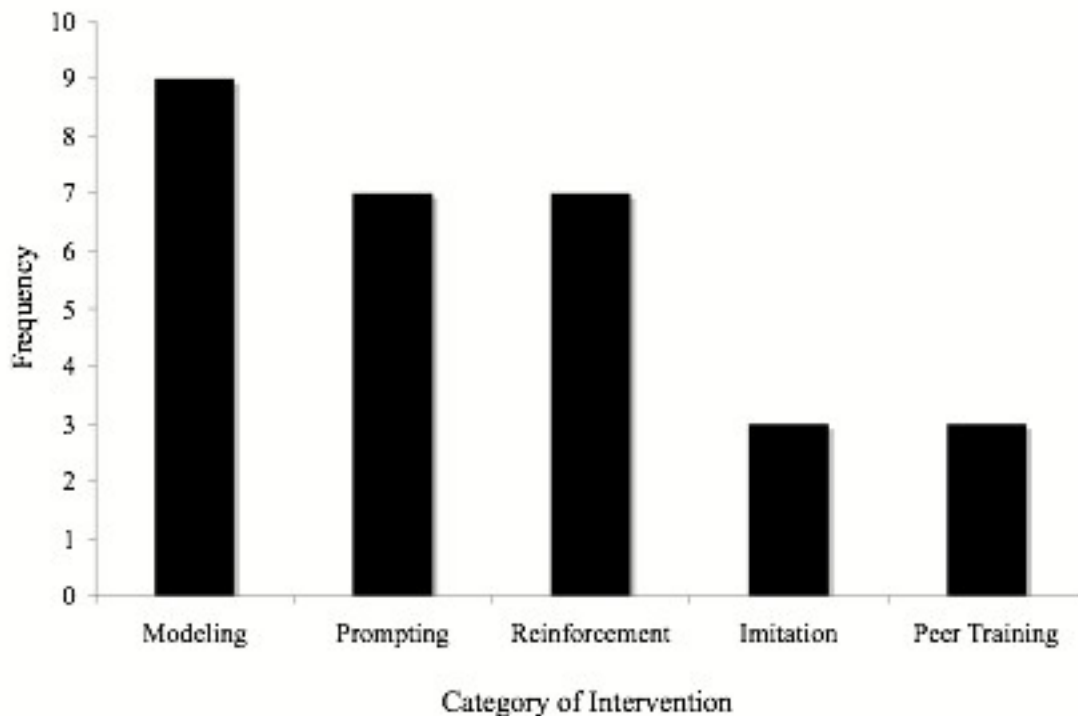
*Length of the interventions.* The length or duration of an intervention was measured differently across the reviewed articles including: number of sessions, number of observations, and total time commitment (i.e., hours, months). Thirteen of the 17 studies reviewed reported the length of intervention in terms of sessions conducted. In this review we utilized the authors report on number of sessions in the intervention phase. When the authors did not report the number of sessions in the intervention phase, we assumed that each data point reported in the X-Y graphs of the studies correlated with one session, unless the article indicated that this was an inappropriate interpretation. The number of sessions utilized in the intervention phase ranged between 1 and 80 with an average of 34.19 sessions per intervention. In two of the studies the length of intervention was reported in total number of hours required to implement the intervention. The intervention described by Dauphin, Kinney, and Stromer (2004) required 8-10 hours. The intervention by Symon (2005) required 25 hours. Two studies measured the length of intervention in terms of numbers of observations recorded. Arntzen, Halstadtrø, and Halstadtrø (2003) reported 118-120 trials across fifteen days. Tarbox, Ghezzi, and Wilson (2006) measured 300 observations in a one-day period. Across the reviewed studies, the overall length of intervention varied greatly, ranging from one day to 7 months.



In comparison to the review by Vaughn et al. (2003), similar results are found. We acknowledge that a the comparison of our findings to those of Vaughn et al.'s is an approximate and conservative comparison given that the authors presented the data differently. Considering this limitation, it appeared that the group design studies reviewed included for some social skills interventions, a range from 5 to 60 sessions was reported, others reported between 10-60 minutes for each session length. The group design studies reported intervention length by different time periods (e.g., weeks, months, etc).

