Social Skills Assessments for Children with Autism Spectrum Disorders

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Abstract

Several interventions have been developed to address social functioning impairments among children with autism spectrum disorders (ASD). This review evaluated the variety of interventions and outcomes from 59 studies published between 1990 and 2010. Over 80 discrete outcomes were used across the 59 studies, and varied from informal self-report measures to standardized test scores. The types of interventions used were similarly diverse, with the majority (74.6%) using a combination of multiple interventions. Although there is not a standard assessment or intervention that can be recommended to improve social skills, key domains have been identified, which can inform the development of appropriate assessments and interventions to improve the social behaviors of children with ASD.

Keywords: Social skills intervention; Autism; Assessment

Introduction

As the number of children diagnosed with autism spectrum disorders (ASD) is increasing worldwide, schools are called upon to both assess and intervene to help these children [1-5]. Access to health care for people with disabilities can be both difficult to obtain and cost-prohibitive [6], and schools may be the only opportunity for some students to be evaluated and treated. Children with ASD, by definition, have difficulty with social interactions [7]. Given that social skills are critical to allow an individual to both understand others and live within the community setting, it is important then to know which assessments are most critical to have a starting point to promoting positive social adjustment among children with ASD.

Children with autism spectrum disorders (ASD) experience challenges in social communication and reciprocity [7]. However, great variation exists in the symptom presentation and functioning of different children on the spectrum. School personnel are often called upon to determine eligibility for these children. Teachers and school staff need access to efficient strategies to assess socialization of children with ASD to know specifically where the problems lie (e.g. not just that the child has "socialization problems", but that the child has difficulties initiating to peers), and where to begin in recommending strategies for intervention.

Several interventions have been designed to address social concerns, but they have not yet been systematically compared to one another. Although it is ideal to select social skills training programs based on the relative efficacy of the intervention, this gap in the current literature makes selection and comparative evaluation extremely difficult. One of the primary challenges in comparing interventions based on the existing literature is the lack of common assessment measures used across intervention studies.

Social skills are often defined differently across multiple studies, and the behavioral outcomes documented typically vary according to the child's needs or the specific social behaviors targeted in the intervention. Existing interventions also target a wide variety of skills under the umbrella term of "social skills", so it is difficult to know where to begin when selecting interventions for children at different levels of functioning. Due to these challenges, it is important to understand and highlight commonalities across assessments to enable practitioners to make informed decisions within the school setting. Furthermore, more systematic evaluation of outcomes could help to suggest which interventions might be most effective for specific subsets of students based on their individual challenges.

Although social skills have been broadly defined, interventions mainly target specific skills within three general domains: communication, play skills/shared activities, and challenging/disruptive behavior. Communication is dependent upon one's ability to attend to others, initiate contact, interpret both the initiations and responses of others, express ideas, and quickly process large amounts of complex information [8,9]. These skills are necessary in order for individuals to interact and formulate the foundations upon which lasting and functional relationships are built. While general communication difficulties are a hallmark symptom of ASD, specific communication skills of children with ASD vary. Specific deficits have been found in initiating interactions [10,11], joint attention [12-14], reciprocal interaction [15,16], understanding and using social communication [17], and recognizing others' needs for personal space [18,19].

The development of peer relationships may also be challenged by poor play skills during shared activities, due to inflexibility to changing rules and topics, and misunderstandings that occur as a result of the constantly changing nature of playground game rules [20]. Peer relationships may also be limited by disruptive or repetitive atypical behavior, such as throwing objects, self-injury, repetitive hand and finger movements, and spinning [21]. Children with ASD may require overt instruction in each skill before they are able to integrate these abilities to allow for successful social interactions with others.

