

Evidence-Based Systematic Review: Effects of Different Service Delivery Models on Communication Outcomes for Elementary School–Age Children

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ABSTRACT: Purpose: The purpose of this investigation was to conduct an evidence-based systematic review (EBSR) of peer-reviewed articles from the last 30 years about the effect of different service delivery models on speech-language intervention outcomes for elementary school–age students.

Method: A computer search of electronic databases was conducted to identify studies that addressed any of 16 research questions. Structured review procedures were used to select and evaluate data-based studies that used experimental designs of the following types: randomized clinical trial, nonrandomized comparison study, and single-subject design study.

Results: The EBSR revealed a total of 5 studies that met the review criteria and addressed questions of the effectiveness of pullout, classroom-based, and indirect–consultative service delivery models

with elementary school–age children. Some evidence suggests that classroom-based direct services are at least as effective as pullout intervention for some intervention goals, and that highly trained speech-language pathology assistants, using manuals prepared by speech-language pathologists to guide intervention, can provide effective services for some children with language problems.

Conclusion: Lacking adequate research-based evidence, clinicians must rely on reason-based practice and their own data until more data become available concerning which service delivery models are most effective. Recommendations are made for an expanded research agenda.

KEY WORDS: service delivery models, pullout, classroom based, indirect–consultative, evidence-based practice



The choice of effective service delivery option is a major concern for school-based speech-language pathologists (SLPs) as they serve on teams developing individual education plans (IEPs) for students with special needs. A service delivery model can be conceptualized as an organized configuration of resources aimed at achieving a particular educational goal. It must address questions of where service is to be delivered, by whom, and in what dosage. More specifically, IEP teams must identify the best (a) mixture of personnel, materials, and specific instructional or intervention procedures; (b) schedule and intensity for the provision of services (e.g., dosage); (c) settings in which intervention services will be delivered; and (d) direct and indirect roles that service providers will assume (Bennett, 1988; Cirrin & Penner, 1995).

As part of the current climate of accountability, SLPs face mandates to apply evidence-based practice (EBP) when making assessment and intervention decisions (Individuals With Disabilities Education Act of 2004 [IDEA]). EBP has been defined as “the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients...[by] integrating individual expertise with the best available external clinical evidence from systematic research” (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996, p. 71). The American Speech-Language-Hearing Association (ASHA, 2004, 2005) has conceptualized the goal of EBP as the integration of clinical expertise, best current external evidence, and client values to provide high-quality services that reflect the values, needs, and choices of students and families served by SLPs.

The purpose of this investigation was to systematically evaluate peer-reviewed articles from the last 30 years concerning the effect of various service delivery models on speech-language (S/L) intervention outcomes for elementary school-age students. An evidence-based systematic review (EBSR) is a comprehensive overview of the scientific literature on a specific clinical question (in this case, a set of 16 related questions) that is conducted using systematic procedures and explicit criteria to reduce bias, resulting in a summary report of the extent to which various treatment approaches are supported by research evidence (ASHA, 2004). An EBSR identifies common themes and gaps in the literature without using the statistical techniques that are employed in a meta-analysis.

In the absence of research evidence, service delivery decisions must be based on other criteria, often guided by tradition or expert opinion. Traditionally, SLPs in schools have used pullout rooms as settings for providing S/L intervention services in schools. *Pullout* typically refers to settings outside the regular or special education classroom where students receive individualized intervention. According to ASHA 2008 Schools Survey data, the pullout model continues to be the most prevalent model used by school practitioners in elementary schools. The summary report for that survey indicated that “overall, clinical service providers spent an average of 22 hours each week in traditional pull-out service, 5 in classroom- or curriculum-based classrooms, 4 in self-contained classrooms, 3 in collaborative consultation, and 1 in a resource room” (ASHA, 2008, p. 8).