*Number of categories used in each intervention study.* Unlike the group design studies reviewed by Vaughn et al. (2003), which averaged 3.4 categories of interventions in each study, the review of single subject design studies indicated that an average of 2.6 categories of interventions were used in each study. This difference may be due to the differences of how we defined categories of intervention compared to Vaughn et al. (2003).

Vaughn et al. (2003) described play-related activities and storytelling as categories of intervention because these types of activities might have solicited social behavior and social skills. We chose to not include these intervention categories because it is difficult to separate the effects of a context that includes play-related activities from another intervention category (e.g., prompting or imitation in a play activity context). There were no comparative studies that addressed this issue. We did find, however, that 5 of the studies included play-related activities as part of the intervention. We also excluded rehearsal/practice, because all but one of the single subject studies reviewed included multiple sessions that provided opportunities for the participants to practice social skills.



*Figure 1.* The frequency of different categories of interventions used to teach social skills across the reviewed articles are displayed.

Figure 1 shows the most commonly utilized interventions in the articles reviewed. The most frequently used categories of interventions were modeling, prompting, and reinforcement. For studies

utilizing modeling, there were three major types of models used. These included peer modeling ( $n=4$ ), adults ( $n=1$ ), and video modeling ( $n=4$ ). The next most frequently used categories of interventions included imitation and peer training. Other categories of interventions used in at least one study included, parent training, priming, social communication acquisition, fading, naturalistic teaching strategies, and token economies. None of the studies reviewed implemented time-out.

The categories of reinforcement, modeling and prompting were used in both reviews and were present in many studies. The ubiquitous nature of these categories provides convergent evidence of the potential necessity of including these categories of intervention in social skills interventions for preschool children with ASD. In this review, we make a distinction between the different types of modeling that are used in interventions. These include adult models, peer models and video models for teaching social behavior.

### *State of Single Subject Design Studies*

As part of our review, we examined the single subject designs of the reviewed studies in order to assess the quality of the social skills interventions across studies. An excellent article by Horner et al. (2005) provides descriptions of quality indicators of single subject design research and provides guidelines for evaluating such designs. The quality indicators that we evaluated and summarized below included demonstration of a stable baseline, description of participant characteristics and intervention setting, behavior that was measured, measurement of social validity, demonstration of procedural fidelity (which is related to evaluation of the independent variable or intervention), and external validity (i.e., maintenance and generalization). Please see Horner et al., (2005) for a thorough review of these and other quality indicators of single subject design research.

*Baseline.* One of the quality indicators is the presence of baseline data. In single subject designs, there needs to be a presence of stable baseline data. Horner et al., (2005) suggest five data points or more. According to Kazdin (2003), two or more baseline data points are sufficient prior to implementing an intervention. Considering these differing reports and other issues related to the stability of the data in the baseline phase (i.e., slope, variability, steady state), we decided that a baseline phase needed to consist of at least three data points and the baseline needed to be described as stable.

It is our opinion that in 38% of the studies reviewed stable baseline data was not included for at one or more participants prior to implementation of the intervention. Variability of baseline data or less than three baseline data points were present in these studies. Specifically, 22% of studies included at least one participant with no baseline data or less than three points of data in the baseline phase. Therefore, without stable baseline data, it is difficult to determine whether the intervention had a functional relationship with the change in behavior.

*Participants and setting.* A description of participants is an important characteristic of single subject research with respect to determining if an intervention is appropriate and might be effective for other participants with similar characteristics. The manner in which the participants were described in the reviewed studies greatly varied. All of the studies reviewed indicated that the majority of participants were diagnosed with or stated as having an ASD (see Table 1). Information related to how participants received a diagnosis varied from participants receiving a diagnosis from an independent psychologist (47% of studies), to the authors only stating that the participants met the criteria listed in the DSM-IV TR as a basis for diagnosis (12% of studies), to a diagnosis based on a review of records (12% of studies), to simply stating that the participants had an ASD, but not reporting how the diagnosis was obtained (29% of studies). Standardized assessments that measure domains of functioning, such as social skills, cognitive



abilities, language/communication skills, adaptive skills, etc, were greatly underutilized. Many of the reviewed studies contained descriptions of participant characteristics by stating strengths and weaknesses of participants or reporting observations of the participants' abilities and levels of functioning in different domains. Some studies reported a combination of standardized assessment scores and descriptions of characteristics. In some studies, there was not enough information about participants to determine the level of functioning and skill set of the participant(s), presenting a challenge for the reader in determining whether the intervention is applicable to other children with ASD