Several meta-analyses and reviews have been conducted to assess the overall effectiveness of social skills interventions. Bellini et al. [22]

noted that previous meta-analyses relied on conclusions made by the studies' authors to evaluate the effectiveness of different social skills interventions and thus could not be compared across studies. Fifty-five studies on social skills interventions that used the percentage of non-overlapping data points (PND) were evaluated, and concluded that treatment and generalization effects were low, while maintenance effects were moderate [22]. In contrast, Rao et al. [23] reviewed 10 social skills training interventions for children with Asperger's syndrome or high-functioning ASD, and found that 70% of the articles reported positive treatment effects in various areas of social functioning including greetings, initiating and maintaining interactions, giving and receiving compliments, turn taking, and sharing. The lack of consistency across social skills interventions has been identified as a factor that complicates the comparison of interventions, resulting in discrepant findings in the evaluation of the effectiveness of these interventions [22-24].

The low consensus across research in this area suggests a need for continued exploration of common elements across studies in order to facilitate the development of recommendations for best practice. This study sought to provide a review of the research so that schools are more informed about the variety of evaluation tools available to focus on the social skills of children with ASD. The most common assessments in the existing research were examined, and a summary of key domains to evaluate and focus on in interventions was developed.

Methods

Article Selection

This review was based on a systematic search of published research available from January of 1990 through December of 2010. *PsycINFO* and *PubMed* online databases were searched for entries containing any combination of the terms: (1) *autism, Asperger, ASD, or PDD-NOS*, (2) *social skills*, (3) *intervention* or *training* (4) *school based* or *academic* and (5) *communication*. Abstracts were screened for the following inclusion criteria: (a) a specific or global social skill deficit was targeted, (b) a school-related intervention was implemented (either based in the school, or with effects measured in the school), (c) the target population was preschool or school-age children with ASD, and (d) the articles were published in peer-reviewed journals. The initial search yielded 86 articles. Twenty articles were excluded because they were article reviews, six articles did not implement interventions, and one article targeted the peers rather than the child with ASD, resulting in a final count of 59 articles for inclusion.

Coding

Each of the 59 articles were reviewed and examined for (a) assessment tools used, (b) components of the intervention, and (c) generalization and length of maintenance of targeted skills. Two raters independently coded these data. Inter-rater reliability was obtained by calculating kappa coefficients for each code. The overall kappa was 0.93. Discrepancies in agreement were rare (only five codes) and resolved through discussion and re-examination of the articles.

Assessment tools

Assessments were coded into three categories: validated measures, non-validated measures, and observational strategies. Raters also coded the source of assessment data for each study based on who completed the measures and/or how the data were obtained; these categories included: parent report, teacher-report, peer-report, self-report (child with ASD), direct observation of the target student(s), and video observations of the target student(s). Each source was double-coded if there were multiple sources of data (e.g., data were collected from a teacher report and a direct observation). Validated measures were defined as a previously cited measure with documented reliability and validity. These measures included: 1) widely published measures of social functioning, such as the Social Responsiveness Scale [25] and the Social Skills Rating System [26]; 2) standardized tests of cognitive and language abilities, such as Wechsler Intelligence Scales for Children [27] and the Comprehensive Assessment of Spoken Language [28]; and 3) observational assessments of autism symptomology (e.g. the Autism Diagnostic Observation Schedule [29]). Non-validated outcomes included measures developed by the studies' authors with no reported psychometrics, such as questionnaires, rating scales, and satisfaction surveys.

Social observations included any information gathered during live or video observation of the student. Methods for collecting observational data included both coding scales, such as the Social Interaction Code and the Behavior Coding Scheme (coding systems with known psychometric properties used to record specific social behaviors), as well as observations of student characteristics and/or behaviors (i.e., affect, gestures, initiations, and responses) with less to no previous empirical support.

Type of intervention

Each article was examined to document the setting of the intervention as well as the theoretical basis of the intervention methods, e.g. cognitive-behavioral, behavioral, instructional, practice-based, or technology-based. Behavioral methods included the use of reinforcement and feedback. Instructional intervention components included those that taught or modeled specific social skills. Role playing and in-vivo practice of learned skills was defined as a practice-based intervention component. Finally, technology-based methods included computer-based and video-modeling interventions. Studies that used a combination of several different types of intervention components were double coded. For example, if an intervention was based on a combination of behavioral and instructional techniques, both categories were coded for that study. The duration of each intervention was noted if the information was provided.