Over the past 30 years, efforts have been made to develop, implement, and evaluate more inclusive alternative service delivery models for providing intervention services to students with S/L impairments. Alternative service delivery models for students with S/L impairments vary in design but often share the goal of enhancing the curricular relevance of S/L intervention by altering the *where* and by

whom characteristics of service delivery. This includes (a) moving the setting of intervention from a separate therapy room into the student’s ongoing educational experiences and (b) expanding the traditional, direct service provider role of the school-based SLP to include consultation and other indirect activities. A number of reports appear in the literature describing the benefits of these more inclusive approaches (e.g., Achilles, Yates, & Freese, 1991; ASHA, 1990, 1991, 1996; Bland & Prelock, 1995; Borsch & Oaks, 1992; Boyle, McCartney, Forbes, & O’Hare, 2007; Cirrin & Penner, 1995; Ferguson, 1992; Frassinelli, Superior, & Meyers, 1983; Holzhauser-Peters & Husemann, 1988; Howlin, 1981; Kohl, Wilcox, & Karlan, 1978; Magnotta, 1991; Marvin, 1987, 1990; Montgomery, 1992; Moore-Brown, 1991; Moore-Brown & Montgomery, 2001; Nelson, 1989, 1993; Roller, Rodriguez, Warner, & Lindahl, 1992; Silliman & Wilkinson, 1991; Simon, 1987; Simon & Myrold-Gunyuz, 1990; Throneburg, Calvert, Sturm, Paramboulas, & Paul, 2000). The caution is that research designs have rarely been used to evaluate the effectiveness of these alternative, more inclusive models directly.

Classroom-based models are described as those in which SLPs provide S/L intervention to individuals or to small groups of students in their general and special education classroom settings, or SLPs may team teach with general and special education classroom teachers using lessons and scaffolding that integrate S/L intervention with instruction in the regular curriculum (e.g., Brandel, 1992; Buttrill, Niizawa, Biemer, Takahasbi, & Hearn, 1989; Christensen & Luckett, 1990; Despain & Simon, 1987; Dodge & Mallard, 1992; Ferguson, 1992; Nelson, Bahr, & Van Meter, 2004; Norris, 1989; Norris & Hoffman, 1990; Prelock, 2000; Prelock, Miller, & Reed, 1995; Simon, 1987; Ukrainetz, 2006). Other alternative models of service delivery involve more indirect provider roles for SLPs. For example, SLPs may consult with classroom teachers (or parents) who, in turn, provide the intervention to students (or their children) in their classrooms (or homes), either in addition to or in lieu of direct services by an SLP (e.g., Craghead, 1990; Damico, 1988; Damico & Nye, 1990; Dyer, Williams, & Luce, 1991; Gruenewald & Pollak, 1990; Marvin, 1987; Prelock, 2000; Silliman, Wilkinson, Belkin, & Hoffman, 1991; Simon, 1987). A different form of indirect service delivery model involves supervision by a certified SLP of speech-language assistants as they implement selected face-to-face direct services to children. This model was evaluated in one large research trial conducted in the United Kingdom (Boyle et al., 2007). The other key service delivery model component (beyond questions of where and by whom service is delivered) is termed *dosage*, influenced by the medical roots of EBP. McCauley and Fey (2006) defined dosage as the frequency and intensity with which treatment is delivered (but see Warren, Fey, & Yoder, 2007, for a review of how intervention intensity has been defined in the literature).

Even as inclusive classroom-based and consultative intervention approaches have become accepted and endorsed by professional organizations of the disciplines that work in school settings (McCormick, Frome Loeb, & Schiefelbusch, 2003), concerns have been raised about limitations of classroom-based and consultative service delivery models for S/L intervention (Beck & Dennis, 1997; Ehren, 2000; Elksnin & Capilouto, 1994; Kavale, 2002; Law et al., 2002). In addition, some authors have suggested that agencies may place children with disabilities in inclusive settings without full consideration of the unique and specific needs of each child (e.g., Westby, Watson, & Murphy, 1994), and SLPs continue to report difficulties

with implementing collaborative consultation models in classrooms (Achilles et al., 1991; Russell & Kaderavek, 1993).

