

Table 1
Participant and Intervention Characteristics

Citation	Sample Size/Age	Characteristics of Target Children	Intervention Characteristics	Intervention Method(s)	Results of Intervention
<i>Intervention Involving Peers</i>					
Garfinkle & Schwartz, 2002	4 TC; 19 CDT 3 to 6 years	Low levels of peer interaction, ability to imitate adults; no observed peer imitation	Interventionist: Assistant teacher Setting: Integrated classroom One 10-min session/day, approximately 57 sessions	Teacher instruction, prompts, and praise for imitative acts	All children increased peer imitations, levels of social interaction remained consistent with baseline
Goldstein & Cisar, 1992	3 TC; 6 CDT Preschool age	Low rates of peer interaction; off-topic verbalizations or echolalia	Interventionist: Research assistant & teachers Setting: Pull-out classroom for script training; observations conducted in classroom 15 min/day for 5-10 days or until 80% criterion met (independent responding by each child)	Sociodramatic script training in triad (1 TC, 2 CDT); Teacher prompts and praise during subsequent free play	Increases in targeted behavior of peers; increases in social interaction for all 3 TC; more effects with training of successive scripts; at generalization, all 3 TC maintained high levels of social interaction
Goldstein, Kaczmarek, Pennington, & Shafer, 1992	5TC; 10 CDT 3 to 6 years	Low levels of communicative behavior in during play; communication ranged from nonverbal to use of simple sentences	Interventionist: Researcher Setting: Pull-out classroom Peer training for 6 or up to 16 sessions to meet 80% criterion with TC in free play	Peer training in facilitation strategies: joint attention, commenting, responding	Peers exhibited high rates of strategy use during peer tx condition, TC increased frequency of total social behavior (verbal and nonverbal); reversal condition reduced freqs
Goldstein & Wickstrom, 1986	3 TC; 2 CDT 3 to 4 years	“Autistic-like” behaviors (e.g., inappropriate play, lack of social responsiveness, low language)	Interventionist: Researcher & teacher Setting: Peer training outside of classroom; observations conducted in integrated classroom Peer training for 15 min/day until criterion met (independent	Peers taught: eye contact, joint attn, commenting, prompting requests, responding, redirecting play; Teacher prompts and tokens during	Overall, large amount of variability day-to-day; largest increase in response rates of TC; 2 TC demonstrated higher rates of initiations

			performance of strategies)	free play	
Gonzalez-Lopez & Kamps, 1997	4 TC; 12 CDT 5 to 8 years	Communication ranged from single words to phrases; minimal play with peers; aggressive and noncompliant behaviors	Interventionist: Teachers Setting: Classroom 10-min training followed by 10-15 min of play	Training of 5 social skills using scripts: beh management, greetings, imitation, sharing & taking turns, asking; reinforcement during play (stickers)	Continual increases in duration time of social interactions through all phases for all TC; Continual increases in frequency of interactions for 3 TC, 1 increased more with reinforcement
Kohler, Greteman, Raschke, & Highnam, 2007	1 TC; 6 CDT 4 years	Mostly isolated play; rote/repetitive language; typically avoided interactions with peers	Interventionist: Teacher Setting: Integrated play activity 15-min training/8 consecutive days; subsequent 10-min play sessions 3 days/week	Variation of Buddy Skills Training (model and practice social skills)	Increases in social overtures in all children, reciprocity, and length of interactions
Kohler, Strain, Hoyson, Davis, Donina, & Rapp, 1995	3 TC; 6 CDT 3 to 5 years	Rare to occasional interactions with peers; inappropriate responses to peer initiations	Interventionist: Teachers Setting: Integrated preschool 15-min initial training sessions for 15 days; Three 15-min trainings after 2 nd baseline	Social skills training for TC and CDT in initiating, responding, and persistence through teacher modeling and practice; group reward system during activities	
Lefebvre & Strain, 1989	3 TC; 6 CDT 4 to 6 years	Limited ability to initiate or respond to peers	Interventionist: Teachers Setting: Integrated classroom 10- to 15-min training session/day for 9 days or until peers reached criterion of 80% (stating and demonstrating strategies)	Social strategy training for all children in class (initiating & responding), review of strategies 1 min. before small group play; whole & small group contingency	Increased levels of peer initiations & responses with differential reinforcement for individual play groups; increases in TC social initiations & responses with above reinforcement (both gradual)
Laushey & Heflin, 2000	2 TC; unspecified	Communication at the sentence level;	Interventionist: Research, teachers and paraprofessionals	Variation of Buddy Skills Training	