From our review of the description of participants' characteristics, it appeared that approximately less than half of participants could be described as functioning in the moderate to high functioning range of ASD, while a little over half of participants could be described as functioning in the moderate to low or severe functioning range of ASD. The level of functioning reported is subjective in nature and is based available standardized assessment data and/or descriptions of observed participant skills and abilities. In the field of Autism, there is some debate over what differentiates between high, moderate, and low functioning Autism (for further reading, see Szatmari, 2001). One of the most common ways in which level of functioning is determined is with IQ scores/cognitive ability (Baron-Cohen, Wheelwright, Lawson, Griffin, Ashwin, Billington, & Chakrabarti, B., 2005). The descriptions of cognitive abilities of participants in the studies reviewed were not consistently reported.

The studies reviewed typically took place in settings that can be described as involving play activities, including small group interactions, turn-taking games, pretend play settings, toys, and peers (including typically developing peers and siblings). Only a few of the reviewed studies implemented an intervention that took place in a structured instructional setting without a preschool-oriented context, such as one-to-one teaching with an adult and child (Tarbox, Ghezzi, & Wilson, 2006; Ingersoll & Schriebman, 2006; Nuzzolo-Gomez, Leonard, Ortiz, Rivera, & Greer, 2002). These studies tended to focus on acquisition of social communicative behavior, attending behavior (e.g., eye contact), and specific skill acquisition behaviors.

*Measurement of social behavior.* The majority of studies measured participants' behavior through observational methods. These observations generally focused on play behaviors ( $n=12$ ). Play behaviors included actions such as; sharing, amount of interactive play, and following rules of a game. Other behaviors measured include; verbal ( $n=6$ ), joint attention ( $n=4$ ), and emotional response ( $n=2$ ). Several studies measured multiple behaviors.

*Social validity and procedural integrity.* Social validity is the acceptance of an intervention by consumers (e.g., parents, teachers, etc) as being socially acceptable. If an intervention is deemed socially acceptable, then it is more likely to be implemented and continued in the home, classroom, etc. In our review, 53% of studies provided measures of social validity. Social validity was obtained from teachers, parents, or focus groups comprised of individuals knowledgeable of ASD. We found two basic methods of measuring social validity. The first was the use of questionnaires completed by teachers or parents (Reagon, Higbee, & Endicott, 2006; Sawyer, Luiselli, Ricciardi, & Gower, 2005; Garfinkle & Schwartz, 2002; Kaiser, Hancock, & Nietfeld, 2000) and the second was observations of video clips by individuals not associated with the study (Hine, & Wolery, 2006; Tsao & Odom, 2006; Ingersoll & Schriebman, 2006). In research it is also important to demonstrate that the intervention was implemented consistently and with fidelity. In the reviewed studies, 65% included measures of procedural fidelity and also demonstrated procedural integrity.

*Maintenance/Follow-up and Generalization.* Maintenance and generalization are essential in determining the effectiveness and possible implications of an intervention study. In our review, we combined maintenance and follow-up into one category that we will refer to as maintenance. Out of the 17 studies reviewed 13 reported a maintenance phase. Out of the thirteen studies 85% reported that the

participants maintained the skill. This high level of maintenance is encouraging, and suggests that in general the interventions in this review teach social skills that continue over time.