METHOD

Literature Search Procedures

A systematic search of the literature was conducted between September 2007 and February 2008. Twenty-seven electronic databases were searched using a total of 55 expanded key words related to service delivery and the frequency and intensity of speech-language pathology services (see Appendix A for key words). Electronic databases searched included Centre for Reviews and Dissemination, CINAHL, Cochrane Database of Systematic Reviews, Education Abstracts, EMBASE, ERIC, Evidence-based Medicine Guidelines, Exceptional Child Education Resources, Health Source: Nursing, HighWire Press, Linguistics Language Behavior Abstracts, Medline, National Library for Health, National Rehabilitation Information Center, Neurosciences Abstracts, PsycArticles, PsycBITE, PsycINFO, Psychology and Behavioral Sciences Collection, PubMed, REHABDATA, Science Citation Index, Social Science Citation Index, Social Services Abstracts, SUMSearch, Teacher Reference Center, and TRIP Database. These databases were selected because they are among the larger databases available and were judged most likely to contain articles on communication sciences and disorders in general as well as in response to the research questions. We excluded databases that were not relevant to our population (e.g., gerontology). Electronic searches of all ASHA journals, as well as hand searches of references from all relevant articles, also were completed for this EBSR.

Table 1. Clinical questions.

Number	Clinical question
	For elementary school-age children (5–11 years), what is the influence of the speech-language pathology service delivery model...
1.	On vocabulary?
2.	On functional communication?
3.	On speech sound production and intelligibility?
4.	On social communication?
5.	On language and literacy?
6.	On narrative discourse?
7.	On curriculum standards?
8.	On referral rates to special education?
9.	On appropriate use of language facilitation techniques by parents, teachers, assistants, caregivers, etc.?
	For elementary school-age children (5–11 years), what is the influence of the frequency/intensity of speech-language pathology services...
10.	On vocabulary?
11.	On functional communication?
12.	On speech sound production and intelligibility?
13.	On social communication?
14.	On language and literacy?
15.	On narrative discourse?
16.	On curriculum standards?

Criteria for Inclusion in the EBSR

We reviewed all studies that met the selection criteria described in the following paragraphs.

- Studies had to contain original data that specifically addressed one or more of the 16 clinical questions presented in Table 1.

Rationale. The questions that were used to frame the current review were specific to the elementary school–age range (from 5 to 11 years) and were divided into sets to ask separately about the effects of the type of service delivery model used and the frequency and intensity with which service was delivered. In constructing these questions, we used the format adopted by ASHA’s National Center for Evidence-Based Practice in Communication Disorders for systematic reviews. Thus, each question specifies a *population* (e.g., elementary school–age children ages 5–11 years), an *intervention* (e.g., service delivery model), and a *specific clinical outcome* (e.g., vocabulary). Outcome measures were selected to represent the range of therapy targets that, in the experience of the authors, were typical and appropriate for elementary school–age students with S/L problems. Also, we wanted to select clinical outcomes that are commonly measured by standardized S/L tests or by functional real-life measures of S/L performance (e.g., speech, language, conversational samples, and observations).
- Studies had to be published after 1975 in peer-reviewed journals and be written in English.

Rationale. We reasoned that our 3-decade time frame was sufficient because a meta-analysis of S/L intervention by Law, Garrett, and Nye (2004) revealed that of the articles they studied, only one of the seven articles on expressive language intervention, none of the ten articles on vocabulary intervention, and none of the two articles on receptive language intervention were published before 1985. In addition, prior experience suggested that articles older than 30 years generally do not include enough methodological detail for the reader to be able to replicate the intervention or to compute effect sizes.
- Studies had to use one of the following design types: randomized clinical trial (RCT), meta-analysis of RCTs, and systematic review of RCTs; nonrandomized comparison study; or multiple-baseline single-subject design study. Studies had to hold the type of intervention constant and only vary the service delivery model or dosage (i.e., frequency and intensity) of speech-language pathology services. An SLP had to be involved in the service delivery. Descriptions of service delivery models without data based on objective measures of treatment outcomes were not included.