	number of CDT 5 to 6 years	minimal eye contact and difficulty maintaining conversations	Setting: Integrated classroom 10- to 15-min training for TC and CDT; tx in daily play sessions with buddies for 18 weeks total	("stay, play, and talk to your buddy"); TC and CDT dyads changed daily; play sessions with teacher reminders; tangible rewards faded over time	
McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992	3 TC; 3 CDT; 2 CDT as comparison 3 to 5 years	No participant characteristics other than diagnosis	Interventionist: Researcher and peers Setting: Integrated preschool One 5-minute training session/day (peer trained within dyad with TC; rotation in dyads after 8 sessions)	Peer training to use incidental teaching strategies in dyad; prompting and adult presence faded over time	TC reciprocal interactions increased with peer trng, continued in Fading I; 2 TC continued in Fading II; peer initiations increased with peer trng; teacher ratings higher for 2 TC; increases in sociometric ratings
Odom, Hoyson, Jamieson, Strain, 1985	3 TC; 3 CDT 2 to 5 years	Rare interactions with peers, inappropriate initiations responses to peer initiations	Interventionist: Teacher Setting: Integrated preschool Five 20-min training sessions for CDT; subsequent 5-min play sessions	Peer training to initiate social interactions and persist to gain response; teacher prompts, social and visual reinforcement (happy faces) during play sessions faded over time	
Odom & Watts, 1991	3 TC; 4 CDT 3 to 5 years	Minimal to no social interactions with peers	Interventionist: Teachers & CDT Setting: Peer training in pull-out classroom; peer initiation tx in integrated classroom	Peer training in initiation strategies (e.g., sharing, organizing, complimenting); teachers prompts to	Peer initiations were greater in peer-initiation condition vs. CTVF alone; social interactions of TC increased with all conditions; Peers & TC

			Peer training in 20-min sessions for 5 days; peer initiation tx during two 30-min structured play activities	peers to implement during play; visual and tangible reinforcement	used play organizers & sharing most; peer sociometric ratings fairly high, but only measured at end of study
Sainato, Goldstein, & Strain, 1992	3 TC; 5 CDT 3 to 4 years	Low language levels	Interventionist: Researcher Setting: Integrated classroom 15- to 20-min peer training session until CDT reached criterion (3 out of 5 uses of strategies without adult prompting); Four to six 10-min self-evaluation training sessions	Peers training in facilitative strategies (e.g., gaining attention, organizing play, sharing) through adult instruction, modeling, and practice; poster illustration provided during practice; Individual self-evaluation training for CDT through adult instruction, practice, and visual supports	Increase in number of facilitative strategies used by peers, particularly in self-evaluation condition; Teacher prompting also decreased in self-evaluation condition
Sawyer, Luiselli, Ricciardi, & Gower, 2005	1 TC; 3-5 CDT (per play session) 4 years (age of peers unspecified)	Communication at the phrase level; primarily solitary play, but interest in peers; rare sharing or cooperative play	Interventionist: Teacher or assistant Setting: Integrated preschool One 30-minute play session/day	Training for TC and CDT through teacher instruction, modeling, and practice; prompting and social praise during play sessions	
Strain & Danko, 1995	3 TC; 3 parents & babysitter; 3 siblings (CDT)/ 3 to 5 years	Minimal to no speech; infrequent interactions with peers	Interventionist: Parent or babysitter Setting: Home 4 adult training sessions; one to three 6-min play sessions/week (average of 40 sessions total)	Adult training through video, discussion, and practice in facilitating interaction among	Increases observed in social interaction, adult prompts and praises

