Rev J Autism Dev Disord (2016) 3:239–253
DOI 10.1007/s40489-016-0079-8

REVIEW PAPER

Data-Driven Individualization in Peer-Mediated Interventions for Students with ASD: a Literature Review

Heartley B. Huber[1] · **Erik W. Carter**[1]

Received: 20 November 2015 / Accepted: 11 May 2016 / Published online: 1 June 2016

Abstract Although peer-mediated interventions have emerged as an evidence-based practice for students with autism spectrum disorder (ASD), little attention has focused on approaches for tailoring these interventions to meet individual students' unique needs. In this systematic literature review of 29 studies, we identified assessment procedures used to inform peer-mediated social interventions for students with ASD. Few studies included well-described assessment methods. While direct observations often were used to tailor social outcomes, weaker methods were used to individualize intervention components. Furthermore, the focus of most assessment procedures was narrow, addressing only one feature of the intervention or outcome. Results of this review highlight the need to improve assessment reporting, use more rigorous assessment methods, and further evaluate the effectiveness of assessments to individualize peer-mediated interventions.

Keywords Autism · Peer-mediated · Assessment · Data-based decisions

For most students, schools present abundant opportunities for engaging in social interactions, creating personal connections, and developing satisfying peer relationships. Indeed, the social experiences of children and adolescents are tied tightly to the quality of their school experience and may affect them well after graduation (Gifford-Smith and Brownell 2003; Rubin et al. 2009). The contributions of social relationships are just as important in the lives of students with autism spectrum disorder (ASD). Their interactions with peers can provide a context for learning valuable social and communication skills. Moreover, the quality of these peer relationships can affect students' emotional well-being, social acceptance, academic success, and overall quality of life (Carter et al. 2014b, c, d; Wentzel et al. 2012).

For students with ASD, navigating peer relationships at school can be challenging. Deficits in social communication and interaction associated with an ASD diagnosis include difficulties with verbal and non-verbal communication, understanding social pragmatics, and developing and maintaining relationships (American Psychiatric Association [APA] 2013). Restricted interests and patterns of behavior can further limit the flexibility often required in social situations or impact motivation to interact with those who do not share similar interests. Students with ASD who exhibit challenging behavior (e.g., repetitive behaviors, aggression, or self-injury) may experience limited opportunities for academic and social participation with their classmates without disabilities. While these all reflect core deficits of ASD, the topography and level of severity of symptoms vary considerably across each student with ASD.

Peer-mediated interventions are among the most widely studied and well-supported social-focused intervention for elementary and secondary students with ASD (Carter et al. 2010; Watkins et al. 2014; Wong et al. 2014). Peer-mediated interventions involve equipping peers to interact with or assist students with ASD to learn new social or academic skills in natural school environments (e.g., classes, cafeterias, clubs). These evidence-based interventions typically target peer interactions by teaching one or more peers how best to communicate with a student with ASD (Carter et al. 2014a).

The potential benefits of peer-mediated social interventions are multiple. First, peer-mediated interventions have strong

✉ Heartley B. Huber
heartley.b.huber@vanderbilt.edu

[1] Vanderbilt University, 230 Appleton Place, Peabody Box 228, Nashville, TN 37203, USA

positive effects on social and academic outcomes for students with ASD. In their meta-analysis of 14 studies examining the efficacy of peer-mediated instruction for students with ASD, Bene et al. (2014) found positive effects for both social (e.g., social communication) and academic (e.g., word recognition, social studies, writing) outcomes. Second, peer-mediated interventions may benefit participating peers without disabilities. Studies have documented increased academic engagement, improved attitudes toward students with disabilities, greater appreciation of diversity, enhanced personal growth, elevated commitment to inclusion, and the development of lasting friendships (see reviews by Carter and Kennedy 2006; Carter et al. 2012). Third, peer-mediated interventions can be implemented in a variety of typical school contexts—the settings where students are expected to use the social communication skills being taught. In other words, peer-mediated interventions provide an opportunity for students with ASD to learn social interaction skills in the context in which the skills will ultimately be used. Engaging in social activities in typical settings with peers—their natural communication partners—helps to promote maintenance and generalization of the acquired skills (Stokes and Baer 1977; Strain et al. 1984).

The degree to which peer-mediated interventions can be tailored to meet the individualized needs of particular students within very specific social contexts is promising. Indeed, the heterogeneity of the social needs inherent to ASD highlights the importance of tailoring interventions in this way. The variety of peer-mediated intervention configurations may provide educators flexibility to choose configurations that best match the needs of individual students, address the most relevant outcomes, and can be delivered in a particular school setting. For example, peer-mediated interventions have been implemented in diverse academic contexts (e.g., general and special education classrooms; large- and small-group settings; e.g., Peck et al. 1997) as well as non-instructional settings (e.g., playgrounds, lunchrooms, courtyards; e.g., Koegel et al. 2013). Moreover, they can be applied to different activities, including academic tasks (e.g., academic assignments, lab activities), leisure activities (e.g., meals, games, sports), and functional tasks (e.g., preparing meals). In addition, other aspects of the intervention—such as the peers who are selected, the materials that are used, the activities within which they are applied, the settings in which they are implemented, and the outcomes that are addressed—can all be adjusted based on individualized needs.

Although data-based individualization is a guiding principle of special education, assessment is often described narrowly as an evaluative method to determine the effectiveness of interventions. However, using assessment to drive data-based adaptions to the design and delivery of interventions is considered best practice in special education (National Autism Center 2009). Although such data-driven individualization has been applied within response to intervention for academic behavior or positive behavior supports (Hawken et al. 2008), little guidance on its application to pro-social behaviors (e.g., social interactions and communication) exists in the literature. For example, functional behavior assessment (FBA), which is frequently referenced as a means of informing social and behavioral interventions (Hawken et al. 2008; Sugai and Horner 2002), is not commonly used to target social interaction or social skill outcomes unless specifically as a replacement for problem behavior.

The purpose of this paper is to systematically review the current literature to identify and describe the assessment procedures used to inform peer-mediated social interventions for students with ASD. In addition, this review describes the elements of the interventions and/or social outcomes targeted by various assessment practices. Exploration of the role of assessment to inform peer-mediated interventions could provide guidance to educators on ways to personalize evidence-based and recommended practices. The identification of available assessment approaches represented within the literature could also provide guidance to educators on avenues for tailoring peer-mediated interventions to meet the needs of individual students with ASD. To date, a review of the role of assessment within the peer-mediated social intervention literature for students with ASD has yet to be conducted.

Method

Inclusion Criteria

We used seven inclusion criteria to select studies for this review. First, studies included one or more participants identified as having a diagnosis or educational classification of ASD (i.e., autism, Asperger syndrome, pervasive developmental disorder not otherwise specified (PDD-NOS)). We included studies with participants with ASD who had co-occurring conditions, such as intellectual disability, seizure disorder, or attention deficit hyperactivity disorder. Second, studies included school-age participants (i.e., grades 1 through 12). We excluded 6-year-old participants if authors did not note their grade, as it was unclear whether they were in kindergarten or first grade. Third, we limited this review to peer-mediated interventions. An intervention was "peer-mediated" when peers were taught or directed by an adult to interact with or provide support to a student with ASD (Wong et al. 2014). We included interventions only if the peer-mediated component was evaluated as part of the study design, alone or as part of an intervention package. Fourth, the interventions targeted at least one social outcome or social skill taught to improve interactions with peers. Outcomes included measures of social functioning related to peer interaction (e.g., age-appropriate conversational topics) and could include discrete behaviors (e.g., social initiations), standardized assessment (e.g., a social

skills scale), ratings of behavior (e.g., a scale of quality of interactions), or informal assessment of student performance (e.g., teacher report of a student's social affiliations). We excluded studies with only outcome measures of academic performance or reduction of problem behavior.