With regard to intervention type, each study was also assessed to determine whether the intervention was provided on an individual or group basis. An intervention was considered to be a group if it contained two or more children with ASD, or one child with ASD with one or more typical peers.

Finally, each study was coded based on who implemented the interventions. There were four general categories of people who facilitated or executed the interventions for the children with ASD: parents, peers, teachers, and researchers. The researchers group typically involved the authors of the articles, graduate students, or other trained university-affiliated people. It was also noted if studies used a measure of treatment integrity.

Generalization and length of maintenance

Each intervention was coded to evaluate whether generalization and maintenance of intervention effects were evaluated after the end of treatment. Generalization was coded if skills were examined across children with different presenting deficits, settings, or social behaviors, while maintenance of skills was coded if effects were evaluated following a period of time after the end of the treatment period. The duration of maintenance was also recorded, if reported.

Results

Across the 59 studies, a total of 693 children with ASD, ages 2 to 21, received social skills interventions. Based on the studies reporting gender, there were 473 males and 71 females, which are consistent with overall rates of ASD across gender [30].

Assessment tools

The primary source of assessment data were in-vivo or video observation (n=46).Teacher reports were the next most common source of data (n=15), followed by self-reports (n=13), parent reports (n=13), and finally peer reports (n=3). When only one source of data were used, it was primarily observation (n=35). One study gathered data using parents as a source of data, and another study relied solely on teachers. The remaining 22 studies used a combination of the four sources of data.

A total of 84 discrete measures were utilized across the 59 studies. Validated measures accounted for about half of the assessments used (51%), with 43 distinct measures. Within studies that utilized validated measures, there was a lack of consistency with regard to the specific scales and rating systems used. While the Social Responsiveness Scale [25] was used in five studies and the Social Skills Rating System [26] was used in four studies, the other 41 validated measures were each used for a specific study (Table 1).

Observational data were found to be the next most common type of assessment, accounting for 39% of outcomes (n=33). Observations were made in 33 different skill categories, ranging from specific verbal social interaction skills to nonverbal behaviors. The two most commonly-used categories were social interactions (n=15) and initiations (n=15). Observational data were collected using coding scales for 13 of the 33 observational outcomes. The most frequently used observational coding scale was the Social Interaction Code (n=8).

Finally, non-validated measures accounted for the least number of assessments (n=8), representing 10% of the outcomes included in this study. Satisfaction surveys, which were used by seven studies, were found to be the most commonly used non-validated measure (Table 1).

Type of intervention

Interventions were most commonly implemented in school settings (73%, n=43), followed by clinical settings (24%, n=14), the children's homes (12%, n=7), or community agencies (8%, n=5). When reported, interventions were implemented from 2 weeks to 13 months. One longitudinal study lasted 18 years.

Most interventions used a combination of intervention strategies (74.6%). Instructional and behavioral techniques were used with equal frequency: 33.3% (n=42) for each. Practice-based components were used in 25.4% of the interventions (n=32). Only 5.6% of the interventions used technology (n=7), and only 2.4% (n=3) used cognitive-behavioral techniques. The most common combination of components included behavioral, instructional, and practice-based techniques (45.5%, n=20), followed by a combination of behavioral and instructional techniques (20.5%, n=9).

With regard to the format of implementation, social skills interventions were predominantly provided in group settings (56%,