				TC and siblings; variety of play sessions subsequent to training	
Strain, Hoyson, & Jamieson, 1985	6 TC, 10 CDT; 40 CDT as comparison 2 to 4 years	Minimal to no functional speech or positive interactions with peers	Interventionist: Setting: Integrated classroom 14-24 months of tx (each component of the LEAP program involves individual time & duration)	LEAP program (components: classroom behavior management program based on interdependent contingencies, TC trained to imitate peers, social skills training for CDT)	No significant differences found in CDT tx & control for any measure other than deviant behavior; increase in frequency of positive social interactions for TC with LEAP program
Tsao & Odom, 2006	4 TC; 4 TD siblings 3 to 11 years	Minimal to no social interactions with siblings	Interventionist: Researcher and parents Setting: Home; generalization observations conducted in other unstructured setting (e.g., park) 10-min social skills lesson with sibling; two 10-min play sessions/week with dyad (TC & sibling)	Social skills lesson for siblings in facilitating social interactions (e.g., eye contact, initiating) based on Buddy Skills Training; adult prompting to siblings during subsequent play sessions	

Abbreviations: TC, target child/ren; CDT, children developing typically; CWD, children with a disability (e.g., developmental delay, behavioral disorder); CWA, children with Autism Spectrum Disorder; tx, treatment; ASD, Autism Spectrum Disorder; MR, Mental Retardation; MLU, mean length of utterance

Table 2. Summary of the criteria ratings

Application of Evaluation Criteria for Single-Subject Experimental Design Studies															
Citations	Average Rating	Design characteristics	Measurement & reliability features			Evaluation of treatment effects						Dimensions of external validity			
		Design	Measurement	Reliability	Implementation Fidelity	Rationale	Robust tx effects	Quality of Baseline	Visual Analysis	Statistics	Maintenance & generalization	Implementation site	Participant selection	Consumer satisfaction	Social validity
Intervention Involving Peers															
Brown, Ragland, & Fox, 1988	2.4	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Garfinkle & Schwartz, 2002	2.9	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Goldstein & Cisar, 1992	3.1	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Goldstein & Wickstrom, 1986	2.5	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Goldstein, Kaczmarek, Pennington, & Shafer, 1992	2.7	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Gonzalez-Lopez & Kamps, 1997	2.7	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Kohler, Greteman, Raschke, & Highnam, 2007	2.5	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Kohler, Strain, Hoyson, Davis, Donna, & Rapp, 1995	2.7	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Kohler, Strain, Maresky, & DeCesare, 1990	2.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Laushey & Heflin, 2000	2.7	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Lefebvre & Strain, 1998	2.6	●	●	●	●	●	●	●	●	●	●	●	●	●	●
McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992	3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Odom, Hoyson, Jamieson, Strain, 1985	2.9	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Odom & Watts, 1991	3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Roeyers, 1995	1.4	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Sainato, Goldstein, & Strain, 1992	2.7	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Sawyer, Luiselli, Ricciardi, & Gower, 2005	2.7	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Strain & Danko, 1995	2.9	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Strain, Danko, & Kohler, 1995	2.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Strain & Kohler, 1995	2.4	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Strain, Hoyson, & Jamieson, 1985	2.7	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Tsao & Odom, 2006	2.9	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Average rating by criterion	2.6	2.9	2.8	2.9	3.1	3.4	3.1	3.1	3.1	1	1.7	4	2.9	1.6	1.3

Adult-Mediated Intervention															
Carter, 2001	2.6	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Chin & Bernard-Opitz, 2000	2.5	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Drasgow, Halle, & Phillips, 2001	1.8	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Gena, 2006	3.1	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hall & Smith, 1996	2.1	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hancock & Kaiser, 2002	2.8	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Koegel, Dyer, & Bell, 1987	2.6	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Koegel, Camarata, Valdez-Menchaca, & Koegel, 1998	2.9	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Kohler, Anthony, Steighner, & Hoyson, 2001	2.9	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Krantz & McClannahan, 1998	2.8	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Matson, Sevin, Box, Francis, & Sevin, 1993	2.9	●	●	●	●	●	●	●	●	●	●	●	●	●	●
McEvoy, Nordquist, Twardoxa, Heckaman, Wehby, & Denny, 1998	2.6	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Thorp, Stahmer, & Schreibman, 1995	2.6	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Average rating by criterion	2.6	3.1	2.7	2.7	2.7	3.6	3.2	3	3	1	2.7	2.8	2.8	1.9	1.6