Fifth, we only included experimental studies testing the efficacy of an intervention using either (a) single-case design research with a minimum of two opportunities for demonstration of an effect or (b) group design studies with at least one control or comparison group (i.e., randomized control trials or quasi-experimental multiple-group designs). Sixth, the study incorporated an assessment used to inform either the intervention or its social outcomes. For the purposes of this review, we defined "assessment" as an approach used to gather information about the strengths, needs, or preferences of participating students (e.g., social needs, prerequisite academic skills needed to access intervention materials), the intervention design, the outcomes selected, or contextual factors (e.g., elements of the physical environment, materials, activities). We only included studies with a clear connection between the assessment and components of the intervention and/or social outcomes targeted. We excluded studies if the assessment was used solely to determine participant inclusion in the study. Seventh, we only included studies published in English in peer-reviewed journals.

Search Procedures

We conducted a comprehensive literature review using an electronic library search of the PsycInfo, PsycArticles, and ERIC databases for all dates from January 1975 to June 2014. We used various combinations of search terms describing (a) participants (e.g., autism, ASD, Asperger syndrome, severe disability, intellectual disability, cognitive disability), (b) study design (e.g., single-case, single-subject, multiple-baseline, group design, randomize, intervention), and (c) participating peers (e.g., peer, peer-mediated, peer support, peer training, general education). In addition, we screened all articles included in related literature reviews (i.e., Bene et al. 2014; Carter et al. 2010; Odom et al. 2010; Watkins et al. 2014; Wong et al. 2014) against our criteria.

Coding of Studies

Twenty-nine studies met criteria for inclusion in this review. We coded each study for the following variables: (a) participant and school characteristics, (b) assessment components and results, (c) intervention components, (d) social outcome measures, and (e) experimental design and quality indicators. Because studies may have included participants who did and did not meet inclusion criteria (e.g., participants with ASD in first grade and kindergarten, participants with ASD and those with other disabilities), we coded participant and school characteristics, assessment, and outcome data only for the subset of participants meeting inclusion criteria. When information was not reported in the article, we coded it within each category as unspecified.

Participants with ASD We coded the total number of participants with ASD, noting their gender, race/ethnicity, and severity of their disability. In the absence of an author-provided severity description, we coded based on IQ scores (i.e., 50–70 as mild, 35–48 as moderate, 20–34 as severe, <20 as profound; Emerson et al. 2012). We coded participant severity as "not specified" if authors provided neither description of severity nor IQ. We also coded participant severity as not specified if the description of participant functioning was inadequate to determine level of severity (e.g., two grade levels below grade-equivalent).

Intervention Components and Settings We coded intervention components relevant to assessment procedures, including the type of intervention, intervention activities/tasks, setting, and group size. First, we coded each peer-mediated intervention according to its components, specifically noting didactic instruction, video modeling, social stories, cooperative learning groups, and social clubs or play dates. All interventions in this review fit into at least one of these categories. Second, we noted whether interventions were structured around academic tasks, social/leisure activities (e.g., crafts, eating at restaurants, lunch, games), or functional skills (e.g., requesting items from a peer, ordering from a restaurant). Third, we coded intervention settings as general education classrooms, special education classrooms, empty classrooms, non-classroom settings (e.g., lunchroom, hallway, playground), or off-campus settings. If studies did not identify the setting, we noted it as not specified. Fourth, we coded each intervention component according to the group format in which it was delivered: group (i.e., three or more students, including the student with ASD), dyad (i.e., adult support or instruction provided to one peer and one student with ASD), or one to one (i.e., one adult and the student with ASD).

Outcomes We categorized each social-related outcome as social interactions (e.g., social initiations, responses), social affiliations (e.g., social status, number of peers affiliated), social contacts (e.g., frequency or duration of social contacts with peers), specific social skills (e.g., joining into conversations, social pleasantries, responding to questions), or social engagement. We also coded whether academic (i.e., academic engagement, academic performance, efficiency of instruction) and behavioral (i.e., behaviors targeted for reduction) outcomes were addressed alongside social outcomes.

Assessment Procedures and Findings We coded assessments by procedures used, setting, and results. Assessment procedures

included interview, direct observation, questionnaires and rating scales, document review, structural analysis, FBA or functional analysis (FA), and academic assessment. We categorized procedures based on the terminology used by authors. For example, if authors indicated they interviewed students to determine appropriate play activities, we coded the procedure as an interview, despite authors not explicitly stating a face-to-face conversation with students occurred (e.g., Delano and Snell 2006). All assessment procedures fit into these categories, with one exception. Authors frequently noted obtaining information from parents, teachers, or other individuals with knowledge of the participant or intervention context without explicit description of how they gathered the information. We coded these cases as "consultation with others (unclear)." For example, we used this code if an author-noted intervention materials were chosen based on input from parents and teachers but was unclear how the consultation occurred (e.g., in person, in writing, via questionnaire). If studies explicitly stated using assessment procedures to inform the intervention or outcome without providing any additional elaboration, we coded them as "assessment unspecified."

When studies incorporated direct observation, we indicated whether the primary focus was on the student with ASD, other students, or both. When studies incorporated interviews, we categorized them as formal, informal, or unspecified. "Formal" refers to published or standardized sets of questions with instructions on how to deliver questions. "Informal" refers to newly created interviews not following a specific protocol from a published tool or previous research.

We coded the setting where each assessment was conducted, if provided, and noted if it was the same as the intervention. We also coded how assessment results were presented (i.e., data summary, narrative summary, or no summary) and whether findings were conclusive for all participants. "Data summary" referred to studies reporting the data resulting from the assessment in figures, tables, or text. "Narrative summary" included a description of findings without reporting supporting numerical data. If authors reported neither quantitative nor narrative assessment results, we coded "no summary." We also examined whether or not assessment results were conclusive for each participant. We noted conclusive results when assessments produced information that could be used to inform the intervention or outcome selection.

Assessment Connections to Interventions and Outcomes We coded the components of the intervention or outcomes each assessment procedure addressed to determine how each was individualized by the researchers within the study. Intervention components included (a) intervention setting(s), (b) identification and selection of participating peers, (c) activities or tasks, (d) materials, (e) topics of conversation, or (f) prerequisite skills. Intervention outcomes were (a) social outcomes or (b) other outcomes (e.g., academic, behavioral). A given approach could address more than one intervention component or outcome.

Experimental Design and Quality Indicators We developed separate coding schemes to examine quality indicators for each type of research design. Because the focus of this review is the use and reporting of assessment in the intervention literature, rather than evaluation of the effectiveness of interventions, we based the coding scheme on the minimal standards for adequate methodological quality (e.g., a minimum of three data points per phase for single-case research). Furthermore, we included studies not meeting minimal experimental design standards in order to determine the overall quality of all studies including formative assessment methods and draw conclusions about needs for future research. We based the coding scheme for single-case design on the guidelines published by the What Works Clearinghouse, which are designed for use by practitioners and researchers to determine if single-case design studies meet acceptable standards to be considered for the documentation of an evidence-based practice (Kratochwill et al. 2010). Using these standards, we examined each study for features contributing to internal and external validity, including replicability of the independent variable, number of data points in each phase, sufficient number of demonstrations, and replications across participants with ASD. Similarly, we based the coding for group design quality indicators on the Procedural and Coding Manual for Review of Evidence-Based Interventions (Kratochwill and Stoiber 2002) and included variables related to the sampling procedures, randomization method, comparison group, and data analysis. Quality indicators coded for both types of designs included reliability and validity of measures, social validity of the intervention and assessment procedures, treatment fidelity, generalization, and maintenance.