Sample Size	Ages (years)	Intervention*	Assessment (measure name)	Article
15	8-17	Parent, peer, & teacher CBT, instruction & practice	Social cognition (The Problem-Solving Measure), emotion understanding (The Emotion Inventory), & social observations	[37]
4	6-7	Child & peer behavioral, instruction &practice	Social observations	[38]
28	7-11	Child CBT behavioral, instruction & practice	Teacher and parent ratings of social behavior (Walker-McConnell Scale and MGH YouthCare Social Competence Development Scale)	[39]
2	9, 10	Peer & teacher behavioral & instruction	Weekly academic tests on curriculum, observations of academic engagement& peer interactions during academic sessions	[40]
1	11	Child and peer instruction & technology	Theory of Mind and social observations	[41]
68	Grades 2-5	Child, parent & peer behavioral, instruction & practice	Complete diagnostic assessment, child loneliness & self-esteem rating scales (Piers-Harris Self-Concept Scale), parent rating scales (Quality of Play Questionnaire, Social Skills Rating System),& teacher rating scale (Pupil Evaluation Inventory)	[42]
4	3-5	Peer & teacher behavioral & instruction	Social observations	[43]
3	6-7	Child & peer behavioral, instruction & practice	Social and language observations	[44]
5	2-6	Peer instruction & practice	Diagnostic evaluation, child, peer, and teacher observations of social behavior and communications	[45]
4	5, 7	Peer & teacher behavioral, instruction & practice	Observations of social and disruptive behavior	[46]
74	2-4	Child & parent behavioral	Autism symptoms (Autism Diagnostic Schedule –Generic), parent-child interaction, adaptive functioning & language	[47]
2	8-9	Peer behavioral	Social observations	[48]
3	4-5	Child, peer, & teacher instruction	Social observations of language requests	[49]
3	5-6	Child & peer, behavioral & instruction	Observations of social and disruptive behavior	[50]
5	3-4	Peer & teacher instruction	Social observations	[51]
3	8-9	Peer & teacher, behavioral & instruction	Reading skills & social observations	[52]
3	7	Child, peer, & teacher, behavioral & instruction	Social observations & social rating scale	[53]
3	6, 8	Child & peer, behavioral, instruction & practice	Social observations	[54]
39	7-14	Child & peer, instruction & practice	Social observations	[55]
1	4	Child & teacher behavioral, instruction & technology	Social observations	[56]
2	13, 16	Child behavioral & instruction	Observations of verbal and non-verbal communication	[57]
4	6, 11	Child & parent, behavioral & instruction	Observations of social and disruptive behavior	[58]
2	8-9	Child, parent & peer instruction	Social observations	[59]