We considered generalization to refer to social skills demonstrated in different settings, with different persons/peers, or with unfamiliar toy sets, social activities as demonstration of generalization. Ten of the 17 studies reviewed reported a generalization phase. Of these 10 studies, 70% reported that the participants were successful in generalizing obtained skills to new settings, individuals, activities, etc. In the Vaughn et al. (2003) article free-play generalization was reported as an important element to group design research and was specific to generalization to a different setting only. In our review we also wanted to evaluate the degree to which free-play generalization is being utilized in the single subject design studies. We found that the descriptions of generalization involving play or free-play varied across studies. Several articles did not report enough information to determine if the participants were engaged in free-play (i.e., children are free to choose which activities to engage in) during a generalization phase. We were able to determine that all ten of the articles that reported a generalization phase utilized a play-like atmosphere, but it was not clear if the condition was one of free-play, as some studies reported that the activities were pre-selected or specific to a change in one dimension (e.g., change in setting or toys) during generalization. Despite this potentially semantic issue, it is encouraging that seven articles reported successful generalization.

#### *Perspectives on the Current Review*

Over the past five years, there has been a substantial amount of research on different types of social skills interventions for preschoolers with ASD. One of the general criticisms of the current literature reviewed is the absence of a model or theory to guide intervention selection for the participants (Romanczyk, White, & Gillis, 2005). Even though there are published social skills curricula and guides on social skills interventions, these curricula have not been empirically tested (Baker, 2004; Quill, 2005; Taylor & Jasper, 2001; Weiss & Harris, 2001). We do not intend to imply that these curricula and books are not helpful or important. Rather, given the increase in different curricula/guide books, available, it is important to begin to examine these interventions empirically as well as the features that are common across the interventions described.

In the articles reviewed, only a few authors discuss why specific social skills or behaviors were chosen as targets for change beyond stating that they were absent. However, most studies lacked a formulation or assessment process to determine why a specific social skill was targeted for intervention. The use of assessments is helpful because they inform if the acquisition skill would lead to further social behaviors or skills or whether other social skills were present. Not all authors reported the method of assessment of social skills. This lack of information is understandable, as a full description of each child's social behaviors is not necessary for implementing an intervention. However, without this information, one asks, why target this social skill and why at this time? Were other requisite skills already present? Would a different social behavior be more or less important to target before this social skill, etc?

We propose the use of a curriculum that is ideally developmentally based, to guide the teaching of social skills. Such a curriculum allows for the selection of a social behavior that is not currently in a child's repertoire and may be a pre-requisite for the development of other social behaviors. There are a few curricula that provide a sequence of social skills goals for consideration. The *Individualized Goal Selection Curriculum* (Romanczyk, Lockshin, & Matey, 2000) provides developmentally sequenced tasks in many skill areas, one of which is social development. Another curriculum is *Getting to Know You! A Social Skills Curriculum* (Hanken & Kennedy, 1998). This is a social skills curriculum specifying a variety of social skills that can be taught at different grade levels (grades 1-9). Using a curriculum as a guide is also helpful to develop identify what behaviors are present, missing, and may be of priority to the child's family in terms of their goals for the child's social development. It should be emphasized that

using a developmentally based curriculum does not imply that one goes through each of the developmental goals in a rigid fashion. It does imply that there is a sequence of social skills in order to provide a guide for goal selection. Procedures or assessments that guide social skills interventions for preschoolers need to be identified or developed and empirically tested.

### *Conclusion*

The goals of this review were to compare categories (or features) of social skills interventions for preschoolers with ASD in single subject design studies and to examine the state of single subject design studies that examine interventions for social skills. We included 17 articles in our review from 12 different peer-reviewed journals dating from June 1999 to December 2006. Based upon the findings from our review, two general themes emerged. The first is the concordance of findings in the current review and Vaughn et al.'s review of group design research (2003). The second is the variability of quality of single subject design studies on social skills intervention.

Social skills interventions typically comprise of a number of features or categories of interventions. In other words, different teaching strategies are used to promote acquisition of social behaviors. Despite these differences, there are categories of interventions that are universal. Across both group design studies (Vaughn et al., 2003) and single subject design studies (based upon the current review), these include categories of reinforcement, prompting, and modeling. These three categories are conceptually intuitive considering the learning styles of individuals with ASD. Social skills are impaired in children with ASD and are a priority in most children's individualized educational plans or individualized intervention programs. Therefore, increased attention to the all components of social skills interventions will be important to identify strategies that work best for children who present with different skill levels.