Reliability

A second reader independently coded 10 randomly selected studies (34.5 %). We calculated inter-coder reliability by comparing exact agreements and disagreements of the scores of two independent readers (i.e., total number of exact agreements, divided by agreements plus disagreements). Inter-coder reliability averaged 89.1 % (range, 79.7–100 %) across 10 studies. Disagreements within studies tended to occur more often when information provided by authors was vague or accompanied by limited detail. Coders evaluated all disagreements to establish a consensus and used the resulting data in the final analysis.

Results

Our initial search yielded 1859 results. After an initial screening of titles and abstracts for relevance to our inclusion criteria, we reviewed the full text of 339 articles. Of those,

we identified 29 studies meeting our inclusion criteria; two included multiple studies (i.e., Buggey 2005, Study 1; Sasso et al. 1998, Study 2).

Participants with ASD

Within the 29 studies, 94 participants met inclusion criteria; 42 did not. The majority of participants not meeting inclusion criteria had disability labels other than ASD ($n = 20$). Sixteen did not meet the criterion for receiving a peer-mediated intervention, the majority of whom comprised a comparison group receiving an adult-directed intervention in a group design study (Kasari et al. 2012). Others did not meet the criterion for being school age (i.e., kindergarten or preschool, $n = 6$).

The majority of participants (78.7 %) were male. Most (57.4 %) were described as having mild disability severity, 6.4 % as mild-moderate, 6.4 % as moderate, and 14.9 % as severe. We coded 14.9 % as not specified, as studies described participants in terms of academic level or included conflicting information (e.g., Harper et al. 2008; Koegel et al. 2012). Of those studies reporting ethnicity, 13.8 % were European American, 6.4 % were Hispanic/Latino, 2.1 % were African American, 1.1 % were Asian American, and 2.1 % were some other race/ethnicity. Information about race/ethnicity was not available for participants in the only group design study included in this review. Because participants in only one intervention group met our inclusion criteria and authors reported ethnicity as percentages of the whole sample ($n = 60$) rather than by group, it was impossible to extrapolate ethnicity for the subset included in this review. For most participants, interventions occurred in elementary schools (85.1 %), 13.8 % were in high schools, and 1.1 % was in middle school.

Intervention Components and Settings

Table 1 includes the description, setting, and format of intervention components for each study. While all interventions in this review included at least one peer-mediated component, interventions varied on multiple dimensions. Interventions included didactic training for students with ASD and/or peers ($n = 16$), video modeling ($n = 4$), social stories ($n = 3$), cooperative learning groups ($n = 2$), and social clubs or play dates ($n = 7$). The majority ($n = 22$) of interventions focused on only social, play, or leisure activities (e.g., crafts, eating together, games); three centered on only academic tasks or activities; and one focused on functional skills (i.e., requesting food items from a peer). Three studies (Garrison-Harrell et al. 1997; Hunt et al. 2003; Thiemann and Goldstein 2004) employed interventions within both academic and social activities. Intervention settings included non-classroom settings ($n = 17$), special education classrooms ($n = 10$), general education classrooms ($n = 8$), empty classrooms ($n = 4$), and off-campus settings ($n = 2$). Five studies included unclear setting descriptions for at least one component.

Outcomes

Social-related outcomes varied across studies and included social interactions ($n = 24$), specific social skills ($n = 11$), social engagement ($n = 5$), social affiliations ($n = 2$), and social contacts ($n = 1$). We coded a category for "other" social outcomes, which included outcomes in six studies not fitting into any of these categories (i.e., quality of interactions, affect, peer responsiveness, reciprocity, modes of communication, use of augmentative communication device). Eight studies also addressed other outcomes, including academic engagement ($n = 1$) academic performance ($n = 3$), functional skills (e.g., ordering at a restaurant, cooking; $n = 1$), or reduction of problem behavior ($n = 3$).

Assessment Procedures and Findings

Table 2 summarizes the assessment procedures used within and across studies. Hughes et al. (1996) included assessment information gathered as part of a previous study (i.e., Hughes et al. 1995), also included in this review. We coded this assessment (i.e., peer observations used for normative comparison data, conducted in the same school) only once, as part of the first study, but included the other three assessment procedures used by Hughes et al. (1996) in the results.

Studies included between one and four assessment procedures ($M = 2.3$). Twenty studies included two or more assessments (see Table 2). The most common assessment procedures were direct observation of other students ($n = 13$) and direct observation of the participant with ASD ($n = 13$), followed by consultation with various stakeholders ($n = 12$). The majority of questionnaires or rating scales ($n = 6$) were used to determine social or academic standing of students, but authors of only one study noted using a formal rating scale (i.e., social network survey; Kasari et al. 2012). No studies included functional behavior assessment and functional analysis. However, structural analysis was used in one study (Peck et al. 1997). Authors of two studies were unclear about the nature of assessment procedures. Loftin et al. (2008) noted that conversational skills were "informally assessed" but provided no additional information. Hunt et al. (2003) indicated that the intervention (i.e., unified plans of support) was based on participants' "assessment information" but did not specify how information was gathered.

Assessment settings included general education classrooms ($n = 6$), special education classrooms ($n = 2$), non-classrooms (e.g., lunchroom, hallways, courtyard, gym; $n = 6$), and off campus ($n = 2$). Authors did not report any assessments occurred in empty classrooms. Most of the 21 studies failing to specify where an assessment took place did so regarding the

Table 1 Intervention descriptions, settings, and formats

Study	Intervention description	Intervention setting	Format
Banda and Hart (2010)	Didactic instruction for student with ASD and didactic peer training (5-min sessions with modeling and role play)	Special education classroom	One to one
Buggey (2005)	Video modeling of social initiations and interactions including students with ASD, teachers, and peers; videos watched by focus student in the classroom before classes	Empty classroom	Unclear
Davis et al. (1994)	Peer training with didactic instruction, role play, example scenarios; teacher-delivered high-probability requests preceded low-probably requests to initiated during play sessions	General education classroom	Group
Delano and Snell (2006)	Social stories with comprehension check prior to play sessions	Special education classroom, open area between classrooms	Dyad
Dugan et al. (1995)	Cooperative learning groups with reinforcement (stickers) for appropriate social skills	General education classroom	Group
Garrison-Harrell et al. (1997)	Peer networks with augmentative communication system	General education classroom, school library, lunchroom, during recess (unclear where)	One to one, group
Ganz et al. (2012)	Didactic training included to modeling and feedback to teach peer to use scripts and prompts; didactic training provided to participant with ASD prior to training sessions	Empty classroom	Group
Harper et al. (2008)	Didactic peer training in pivotal response raining and triads on the playground with participant with ASD	Classroom, playground	Group
Hughes et al. (1995)	Written didactic instruction (multiple exemplar self-instructional training with a training script) for peers; peers provided prompting and feedback to the participant with ASD	Special education classroom, lunchroom, multi-purpose room, gym	Dyad
Hughes et al. (1996)	Written didactic instruction (multiple exemplar self-instructional training with a training script) for peers; peers provided prompting and feedback to the participant with ASD	Hall, gym, lunchroom, classrooms (unclear what kind)	Dyad
Hughes et al. (2002)	Peers asked to engage in a predetermined leisure activity	Special education classroom, lunchroom, gym	Dyad
Hunt et al. (1994)	Cooperative learning groups with specific peer instruction on how to prompt and reinforce the student with a disability	General education classroom	Group
Hunt et al. (2003)	Unified plan of support included peer support during writing, photo book to aid in social interactions, and lunch buddies for the participant with ASD; other accommodations and modifications for academics	General education classroom, cafeteria, hallway	Group; other formats unclear
Kasari et al. (2012)	Compared child (1:1 social skill instruction for student with ASD) vs. peer (group didactic peer training on facilitation and modeling for students with ASD) vs. child + peer	Playground, setting for training sessions unclear	One to one, group
Koegel et al. (2005)	Adult-facilitated structured social club during lunch based on each participant's interest	Off-campus (participants' homes, park, pool)	Dyad
Koegel et al. (2012)	Play dates with contextual support vs. play dates without contextual support	Picnic tables at lunch, playground	Group
Koegel et al. (2013)	Adult-facilitated structured social club during lunch based on each participant's interest	Empty classroom, school lawn, basketball court	Group
Liber et al. (2008)	Adult-implemented time delay procedure used during a play activity with one peer with a disability; peers trained to wait for and respond to initiations (format of training unclear)	Special education classroom	One to one, dyad
Loftin et al. (2008)		Lunchroom	One to one