44	8-11	Child & peer, instruction & practice	Parent reports (Clinical Global Impressions Scale, Social Competence Inventory, and parent satisfaction survey)	[60]
3	4	Teacher instruction & practice	Social observations	[61]
1	4	Child, peer & teacher instruction & practice	Social observations	[62]
4	9, 12	Teacher behavioral	Social observations focusing on scripted responses	[63]
25	4-6	Child & peer, behavioral, instruction, practice, & technology	Social observations using video & language assessment	[64]
33	13-17	Child & parent, behavioral, instruction, & practice	Parent and teacher rating scales (Social Skills Rating Scale), quality of friendships and play (Friendship Qualities Scale, Quality of Play Questionnaire),& social skills assessment (Test of Adolescent Social Skills Knowledge)	[65]
4	Grades 1-4	Child, peer, & teacher, behavioral, instruction, & practice	Social observations	[66]
2	5	Child, peer, & teacher behavioral	Social observations	[67]
3	5-7	Teacher behavioral, instruction & practice	Social observations	[68]
3	6, 7, 9	Peer & teacher, behavioral & instruction	Social observations	[69]
4	6-8	Teacher behavioral, instruction, & practice	Social observations	[70]
36	7-12	Child behavioral, instruction, & practice	Child skills checklists, emotion understanding (Diagnostic Analysis of Non-verbal Accuracy-2, Child Facial Expressions), language (Comprehensive Assessment of Spoken Language), &IQ (Wechsler Intelligence Scale for Children – 4th Edition), parent ratings (Social Responsiveness Scale, Behavior Assessment System for Children-Second edition,)	[71]
25	7-12	Teacher instruction	Social observations & teacher report of symbolic play abilities	[72]
25	Not provided	Child behavioral, instruction, & technology	Social observations and language assessment (Assessment of Basic Language and Learning Skills)	[73]
7	Grades 1-4	Teacher instruction & practice	Teacher report of social skills (Social Responsiveness Scale)	[74]
4	3-4	Child& peer, behavioral, instruction, & practice	Social observations	[75]
4	3-4	Child, peer, & teacher, behavioral & instruction	Social observations	[76]
1	5	Child & peer instruction, & technology	Social observations	[11]
3	7, 10	Parent & peer instruction	Social observations	[77]
31	6-11	Child & peer, behavioral, instruction, & practice	Adaptive behavior (Vineland Adaptive Behavior Scales), ASD rating scale (Gilliam Autism Rating Scale), & social observations	[78]
12	14-21	Child& teacher behavioral, & practice	Self-, peer-, and parent surveys	[79]
2	10	Peer behavioral, instruction, & practice	Social observations	[80]
3	3-4	Child & peer instruction & practice	Social observations	[81]
3	9-10	Child instruction& technology	Social observations	[82]
3	6, 9, 10	Child instruction & technology	Social observations	[83]
3	8, 13	Teacher behavioral	Social observations	[84]
3	5	Child & peer behavioral	Social observations	[85]
4	5-6	Teacher instruction & technology	Social observations focused on following teacher direction & vocabulary	[86]
27	11-14	Parent & child, CBT, instruction & practice	Parent report (Social Responsiveness Scale), Tests of theory of mind & emotion understanding (Diagnostic Analysis of Non-verbal Accuracy-2, Child Facial Expressions & Reading the Mind in Eyes), & executive function (Behavior Rating Inventory of Executive Function)	[87]
5	4-6	Peer & teacher instruction	Social observations	[88]
6	2-4	Parents, peers, & teachers behavioral, instruction, & practice	ASD rating scale (Childhood Autism Rating Scale), IQ (Stanford Binet), Learning Profile, & Social observations	[89]
3	3-5	Parents, peers, & teachers behavioral, instruction, & practice	Social observations	[90]
46	3-18	Child behavioral, instruction, & practice	Social & behavioral rating scales (Social Responsiveness Scale, Aberrant Behavior Checklist, &Nisonger Child Behavior Rating Scale)	[91]
10	12-17	Child instruction & practice	Social observations in role play, self- and parent- satisfaction ratings	[92]
22	3-6	Child & teacher, behavioral & technology	Language (PPVT-III, EVT), skills assessment (Brigance), ASD Rating scale (Childhood Autism Rating Scale), skill acquisition monitoring (through the TeachTown computerized program)	[93]
15	11-14	Child, parent & peer behavioral, instruction, & practice	Feasibility, adherence to intervention, program satisfaction.	[94]

*Interventions: "Instruction" is any direct instruction on social skills, "behavioral" describes any behavioral interventions to change social behaviors, "practice" refers to interventions in which skills are practiced with peers, and "technology" includes any interventions involving a technology component (i.e. video modeling). In addition, the target of the intervention (child refers to the target child with ASD, peers, parents, or teachers) is also included in the intervention description.

Table 1: Intervention studies focused on social skills for children with ASD between 1990-2010.

Social Domain	Explanation	Sample Assessment
Motivation to interact	How much does the child want to engage with others?	Self- or teacher/caregiver report of interest in and goals of friendships.
Self-awareness	Does the child know how they are presenting themselves or perceived by peers?	Self- or teacher/caregiver report on personal awareness.
Non-verbal and verbal social interaction skills	Does the child have both the verbal understanding and physical skill to interact with others?	Receptive and expressive language (i.e. PPVT-4* and EVT-2*), and teacher/caregiver report or observation of interaction skills.
Understanding affect in one's self and others	Can the child recognize and respond to emotions?	Affect Recognition (i.e. NEPSY-II*)
Social intelligence and awareness	How well can the child "read" a social situation and know how to respond?	Theory of Mind (i.e. NEPSY-II*)
Friendship and Play	Does the child have friends and are they engaging with peers during unstructured social time?	Self- and peer- report of friendships, and observations of play engagement with peers.

*Proposed objective test assessments: NEPSY: tests across six domains of neurocognitive processes. PPVT: Peabody Picture Vocabulary Test – 4th Edition. EVT-2: Expressive Vocabulary Test – 2nd Edition

Table 2: Summary of key social domains for assessment.

n=33) as compared to individual treatment (37%, n=22). A small percentage of the studies (7%, n=4) used a combination of individual and group intervention.