Application of Evaluation Criteria for Group Design Studies

Citations	Average Rating	Design characteristics & internal validity				Measurement & reliability features			Evaluation of treatment effects				Dimensions of external validity			
		Design	Group Equivalence	Comparison Group	Attrition	Measurement	Reliability	Implementation Fidelity	Rationale	Robust tx effects	Statistics	Maintenance & generalization	Implementation site	Participant selection	Consumer satisfaction	Social validity
Comprehensive Intervention Program																
Rogers, Herbison, Lewis, Pantone, & Reis, 1986	1.9	●	●	●	n/a	●	●	●	●	●	●	●	●	●	●	●
Rogers & DiLalla, 1991	1.8	●	●	●	n/a	●	●	●	●	●	●	●	●	●	●	●
Salt, Shemilt, Sellars, Boyd, Coulson, & McCool., 2002	1.9	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Average rating by criterion	1.9	1	1	1.3	2	3.3	2	1.7	2	2	1.7	1.7	2.3	3.7	1	1
Intervention Involving Peers																
Strain, Hoyson, & Jamieson, 1985	1.8	●	●	●	●	*	*	*	*	*	*	*	*	*	*	*
Average rating by criterion	1.8	2	2	2	1											
Adult-Mediated Intervention																
Mahoney & Perales, 2003	2.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Average rating by criterion	2.3	1	1	1	3	3	2	3	3	4	2	1	4	4	1	1
Combined Approach: Adult- and Peer-Mediated Intervention																
Kalyva & Avramidis, 2005	2.5	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Average rating by criterion	2.5	2	1	2	4	3	3	2	4	4	2	3	4	2	1	1
Other Interventions																
McHale, Simeonsson, Marcus, & Olley, 1980	1.7	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Average rating by criterion	1.7	1	1	2	1	2	2	1	4	1	2	1	2	3	1	1

* same as indicated in Single Subject Design Table; average rating was calculated using only the 4 scores indicated

Table 3. Summary of effect size estimates for single-subject designs using PAND.

Study	Authors	Dependent variable	PAND	Phi	Lower CI	Upper CI	Cohen's <i>d</i>
Peer-Mediated							
PM1a	Brown, Ragland, & Fox, 1988	Total social	96%	0.92	0.80	0.97	4.77
PM1b		Total social	74%	0.48	0.29	0.63	1.08
PM2	Garfinkle & Schwartz, 2002	Total social	57%	-0.28	-0.40	-0.02	-0.58
		Generalization to free play	75%	0.15	-0.05	0.37	0.31
PM3	Goldstein & Cisar, 1992	Theme-related social behavior	96%	0.92	0.83	0.96	4.56
		Theme-unrelated social behavior	83%	0.62	0.49	0.72	1.58
PM4	Goldstein, Kaczmarek, et al., 1992	Total social	73%	0.39	0.27	0.49	0.84
		Communication acts	63%	0.16	0.05	0.28	0.33
PM5	Goldstein & Wickstrom, 1986	Responses	81%	0.56	0.43	0.67	1.36
		Initiations	74%	0.39	0.25	0.52	0.84
		Total social	77%	0.45	0.31	0.58	1.01
PM6	Gonzalez-Lopez & Kamps, 1997	Total social	84%	0.65	0.53	0.74	1.70
		Duration of interactions	83%	0.63	0.51	0.72	1.62
PM7	Kohler, Greteman et al., 2007	Total social	96%	0.92	0.78	0.97	4.55
PM8	Kohler, Strain, Hoyson et al., 1995	Total social	95%	0.90	0.83	0.95	4.23
PM9	Kohler, Strain, Maretsky et al., 1990	Total social	79%	0.57	0.45	0.67	1.39
PM10	Laushey & Heflin, 2000	Total Social	100%	1.00	0.84	1.00	Large
PM11	Lefebvre & Strain, 1998	Total social	80%	0.54	0.43	0.64	1.30
PM12	McGee, Almeida, et al., 1992	Total social	93%	0.83	0.67	0.92	3.02
PM13	Odom, Hoyson, et al., 1985	Total Social	91%	0.79	0.72	0.84	2.58
PM14	Odom & Watts, 1991	Total social (peer initiation)	94%	0.82	0.70	0.89	2.84
		Total social (correspondence training)	87%	0.74	0.64	0.82	2.22
PM15	Sainato, Goldstein, & Strain, 1992	Total social	76%	0.52	0.36	0.65	1.22
		Initiations	43%	-0.14	-0.31	0.03	-0.28
PM16	Sawyer, Luiselli, et al., 2005	Sharing (physical)	100%	1.00	0.47	1.00	Large
		Sharing (verbal)	93%	0.71	0.23	0.95	2.01