Table 1 (continued)

Study	Intervention description	Intervention setting	Format
	Didactic instruction on social initiations using task analyses and multiple exemplars; self-monitoring strategy; peer training to respond to initiations		
Mundschenk and Sasso (1995)	Didactic peer training with self-monitoring (conducted one at a time) to interact with the participant with ASD in a small group play session	School library, hallway	Group
Owen-DeSchryver et al. (2008)	Didactic peer training on the importance of making friends with students with disabilities and strategies to provide support to the participant with ASD	Unclear ("separate locations")	Group, dyad, unclear
Parker and Kamps (2011)	Didactic training on task analyses of activities and social scripts for participants with ASD; didactic training for peers to model and prompt; peer groups for social activities	Off-campus (restaurant and participant's home), school locations unclear	One to one, group
Peck et al. (1997)	Treatment A (best conditions), treatment B (worst conditions); each treatment is based on individual structural analysis results; didactic training for peers on providing high vs. low structure and high vs. low social interaction	Special education classroom	Unclear
Reilly et al. (2014)	Didactic training for participants with ASD to use novel peer-directed questions; (for two participants only) didactic peer training to teach prompting and praise	General education classroom, special education classroom, empty classroom, lunchroom, school library, hallways, school courtyard	Dyad
Sansosti and Powell-Smith (2008)	Social stories and video models; peers were prompted to respond to initiations by participant with ASD	Playground	One to one, group
Sasso et al. (1998)	Didactic peer training to initiate play activities with participants with ASD; peer self-evaluation and feedback at the end of play sessions; compared high-status pairings	General education classroom	Group
Strasberger and Ferreri (2014)	Peer-assisted communication training with video modeling and feedback for use of SGD; didactic training provided to peers	Special education classroom, office	Dyad
Thiemann and Goldstein (2001)	Social stories with didactic peer training for specific social skills; social activities and self-evaluation	Non-classroom	Group
Thiemann and Goldstein (2004)	Didactic peer training (including role play and feedback) on facilitative strategies to target social behavior	General education classroom, special education classroom	Group

ASD autism spectrum disorder, *SGD* speech-generating device

Table 2 Assessment procedures employed in each study

Study	Formal interview	Informal interview	Interview (format unclear)	Consulting with others (unclear)	Direct observation (student with ASD)	Direct observation (peers)	Questionnaire	Document review	Structural analysis	Academic assessment	Not specified	Total
Banda and Hart (2010)				X	X			X				3
Buggey (2005)							X					1
Davis et al. (1994)[a]				X	X	X		X				4
Delano and Snell (2006)		X			X					X		3
Dugan et al. (1995)							X					1
Garrison-Harrell et al. (1997)					X	X	X					3
Ganz et al. (2012)[a]				X		X		X				3
Harper et al. (2008)[a]				X	X	X						3
Hughes et al. (1995)[a]		X				X	X					3
Hughes et al. (2002)				X	X	X						3
Hughes et al. (1996)[a]		X			X		X					3
Hunt et al. (1994)								X				1
Hunt et al. (2003)[a]					X						X	2
Kasari et al. (2012)				X	X		X					3
Koegel et al. (2005)[a]				X		X						2
Koegel et al. (2012)[a]			X			X						2
Koegel et al. (2013)[a]			X			X						2
Liber et al. (2008)[a]				X								1
Loftin et al. (2008)											X	1
Mundschenk and Sasso (1995)[a]						X	X					2
Owen-DeSchryver et al. (2008)				X	X	X						3
Parker and Kamps (2011)[a]				X								1
Peck et al. (1997)[a]				X					X			2
Reilly et al. (2014)[a]						X						1
Sansosti and Powell-Smith (2008)[a]			X		X	X				X		4
Sasso et al. (1998)[a]				X			X					2
Strasberger and Ferreri (2014)	X				X							2
Thiemann and Goldstein (2001)							X					1
Thiemann and Goldstein (2004)[a]					X							1
Total	1	3	3	12	13	13	9	4	1	2	2	

[a] Studies that provided results

location of interviews, questionnaires, or academic assessments. Authors reported assessment settings most frequently for categories of direct observation. Although four studies did not specify the location of direct observations of students with ASD (Davis et al. 1994; Harper et al. 2008; Hughes et al. 1996) or peers (Koegel et al. 2012), 80 % of studies with direct observation reported that observations were conducted in the same intervention setting.

Authors of 17 studies (58.6 %) reported assessment results, and in each study, findings were conclusive for all participants. Each of these included narrative summaries of results, and 10 studies included supporting data as well. The only study including results for individual assessment procedures was Peck et al. (1997). Peck et al. (1997) indicated that results were conclusive for structural analyses related to some social outcomes, but not all, for the two participants with ASD. Because the assessment package as a whole produced results used to individualize interventions for both participants, we coded the results of this study as conclusive.

Ten studies reporting assessment results included direct observation of other students, and the majority (83.3 %) of these reported results. Although results were reported fairly consistently for direct observation of other students, only four studies included results of direct observation of students with ASD. Eight studies (66.7 %) including consultation with stakeholders reported results. Authors of studies employing interviews (i.e., formal, informal, and/or unspecified format) reported findings in 62.5 % of studies, and 80 % of authors reporting the use of document reviews included assessment results. For academic assessment, authors did not report results in either case.

Of the 12 studies lacking assessment results, one study did not include the results but noted that they were available by request (Hughes et al. 2002). In some cases, the information provided was vague or insufficient to determine results. For example, Strasberger and Ferreri (2014) conducted a formal parent interview and paired-choice preference assessment to determine preferred items for each participant but only included a short list of examples of preferred items used as part of the intervention, rather than a list of items used for each participant.