Intervention facilitators were most commonly peers (33%; n=33) or researchers (30%; n=30) with teachers (12%, n=12) and parents (25%, n=25) also participating to a lesser extent. The majority of interventions (58%, n=34) were implemented by two or more facilitators, typically a combination of peers and researchers (32.3%, n=11) or peers and teachers (21.5%, n=7). In an examination of the treatment integrity measures, only 25.4% of the studies reviewed used fidelity checklists to measure intervention integrity (n=15), although a larger portion measured inter-rater reliability (77.9%, n=46).

Generalization and length of maintenance

Only a small percentage of studies assessed generalization across children, settings, or behaviors (37%, n=22) and/or maintenance of skill improvements (27%, n=16). Of the 16 studies measuring maintenance, 11 studies reported the length of time over which maintenance effects were measured. One study assessed maintenance two years after treatment. For the remaining ten studies, maintenance was assessed for an average of 5.2 weeks post intervention, with the longest assessment conducted three months after treatment termination.

Discussion

The results of this study suggest that there is no single way to examine and intervene upon social concerns for children with ASD. These studies do, however, show commonalities across domains and assessments that can help make suggestions for practice. While there is diversity in the actual number of assessments used (84 different outcomes across 59 studies), the underlying concepts explored by each is similar. Highlighting those similarities can help put into perspective the hierarchy of assessment needs for children with ASD to be able to better identify the specific social challenges that children are facing.

While the types of information gathered were similar across assessment tools (e.g. observations or rating scales completed by teachers, parents, or students), it was unclear which measure gathered the most relevant information for selecting and evaluating interventions. Within the observational category alone, there were 32 distinct skills measured, ranging from specific verbal social interaction skills to nonverbal behaviors. A high quality, comprehensive social skills assessment tool is necessary for teachers and practitioners who may be struggling with challenging student behavior, as well as to improve the ability to target specific social needs in interventions for children with ASD.

Assessment tools

Given a general lack of consensus regarding appropriate outcome measures, several previous reviews have cited the need for researchers to establish and utilize commonly used, reliable, socially valid outcome measures [24,31]. Even in this study, the lack of consistency despite the large number of validated social skills measures utilized across these studies was striking. While a couple of scales were used in multiple studies (the most common being used in only 8.5% of studies reviewed), most measures were utilized by only one study, and no single scale emerged as a common standard. Despite the inconsistency in specific measures being used, an investigation across measures indicates that there are a number of domains that appear important to assess and target in intervention. Especially for schools without the resources to conduct comprehensive assessments over time, it is important to consider which of the following skills are most impacted for the child with ASD, and focus on those skills in intervention (Table 2). Although a comprehensive list of possible measures in each domain is beyond the scope of this article, these initial assessments are suggested as they have been used previously with this population. There are always newly developing tools (i.e. eye tracking technologies) that continue to be created to look at different domains. However, the domains themselves that should be examined for students with ASD have remained relatively stable (Table 2).

Six key domains were identified: (1) motivation to interact, (2) self-awareness, (3) non-verbal and verbal interactional skills, (4) understanding affect in oneself and others, (5) social intelligence and awareness, and (6) friendships and play. Using a battery of measures that addresses all of these domains could provide insight into specific social skills areas in which a child is excelling, as well as where he or she may need additional support. Furthermore, in contrast to the current trend of evaluating only improvements in specific skills taught during the context of the intervention, a battery approach could potentially promote our understanding of which intervention techniques and specific social skills have the greatest impact on overarching "social success" as measured by a range of different skills.

In order to achieve this comprehensive measurement, it is clear that, ideally, multiple informants are needed. The proposed battery incorporates objective test assessments, self-report, peer, teacher and/or caregiver reports, and observations (Table 2). By collecting data from all of these sources, information can be cross-validated to evaluate progress towards both global and specific social skill goals.

Selection of interventions

Currently, a standard method for selecting social skills interventions

for children with ASD does not exist. It is commonly and mistakenly assumed that problem behaviors and skill deficits are similar and universal in all children with ASD. This assumption has led to the selection of interventions based on the knowledge of the individual choosing the intervention, as opposed to the implementation of developmentally appropriate and individualized best practices for specific children [20].