PM17	Strain & Danko, 1995	Total social	84%	0.67	0.54	0.76	1.78
PM18	Strain, Danko, & Kohler, 1995	Total social	88%	0.76	0.69	0.81	2.30
PM19	Strain, Hoyson, Jamieson, 1985	Total social	100%	1.00	0.84	1.00	Large
PM20	Strain & Kohler, 1995	Total social	86%	0.66	0.47	0.79	1.76
PM21	Tsao & Odom, 2006	Total Social	69%	0.27	0.03	0.49	0.56
Adult-Mediated							
AM1	Carter, 2001	Total Social	96%	0.91	0.77	0.97	4.39
		Total Social	82%	0.64	0.45	0.78	1.67
AM2	Chin & Bernard-Opitz, 2000	Total Social	100%	1.00	0.70	1.00	Large
		Total Social	93%	0.85	0.49	0.97	3.23
AM3	Drasgow, Halle, & Phillips, 2001	Responses	64%	0.18	-0.09	0.41	0.37
		Total Social	62%	0.11	-0.12	0.35	0.22
AM4	Gena, 2006	Initiations	100%	1.00	0.85	1.00	Large
		Responses	97%	0.94	0.77	0.99	5.51
AM5	Hall & Smith, 1996	Total Social	55%	0.02	-0.27	0.32	0.04
		Sharing	50%	-0.08	-0.35	0.23	-0.16
		Total Social	68%	0.31	0.01	0.57	0.65
		Total Social	55%	0.02	-0.27	0.32	0.04
		Total Social	50%	-0.08	-0.35	0.23	-0.16
AM6	Hancock & Kaiser, 2002	Total Social	94%	0.81	0.61	0.91	2.76
		Total Social	83%	0.42	0.22	0.61	0.93
		Total Social	85%	0.47	0.27	0.65	1.06
AM7	Koegel, Camarata, et al., 1998	Total Social	100%	1.00	0.89	1.00	Large
AM8	Koegel, Dyer, & Bell, 1987	Total Social	100%	1.00	0.61	1.00	Large
AM9	Kohler, Anthony et al., 2001	Total Social	90%	0.79	0.66	0.88	2.58
AM10	Krantz & McClannahan, 1998	Total Social	70%	0.32	0.17	0.46	0.68
AM11	Matson, Sevin, et al., 1993	Initiations	85%	0.63	0.54	0.70	1.62
AM12	McEvoy et al., 1988	Total Social	90%	0.79	0.66	0.88	2.58
AM13	Thorp et al., 1995	Total Social	87%	0.74	0.46	0.88	2.20
		Total Social	72%	0.39	0.01	0.67	0.85
		Total Social	87%	0.73	0.46	0.87	2.14

Table 4. Summary of effect size estimates for group designs.

Study	Authors	Dependent variable	Cohen's <i>d</i>
Peer-Mediated			
GPM1	Strain et al., 1985		unable to calculate
Adult-Mediated			
GAM1	Mahoney & Perales, 2003	Initiation	1.16
		Total Social	1.58
Combined Approaches			
GCA1	Kalyva & Avramidis, 2005	Response	3.09
		Initiation	3.00
Comprehensive Programs			
GCP1	McConkey et al., 2010	Total Social	0.77
GCP2	Remington et al., 2007	Socialisation	1.14
		Initiation	1.15
		Response	1.69
GCP4	Rogers, Herbison, et al., 1986		unable to calculate
GCP3	Rogers & DiLalla, 1991		unable to calculate
GCP5	Salt et al., 2002	Total Social	0.81
		Initiation	1.29
		Total Social	0.79
Other Approaches			
GOA1	McHale et al., 1980		unable to calculate

Figure 1. Forest plot for peer-mediated interventions.