Assessment Connections to Interventions and Outcomes

Table 3 summarizes the frequency with which each assessment procedure was used to inform an intervention component or outcome. While studies frequently incorporated just one assessment procedure to assess a single intervention component or outcome, a small number of studies used multiple assessment procedures to assess the same intervention components or outcomes (Banda and Hart 2010; Davis et al. 1994; Mundschenk and Sasso 1995; Sansosti and Powell-Smith 2008). For example, Banda and Hart (2010) consulted with teachers, observed students with ASD, and completed document reviews to determine outcomes for each participant. Mundschenk and Sasso (1995) used a peer nomination measure (i.e., questionnaire) to determine high status peers, from which teachers provided input to determine peer selection.

Three studies used multiple assessments to examine multiple components. Peck et al. (1997) consulted with teachers to generate hypotheses about which settings and tasks would elicit higher rates of appropriate social behavior and lower rates of off-task behavior. They subsequently assessed various settings and activities using structural analyses. Delano and Snell (2006) used both informal interviews and prebaseline observations of participants to determine their preference for play activities and determine the appropriateness of social outcomes. Harper et al. (2008) conducted observations of students with ASD and their peers to determine activities preferred by both participants and peers. This study also included direct observations of participants to select social outcomes, which they confirmed by consulting with teachers.

Authors used assessment procedures to inform different aspects of the intervention—including the setting, selection of peers, the activities or tasks, and the materials—37 times across 19 studies. Assessment procedures informed the selection of outcomes or determined normative comparison (e.g., rates of social interactions of peers) 32 times across 17 studies. Eight studies included assessment procedures used to inform both intervention components and outcomes. One study used a questionnaire to assess the prerequisite skills needed to access the intervention (i.e., video self-modeling; Buggey 2005).

When an assessment approach was used to inform an intervention, studies most frequently relied on consultation with stakeholders ($n = 11$), mostly for the selection of activities or tasks ($n = 6$) or the selection of peers ($n = 4$). The vast majority of assessments were used to either identify social outcomes for participants with ASD ($n = 20$) or determine normative comparisons based on levels of social outcomes for peers ($n = 11$). Of the 14 studies using direct observation of other students, the majority ($n = 12$) used direct observation of peers to collect normative information used to compare participant outcome data. Two studies (Koegel et al. 2005; Owen-DeSchryver et al. 2008) used direct observation to identify potential peer partners, and two studies (Harper et al. 2008; Hughes et al. 2002) used observations of peers to determine mutually enjoyable activities for the intervention.

Although all interventions included a peer-mediated component, only seven studies (23.3 %) reported using any form of assessment to identify appropriate peer partners. Those assessments included consultation with stakeholders (e.g., teachers, parents, paraprofessionals), direct observation of the student with ASD, direct observation of peers, and questionnaire or rating scale. In addition, the use of assessments to identify activities and/or tasks or materials was reported by fewer than half of studies ($n = 13$).

Table 3 Frequency of assessment connections to intervention components and outcomes

	Formal interview	Informal interview	Interview (format unclear)	Consulting with others (unclear)	Direct observation (student with ASD)	Direct observation (peers)	Questionnaire	Document review	Structural analysis	Academic assessment	Not specified	Total
Setting	–	–	–	1	–	–	–	–	1	–	–	2
Peer selection	–	–	–	4	1	2	5	–	–	–	–	12
Activities/tasks	–	1	2	6	3	2	1	–	1	–	–	16
Materials	1	–	–	–	2	–	–	1	–	2	1	7
Prerequisite skills	–	–	–	–	–	–	1	–	–	–	–	1
Social outcomes	–	3	1	4	7	11	2	3	–	–	–	31
Other outcomes	–	–	–	–	–	–	–	1	–	–	–	1
Specific element unclear	–	–	–	–	–	–	–	–	–	–	1	1
Total	1	4	3	15	13	15	9	5	2	2	2	

Experimental Design and Quality Indicators

Twenty-eight studies used single-case methodology. Only 10 of these studies met the minimum standard for single-case design research, specifically (a) including a minimum of three data points per phase, (b) a minimum of three demonstrations, (c) reliability of outcome measures reported for at least 33 % of sessions at a minimum of 80 %, and (d) reporting treatment fidelity. Twenty-five studies included a sufficient number of data points per phase, while three did not. Only 22 studies included a sufficient number of demonstrations to establish experimental control. Twenty-five studies met minimal criteria for inter-observer agreement of observational measures, and only 16 studies included treatment fidelity data.

The group design study (Kasari et al. 2012) was a randomized control trial utilizing a 2×2 factorial design and met the standards for group design research (i.e., randomly assigned participants, sufficient group size, appropriate unit of analysis, appropriate use and description of sampling and randomization procedures, established group equivalence at pretest, statistically significant outcomes, and moderate to large effect sizes).

Across the 29 studies, 12 studies (41.4 %) measured generalization across communicative partners ($n = 9$), settings ($n = 10$), or materials ($n = 2$). Less than half of studies ($n = 14$; 48.3 %) reported maintenance data. Fifteen studies (51.7 %) reported social validity, but none reported on the social validity of assessment procedures.

Discussion

The social needs of students with ASD vary widely. Although many possibilities for individualization exist within peer-mediated interventions, little attention has focused on how to use formative assessment to tailor these interventions. Our review explored the assessment procedures used to inform peer-mediated social interventions and social outcomes for students with ASD. Findings of this review highlight the limited attention given to assessment and suggest gaps to be addressed in future research.

First, the focus on assessment within the peer-mediated intervention literature is relatively limited. In a prior review, Carter et al. (2010) identified 55 studies of peer-mediated social interventions including students with ASD between 1990 and 2008. However, even without these constraints of specific publication dates, we identified only 29 peer-mediated intervention studies targeting social outcomes for students with ASD and incorporating at least one assessment procedure. Moreover, only one study (i.e., Peck et al. 1997) included assessment procedures as a central focus of the study and attempted to evaluate its efficacy. Although this may reflect a failure to report assessment information in journal articles rather than a failure to conduct assessment, approaches

for carrying out assessment-based individualization of peer-mediated social interventions remains a key gap in the literature.

Second, assessment procedures most frequently focused on the outcomes targeted by the peer-mediated interventions. Multiple studies ($n = 20$) included direct observation to select appropriate social outcomes for students with ASD or to gather information about normative rates to which outcomes could be compared. Other assessment procedures—including interviews, consulting with various stakeholders, questionnaires, and document reviews—were used less frequently to select outcomes and never for collecting information on peer social behavior. The reliance on direct observation for both the selection of outcomes and collection of normative data is promising for a number of reasons. Direct observation is a widely accepted data collection practice and can provide useful information about students, the social context, and environmental factors likely to influence social interactions. A number of studies in this review described observational methods illustrating how direct observation can be applied systematically (e.g., Davis et al. 1994; Garrison-Harrell et al. 1997; Sansosti and Powell-Smith 2008). Although studies often seek to evaluate the effectiveness of an intervention for improvements in certain predetermined outcomes, studies in which outcomes were selected for individual students based on assessment results provide helpful models for identifying the most appropriate outcomes for a particular peer-mediated intervention.

Furthermore, the use of direct observation to collect normative comparison data is particularly relevant to social interventions. "Normal" levels and topographies of social behaviors vary substantially across social contexts (e.g., the cafeteria vs. an academic class). Peer comparison data not only provides readers with context for interpreting social behavior but it also paints a picture of the environments specific to participants in the studies. Koegel et al. (2013) illustrates this point. While readers may assume that normative rates of social interactions are relatively the same across lunchtime social clubs, levels and ranges of peer interactions varied substantially across the lunchtime clubs in which each participant participated. Each peer comparison provided insight into each participant's social outcomes relative to the specific group, framing outcomes in an appropriate context as a means of validating results.