While a number of existing interventions have been effective at improving specific social skills in children with ASD, the lack of consistency among outcome measures renders it difficult for practitioners to make educated decisions about intervention selection to best meet the specific needs of each child. Several suggestions are offered to remedy the current situation and enhance translation from research to practice. First, a comprehensive baseline assessment of initial strengths and skill deficits (based on the domains highlighted above) should preclude intervention selection. Just as best practice in academic assessment and intervention begins with a skills level assessment, this same principle can and should be applied to social skill interventions for students with ASD. Assessments should obtain information on the domain and level of skills that are most problematic for an individual child with ASD. For example, an assessment may indicate that a child experiencing difficulties in non-verbal interactional skills; thus, intervention should target this prerequisite communication skill, rather than more advanced skills such as increasing the child's number of friendships.

Presently, most social skills intervention studies deliver treatment with little consideration for the types of specific skill deficits children may have, which may contribute to the small effect sizes observed in many studies [31]. Almost all of the reviewed studies did not discuss their assessment of student skill deficits and method of matching interventions to these problem areas. Furthermore, aside from specifying the types of deficits within a domain, assessment should identify levels of skill deficits (i.e. acquisition, fluency, generalization), as each level requires a distinct set of intervention procedures [31]. An assessment can also help determine if practice (e.g. role playing) or informational (e.g. instruction) intervention techniques (or both) are needed. For example, for a student with social communication difficulties, it may be determined that the child does not understand the common social rules of communication. Thus, instructional techniques are needed to provide a basic understanding of the rules of communication. However, once those rules have been taught, practice opportunities with peers are needed to fully solidify these skills. The majority of interventions reviewed (74.6%) included a combination of approaches, as well as a variety of individuals implementing the intervention (e.g. teachers, parents, peers, etc.); thus, multiple techniques presented by multiple individuals may be needed to achieve lasting and meaningful improvements in the social interactions of children with ASD.

We know that the most common and best supported interventions for children with ASD involve Applied Behavior Analysis techniques [32-34]. These methods are behavioral interventions that look at antecedents (stimulus) and consequences (reinforcers) of behaviors, and adapt them to alter the child's behavior to one that is more desired. For example, if a child is having difficulty engaging with peers on the playground, a reward system may be put in place (changing the reinforcers for the child's behavior) to initially increase the child's motivation to try to engage. These strategies have been found to be effective with both academic and social behaviors [35,36], and are widely supported in practice in schools.

It has also been shown that students with ASD maintain skills better

when they are taught in the setting in which they will later be performing the skills [22]. Thus, it is important to conduct interventions in the school setting, with their classroom peers, to ensure that these skills have the best chance of being maintained even after the intervention is complete. The majority of studies examined did not follow students long after interventions were terminated (those that did follow the students at all only did so for up to 3 months). In practice, we need skills to be maintained for years to come, and to provide a base upon which new skills can be taught. The more integrated the intervention is into everyday school practices, the more likely that both the intervention and skills learned by the child will be maintained.

Although this study is the first review to systematically evaluate the outcomes of social skills intervention studies, we limited our assessment of the literature to a brief span of time (1990-2010). Although earlier studies of social skills interventions were not included, it is unlikely that there would be more consistency across those studies than the ones examined. This review was an integral first step that highlighted the need to identify and utilize consistent outcomes in social skills training for children with ASD.

It is clear that a systematic assessment is needed to best understand and address the social concerns for each child with ASD. Using multiple informants (i.e. self, teachers, peers, and objective observers) and standardized scales and observation systems that assess key social domains provides the most comprehensive assessment information. This comprehensive initial assessment can then be used to facilitate individualized intervention planning by enabling practitioners to select interventions specifically targeted to a student's needs. Interventions should then incorporate multiple modalities (e.g. behavioral, instructional, and practice-based techniques) with multiple interventionists (e.g. teachers, aides, parents, and peers) in the setting in which you want the behavior to occur (e.g. the classroom) to ensure skill mastery and maintenance.

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