Single subject design methodology lends itself to examining the causal relationship between the change in social behavior of one or more individuals and a specific "category of intervention" or the entire intervention package. In this review, we used Horner et al.'s (2005) criteria for evaluating single subject design studies. We found considerable variability across the reviewed studies in meeting these criteria. This may be partly due to limitations of conducting single subject design research in applied settings, but it might reflect a need for researchers to more carefully attend to these quality indicators.

Overall, the quality of research on interventions for social skills impairment in children with ASD is likely to improve should future studies: a) identify and describe participants better by using standardized assessments for diagnosis and/or description of participant characteristics when appropriate; b) improve the elements of the single subject designs used to evaluate social skills interventions in order to improve the validity; c) demonstrate replication of both specific features of social skills intervention studies as well as intervention packages; and d) be familiar with current research examining different aspects of social impairment in ASD that might help to inform social skills interventions.

### *Limitations*

There are limitations of this review worth mentioning. The number of studies reviewed, after meeting our criteria for inclusion, is relatively small (i.e., 17). This might be due to the focus of this review. We focused on including studies that mostly included children with ASD who were of preschool age. Furthermore, the studies needed to utilize single subject design methods only. Another limitation might be the operational definition of "social skills" we used to include studies in our review. As mentioned previously, our operational definition of social skills relates to specific learned behaviors. Different researchers/professionals might not share a consistent definition. This definition might have limited the studies that were reviewed. Consequently, interventions that might have indirect or ancillary

improvements for social skills development, such as psychopharmacological treatments or language acquisition interventions were not included in this review. An additional limitation of this review is that we evaluated the studies based upon the information reported in those studies. It is possible that some authors did not report information that we were evaluating, which might change the conclusions of this review. Future reviews of social skills interventions might gather more information by expanding the age group, broadening the range of disabilities, and including interventions that might have ancillary, yet positive effects on the development of social skills.

### *Future research*

There are many research questions that warrant future research in the area of social skills interventions for preschoolers with ASD. As discussed above, many studies included multiple features for a social skills intervention and the majority of these studies reported success at improving social skills. Not surprisingly, the focus of many of the interventions was on the acquisition of behaviors necessary for play and interactions with preschool age peers as play behaviors are an essential part of preschool development.

Dismantling studies of social skills interventions for young children would be helpful in order to identify the specific components that are the most important for improving the social impairment in ASD. Identifying interventions and specific components of interventions that are effective at increasing social behavior and social skills for children with ASD is an important endeavor that continues to need further research. The continued use of single subject research is critical for examination of interventions including the key components of interventions that lead to behavior change and the demonstration of maintenance and generalization of behavior change. For example, video-modeling interventions for the teaching of social skills appears to be effective, but it is not yet understood why video modeling is effective (Corbett & Abdullah, 2005).

Future research should also focus on the development of measures of social behavior that can be used across multiple studies. Such measures would assist in improving the assessment of different interventions. In addition, understanding how improvements in social skills relate to outcome for children with ASD is another important area for future research. The measurement of progress for children with ASD in the area of social skills continues to vary, as illustrated by this review. That is, ascertaining better ways to measure the relationship between change in specific social behaviors compared to typical development is important to understanding what interventions will lead to better outcomes, across domains (e.g., social, language, academic, behavioral, emotional, etc) in children with ASD.

### *Summary*

The results from this review suggest that there is growing consensus of what features of interventions are important for social skills interventions between papers reviewing group studies (e.g., Vaughn et al., 2003) and this review that examined single subject studies. There was consensus across different researchers with differing theoretical and clinical orientations in the current review and the review by Vaughn et al. Both reviews found that the categories in interventions, reinforcement, modeling, and prompting were commonly used in social skills interventions. However, there remains a need to have research that can apply measures of social behavior consistently across different research studies (group or single subject designs). We hope this review encourages others to continue intervention research in this important area, which will ultimately improve the quality of the social skills interventions used in clinical and educational settings.

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*Note:* The references with an asterisk (\*) were the studies included in the review.

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