Third, although more than half of studies used assessment to adapt intervention components, most relied on fairly weak assessment methods. Consultation with stakeholders was frequently used as a means of gathering information about activities or tasks, materials, setting, and peers. Authors noted getting input from teachers, parents, and/or paraprofessionals, without including details about precisely how they obtained the information (e.g., Liber et al. 2008; Parker and Kamps 2011). While it is possible that researchers used more rigorous methods not reported in these articles, readers are unable to draw conclusions about or take direction without more detailed descriptions.

More rigorous methods of assessment—such as direct observation, questionnaires, and interviews—were less frequently used to individualize intervention components than outcomes. For example, Ganz et al. (2012) used systematic direct observation to collect peer comparison data to contextualize outcomes for the student with ASD but "asked Barbara's teacher to suggest two activities that were age appropriate and that she thought the students would enjoy" to select intervention activities. Other studies demonstrated similar use of more rigorous assessments targeted to outcomes, while using less rigorous methods to individualize intervention component studies (e.g., Koegel et al. 2005, 2012). Also surprising, less than one third of studies included assessments to inform peer selection. Because peers must be selected at the start of each peer-mediated intervention, they are most likely to vary across participants and present a prime opportunity to select peers based on students' preferences or desired characteristics. Yet, few studies included descriptions of assessment methods to guide peer selection.

Fourth, the focus of assessment in most studies was narrow. In 18 studies, researchers used a single assessment procedure to address only one feature of the intervention or outcome. Each assessment procedure reflected in this collection of studies has potential for researchers to gather information related to multiple intervention elements and/or outcomes at once (e.g., questionnaires incorporating items asking about students' preferences and social needs, direct observations noting specific social outcomes requiring intervention and the peers with which the student most frequently interacts). Only three studies illustrated the use of assessment procedures to address multiple intervention components and outcomes (i.e., Delano and Snell 2006; Harper et al. 2008; Peck et al. 1997). Each also used multiple assessment procedures to gather information about each intervention component and outcome. By using various sources of information for a single component and using each assessment to gather information useful for individualizing more than one intervention element, these few studies demonstrated the use of both effective and efficient assessment.

Fifth, the assessment procedures within studies were often poorly described and not easily replicable. More than half of the studies included ambiguous descriptions of assessments requiring coding in less-precise categories, including "consultation with stakeholders-format unclear," "interview format unspecified," and assessment unspecified. Assessments described with enough information to warrant specific categorization of assessment practices were still often insufficient to replicate, such as "selection of dependent variables was based on investigator observations, teacher input and participants' IEP goals" (Banda and Hart 2010, p. 126). Well-described assessments were rare, and the inadequate descriptions used by many authors leaves uncertain the format

and quality of the assessment. Like any other element of the independent variable, a clear and replicable description of assessment methods used to individualize interventions or select outcomes is relevant to the replicability of the study and its findings.

Limitations

Several limitations warrant consideration when drawing conclusions from this review. First, we limited this review to information reported by study authors, which may provide an incomplete portrait of what researchers actually did. Therefore, conclusions about the quality of the actual assessment procedures should be made with caution. The reasons for the omission of assessment information could be multiple, including limited manuscript space or the absence of standards for describing this aspect of a study. Nevertheless, clear reporting is needed to enable both replication and extension by other research teams.

Second, we defined assessment broadly to present a comprehensive overview of how data-based decision making is used in the peer-mediated intervention literature. For example, document reviews can be a good source of assessment data but are not assessments, per se. No authors reporting the use of document reviews included information about specific assessment information retrieved. In addition, consultation with stakeholders may not always be considered a true assessment. Given the limited information provided by most authors, our decision to include studies using methods loosely defined as assessment procedures was twofold. Some studies included these methods in conjunction with other assessments, often as a precursory step to a more in-depth assessment procedure (e.g., Peck et al. 1997). By including this information, we were able to provide a more comprehensive description of all methods used to inform interventions and outcomes. Including these vague methods also further highlights the need for more detailed reporting.

Third, this review does not allow us to address the efficacy of the assessment approaches used within these studies. Only Peck et al. (1997) experimentally evaluated the effects of assessment-based individualization of interventions on social outcomes. Yet, this study did not draw clear conclusions about the effectiveness of the assessment-based changes made to the intervention. Without high-quality experimental evaluation of assessment procedures, we are unable to draw conclusions about which assessments were most effective.

Implications for Practice

The findings of this review have some implications for practice. First, given the flexible nature of many peer-mediated interventions, practitioners should consider all opportunities for individualization when introducing a social-focused intervention involving peers. The selection of activities, materials, settings, and peer partners provides opportunities to increase the motivation of students with ASD and peers by capitalizing on students' preferences and strengths and minimizing challenges unrelated to intervention goals. For example, when choosing inclusive activities for an after-school club, using assessment to determine the interests and preferences of the students with and without ASD can serve to identify activities that are engaging and reinforcing for all students. Moreover, formative assessment can be used to decrease or eliminate unnecessary challenges by determining if the student has the necessary prerequisite skills for the assigned activities or if tasks are too difficult to complete without adult assistance. If intervention goals are primarily social rather than academic, selecting materials at the academic level of the student with ASD may allow him or her to participate independently, leaving the focus of the intervention on the targeted social outcomes.

Second, a number of studies incorporated assessment methods with strong potential for application for use by practitioners who are implementing peer-mediated social interventions. Preference assessments—which take a variety of forms—are a valuable means for practitioners to determine students' likes and dislikes. Practitioners can use formal or informal interviews to ask students, parents, or teachers to rank order students' preference for materials, activities, settings, or peers. Published measures, such as the Reinforcement Assessment for Individuals with Severe Disabilities (Fisher et al. 1996) used by Strasberger and Ferreri (2014), could be used with school-age children and provides a structured interview format. Structured observations may be another useful way to determine preference based on how often or how long a student engages with particular items, activities, or peers, either given free access or when presented with a choice. Furthermore, these methods can be combined to gather information from multiple sources and gain a more comprehensive understanding of the preferences of students with ASD and their peers. These same assessment methods can be useful to rule out non-preferred items, activities, or peer partners.

Third, direct observation was used across multiple studies to collect information on the normative rates of peers' behavior. This approach could be particularly helpful to guide the intervention decisions of practitioners. Because peer-mediated interventions can be implemented in a wide variety of settings with varying social expectations, appropriate or expected levels of social outcomes may not always be known in advance. Peer comparison data can aid practitioners in determining a targeted level of behavior change specific to the context of the intervention.

Implications for Future Research

The findings of this review highlight several avenues for future research. First, authors should describe assessments

comprehensively and replicably. Most studies in this review failed to include sufficient detail to categorize or differentiate the methods of assessment, making a clear and complete understanding of procedures impossible. To provide replicable methods, future researchers must clearly (a) identify and describe the assessment approach being used, including its psychometric properties and findings; (b) note when in the course of the intervention the assessment was completed (e.g., prebaseline; between baseline and intervention); (c) describe the setting in which assessment was conducted; (d) identify the person implementing each assessment; and (e) describe the specific intervention components individualized based on assessment data. As part of the process of defining the independent variable, assessment methods should be described in a replicable manner.

Second, researchers must strive to use methods of assessment that meet benchmarks for quality in the special education field. Using high-quality assessment methods provides valuable models of best practice for practitioners and other consumers of research. This is particularly important for emerging, promising intervention practices, for which the means for making adaptations may not be commonly known or practiced by educators or other researchers. Moreover, interventions with flexibility of implementation and great potential for individualization, such as peer-mediated social interventions, require researchers to carefully consider ways to use multiple sources of information (i.e., multiple assessment methods) to inform a variety of different intervention components and outcomes. Further exploration of best practices for *effective* and *efficient* formative assessment would benefit practitioners by minimizing their time and effort put toward the assessment and intervention process and benefit their students by maximizing the impact of interventions.

Third, research experimentally evaluating the effects of assessment-based changes to peer-mediated social interventions is needed. Without it, neither researchers nor practitioners can draw meaningful conclusions about which assessments are effective and which elements of interventions can be individualized to improve outcomes for students with ASD. Research testing the effects of an individualized intervention compared to baseline or control group, as done in the vast majority of the studies in this review, allows us to draw conclusions only about the effectiveness of the individualized intervention, not the assessment. In order to determine the effectiveness of assessment-based modifications to the intervention, future research must compare the effects of unaltered peer-mediated interventions with adapted ones. This can be accomplished readily using single-case design, which provides a means of evaluating effects both within and across participants.

Compliance with Ethical Standards

Ethical Statement This article does not contain any studies with human participants or animals performed by any of the authors. For this type of study, formal consent is not required.

Conflict of Interest The authors declare that they have no conflict of interest.

References

*Indicates studies included in this review

*Banda, D. R., & Hart, S. L. (2010). Increasing peer-to-peer social skills through direct instruction of two elementary school girls with autism. *Journal of Research in Special Educational Needs, 10*, 124–132. doi: 10.1111/j.1471-3802.2010.01149.x.

*Buggey, T. (2005). Video self-modeling applications with students with autism spectrum disorder in a small private school setting. *Focus on Autism and Other Developmental Disabilities, 20*, 52–63. doi: 10.1177/10883576050200010501.

*Davis, C. A., Brady, M. P., Hamilton, R., McEvoy, M. A., & Williams, R. E. (1994). Effects of high-probability requests on the social interactions of young children with severe disabilities. *Journal of Applied Behavior Analysis, 27*, 619–637. doi: 10.1901/jaba.1994.27-619.

Delano, M., & Snell, M. E. (2006). The effects of social stories on the social engagement of children with autism. *Journal of Positive Behavior Interventions, 8*, 29–42. doi:10.1177/10983007060080010501.

*Dugan, E., Kamps, D., Leonard, B., Watkins, N., Rheinberger, A., & Stackhaus, J. (1995). Effects of cooperative learning groups during social studies for students with autism and fourth-grade peers. *Journal of Applied Behavior Analysis, 28*, 175–188. doi: 10.1901/jaba.1995.28-175.

*Ganz, J. B., Heath, A. K., Lund, E. M., Camargo, S. P., Rispoli, M. J., Boles, M., & Plaisance, L. (2012). Effects of peer-mediated implementation of visual scripts in middle school. *Behavior Modification, 36*, 378–398. doi: 10.1177/0145445512442214.

*Garrison-Harrell, L., Kamps, D., & Kravits, T. (1997). The effects of peer networks on social-communicative behaviors for students with autism. *Focus on Autism and Other Developmental Disabilities, 12*, 241–256. doi: 10.1177/108835769701200406.

*Harper, C. B., Symon, J. B., & Frea, W. D. (2008). Recess is time-in: using peers to improve social skills of children with autism. *Journal of Autism and Developmental Disorders, 38*, 815–826. doi: 10.1007/s10803-007-0449-2.

*Hughes, C., Harmer, M. L., Killian, D. J., & Niarhos, F. (1995). The effects of multiple-exemplar self-instructional training on high school students' generalized conversational interactions. *Journal of Applied Behavior Analysis, 28*, 201–218. doi: 10.1901/jaba.1995.28-201.

*Hughes, C., Killian, D. J., & Fischer, G. M. (1996). Validation and assessment of a conversational interaction intervention. *American Journal of Mental Retardation, 100*, 493–509.

*Hughes, C., Copeland, S. R., Wehmeyer, M. L., Agran, M., Cai, X., & Hwang, B. (2002). Increasing social interaction between general education high school students and their peers with mental

retardation. *Journal of Developmental and Physical Disabilities, 14*, 387–402. doi:10.1023/A:1020386920054.

*Hunt, P., Staub, D., Alwell, M., & Goetz, L. (1994). Achievement by all students within the context of cooperative learning groups. *Research and Practice for Persons with Severe Disabilities*, *19*, 290–301. doi: 10.1177/154079699401900405.

*Hunt, P., Soto, G., Maier, J., & Doering, K. (2003). Collaborative teaming to support students at risk and students with severe disabilities in general education classrooms. *Exceptional Children, 69*, 315–332. doi: 10.1177/001440290306900304.

*Kasari, C., Rotheram-Fuller, E., Locke, J., & Gulsrud, A. (2012). Making the connection: randomized controlled trial of social skills at school for children with autism spectrum disorders. *Journal of Child Psychology and Psychiatry, 53*, 431–439. doi: 10.1111/j.1469-7610.2011.02493.x.

*Koegel, L. K., Vernon, T. W., Koegel, R. L., Koegel, B. L., & Paullin, A. W. (2012). Improving social engagement and initiations between children with autism spectrum disorder and their peers in inclusive settings. *Journal of Positive Behavior Interventions, 14*, 220–228. 1098300712437042.

*Koegel, R., Kim, S., Koegel, L., & Schwartzman, B. (2013). Improving socialization for high school students with ASD by using their preferred interests. *Journal of Autism and Developmental Disorders, 43*, 2121–2134. doi: 10.1007/s10803-013-1765-3.

*Koegel, R. L., Werner, G. A., Vismara, L. A., & Koegel, L. K. (2005). The effectiveness of contextually supported play date interactions between children with autism and typically developing peers. *Research and Practice for Persons with Severe Disabilities, 30*, 93–102. doi: 10.2511/rpsd.30.2.93

*Liber, D. B., Frea, W. D., & Symon, J. B. (2008). Using time-delay to improve social play skills with peers for children with autism. *Journal of Autism and Developmental Disorders, 38*, 312–323. doi: 10.1007/s10803-007-0395-z.

*Loftin, R. L., Odom, S. L., & Lantz, J. F. (2008). Social interaction and repetitive motor behaviors. *Journal of Autism and Developmental Disorders, 38*, 1124–1135. doi: 10.1007/s10803-007-0499-5.

*Mundschenk, N. A., & Sasso, G. M. (1995). Assessing sufficient social exemplars for students with autism. *Behavioral Disorders, 21*, 62–78.

*Owen-DeSchryver, J. S., Carr, E. G., Cale, S. I., & Blakeley-Smith, A. (2008). Promoting social interactions between students with autism spectrum disorders and their peers in inclusive school settings. *Focus on Autism and Other Developmental Disabilities, 23*, 15–28. doi: 10.1177/1088357608314370.

*Parker, D., & Kamps, D. (2011). Effects of task analysis and self-monitoring for children with autism in multiple social settings. *Focus on Autism and Other Developmental Disabilities*, *26*, 131–142. doi: 10.1177/1088357610376945.

*Peck, J., Sasso, G. M., & Jolivette, K. (1997). Use of the structural analysis hypothesis testing model to improve social interactions via peer-mediated intervention. *Focus on Autism and Other Developmental Disabilities, 12*, 219–230. doi: 10.1177/108835769701200404.

*Reilly, C., Hughes, C., Harvey, M., Brigham, N., Cosgriff, J., Kaplan, L., & Bernstein, R. (2014). "Let's talk!": Increasing novel peer-directed questions by high school students with autism to their general education peers. *Education and Training in Autism and Developmental Disabilities, 49*, 214–231.

*Sansosti, F. J., & Powell-Smith, K. A. (2008). Using computer-presented social stories and video models to increase the social communication skills of children with high-functioning autism spectrum disorders. *Journal of Positive Behavior Interventions, 10*, 162–178. doi: 10.1177/1098300708316259.

*Sasso, G. M., Mundschenk, N. A., Melloy, K. J., & Casey, S. D. (1998). A comparison of the effects of organismic and setting variables on the social interaction behavior of children with developmental disabilities and autism. *Focus on Autism and Other Developmental Disabilities, 13*, 2–16. doi: 10.1177/108835769801300101.

*Strasberger, S. K., & Ferreri, S. J. (2014). The effects of peer assisted communication application training on the communicative and social behaviors of children with autism. *Journal of Developmental and Physical Disabilities*, *26*, 513–526. doi: 10.1007/s10882-013-9358-9.

*Thiemann, K. S., & Goldstein, H. (2001). Social stories, written text cues, and video feedback: effects on social communication of children with autism. *Journal of Applied Behavior Analysis, 34*, 425–446. doi: 10.1901/jaba.2001.34-425.

*Thiemann, K. S., & Goldstein, H. (2004). Effects of peer training and written text cueing on social communication of school-age children with pervasive developmental disorder. *Journal of Speech, Language, and Hearing Research, 47*, 126–144. doi:10.1044/1092-4388(2004/012).

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington: American Psychiatric Association.

Bene, K., Banda, D. R., & Brown, D. (2014). A meta-analysis of peer-mediated instructional arrangements and autism. *Review Journal of Autism and Developmental Disorders, 1*, 135–142. doi:10.1007/s40489-014-0014-9.

Carter, E. W., & Kennedy, C. H. (2006). Promoting access to the general curriculum using peer support strategies. *Research and Practice for Persons with Severe Disabilities, 31*, 284–292.

Carter, E. W., Sisco, L. G., Chung, Y., & Stanton-Chapman, T. (2010). Peer interactions of students with intellectual disabilities and/or autism: a map of the intervention literature. *Research and Practice for Persons with Severe Disabilities, 35*, 63–79. doi:10.2511/rpsd.35.3-4.63.

Carter, E. W., Sisco, L. G., & Chung, Y. (2012). Peer-mediated support strategies. In P. A. Prelock & R. McCauley (Eds.), *Treatment of autism spectrum disorders: evidence-based intervention strategies for communication and social interactions* (pp. 221–254). Baltimore: Paul H. Brookes.

Carter, E. W., Asmus, J. M., & Moss, C. K. (2014a). Peer support interventions to support inclusive education. In J. McLeskey, N. Waldron, F. Spooner, & B. Algozzone (Eds.), *Handbook of research and practice for effective inclusive schools* (pp. 377–394). New York: Routledge.

Carter, E. W., Bottema-Buetel, K., & Brock, M. E. (2014b). Social interactions and friendships. In M. Agran, F. Brown, C. Hughes, C. Quirk, & D. Ryndak (Eds.), *Equity and full participation for individuals with severe disabilities: a vision for the future* (pp. 197–216). Baltimore: Paul H. Brookes.

Carter, E. W., Common, E. A., Sreckovic, M. A., Huber, H. B., Bottema-Beutel, K., Redding Gustafson, J., & Hume, K. (2014c). Promoting social competence and peer relationships for adolescents with autism spectrum disorders. *Remedial and Special Education, 35*, 91–101. doi:10.1177/0741932513514618.

Carter, E. W., Huber, H. B., & Brock, M. E. (2014d). Developing effective peer support arrangements for students with severe disabilities in inclusive classrooms. In J. Hart & K. Whalon (Eds.), *Friendship 101: Developing social skills among children and youth with autism and developmental disabilities*. Arlington: Council for Exceptional Children.

Emerson, E., Hatton, C., Dickson, K., Gone, R., & Caine, A. (Eds.). (2012). *Clinical psychology and people with intellectual disabilities* (Vol. 97). West Sussek: Wiley.

Fisher, W. W., Piazza, C. C., Bowman, L. G., & Amari, A. (1996). Integrating caregiver report with a systematic choice assessment. *American Journal on Mental Retardation, 101*, 15–25.

Gifford-Smith, M. E., & Brownell, C. A. (2003). Childhood peer relationships: social acceptance, friendships, and peer networks. *Journal*

of School Psychology, 41, 235–284. doi:10.1016/S0022-4405(03)00048-7.

Hawken, L. S., Vincent, C. G., & Schumann, J. (2008). Response to intervention for social behavior: challenges and opportunities. *Journal of Emotional and Behavioral Disorders, 16*, 213–225. doi:10.1177/1063426608316018.

Kratochwill, T. R., & Stoiber, K. C. (2002). Evidence-based interventions in school psychology: conceptual foundations of the Procedural and Coding Manual of Division 16 and the Society for the Study of School Psychology Task Force. *School Psychology Quarterly*, *17*, 341–389. doi: http://dx.doi.org/10.1521/scpq.17.4.341.20872.

Kratochwill, T. R., Hitchcock, J., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2010). Single case design technical documentation. Retrieved from What Works Clearinghouse website: http://ies.ed.gov/ncee/wwc/pdf/wwc_scd.pdf.

National Autism Center. (2009). *National standards project findings and conclusions*. Randolph, MA: Author.

Odom, S. L., Collet-Klingenberg, L., Rogers, S. J., & Hatton, D. D. (2010). Evidence-based practices in interventions for children and youth with autism spectrum disorders. *Preventing School Failure, 54*, 275–282. doi:10.1080/10459881003785506.

Rubin, K. H., Bukowski, W. M., & Laursen, B. (Eds.). (2009). *Handbook of peer interactions, relationships, and groups*. New York, NY: Guilford Press.

Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis, 10*, 349–367. doi:10.1901/jaba.1977.10-349.

Strain, P. S., Odom, S. L., & McConnell, S. (1984). Promoting social reciprocity of exceptional children: identification, target behavior selection, and intervention. *Remedial and Special Education, 5*, 21–28. doi:10.1177/074193258400500106.

Sugai, G., & Horner, R. H. (2002). The evolution of discipline practices: school-wide positive behavior supports. *Child and Family Behavior Therapy, 24*, 23–50. doi:10.1300/J019v24n01_03.

Watkins, L., O'Reilly, M., Kuhn, M., Gevarter, C., Lancioni, G. E., Sigafoos, J., & Lang, R. (2014). A review of peer-mediated social interaction interventions for students with autism in inclusive settings. *Journal of Autism and Developmental Disorders*, doi: http://dx.doi.org/10.1007/s10803-014-2264-x.

Wentzel, K. R., Donlan, A., & Morrison, D. (2012). Peer relationships and social motivational processes. In A. M. Ryan & G. W. Ladd (Eds.), *Peer relationships and adjustment at school* (pp. 79–107). Charlotte: Information Age Publishing.

Wong, C., Odom, S. L., Hume, K. Cox, A. W., Fettig, A., Kucharczyk, S., … Schultz, T. R. (2014). *Evidence-based practices for children, youth, and young adults with autism spectrum disorder*. Chapel Hill, NC: The University of North Carolina, Frank Porter Graham Child Development Institute, Autism Evidence-Based Practice Review Group.