Rationale. In RCTs, the investigator actively compares treatment and control groups that have been created by randomly assigning participants to the groups. Nonrandomized comparison studies contrast the outcomes of treatment groups by comparing outcomes for students who were matched to each other on a particular variable or who were assigned to groups on any basis other than randomization. Multiple-baseline single-subject design studies demonstrate causality in a manner that is generally considered to be reliable and valid. Treatment methods were not allowed to vary in addition to the service delivery model to make it possible to attribute any differential outcomes to the service delivery model alone.

4. Studies had to include children ages 5 to 11 years (i.e., elementary school–age children, usually in Grades K–5) with S/L impairments as either a primary disability or a secondary disability. **Rationale.** Studies on speech-language pathology service delivery models used with preschool children (<5 years) or older students (>12 years) were not included because of the authors’ intent to focus on elementary school–age students and constraints on time and resources. Time and resource constraints, along with focus, also provided the rationale for not including studies of service delivery models used with “at-risk” students (without identified S/L disabilities) in general education settings, or studies of students with learning disabilities delivered by interventionists not clearly identified as SLPs. We wanted to include studies of students with “secondary” language and communication problems related to autism spectrum disorder, developmental cognitive disabilities, general developmental delays, hearing impairment, and other disabilities, because school SLPs often have questions about appropriate models for delivering S/L services to these students.

Articles Identified and Accepted or Rejected

Using the search terms summarized in Appendix A, we originally identified 462 citations for review based on article abstracts. Two authors, blinded from one another’s results, reviewed each abstract and initially identified (with 95% agreement) 255 abstracts as potentially meeting the inclusion criteria. Full-text articles of these studies were reviewed, which resulted in an additional 250 articles being excluded because they did not directly address one or more of the clinical questions, did not use an experimental or quasi-experimental design, did not hold the intervention constant and only vary the service delivery model, did not report original data, did not include an SLP in the service delivery, or had participants outside of the specified age range. A total of five studies remained that met all inclusion criteria. They constituted the corpus for this EBSR. A log

of rejected studies, including the reasons for exclusion, is available from the authors upon request.

Quality Appraisal Procedures

Two authors, blinded to one another’s results, assessed each study for methodological quality (with 95% agreement) in the following areas: study protocol description, assessor blinding, sampling/allocation, evidence of treatment fidelity, significance, precision, and intention to treat (when applicable). “Intention to treat” is defined as:

an analysis of a randomized controlled trial where participants are analyzed according to the group to which they were initially randomly allocated, regardless of whether or not they had dropped out, fully complied with the treatment, or crossed over and received the other treatment. Because it maintains the original randomization, an intention-to-treat analysis contributes to the internal validity of a treatment study. (ASHA, 2005)

For each study, a quality score was determined based on the number of indicators that met the highest level of quality in each area. A study received a point for each indicator meeting the highest level of quality (see Table 2). For controlled trials, all seven quality indicators were relevant, leading to a maximum quality score of 7. For all other study designs, where an intention-to-treat analysis was not applicable, the highest quality score was 6.

Each critical appraisal was reviewed by at least two randomly chosen authors. Any discrepancies in ratings between authors were resolved via consensus. A final synthesis of the body of scientific literature was compiled into an evidence table based on each study’s quality indicator score and the corresponding clinical question.

Data Extraction Procedures

The data extraction tool used in the present EBSR was based on careful consideration of the data categories that, in the authors’ experience, were relevant to the study of service delivery models. Also,

Table 2. Quality indicators.

<i>Indicator</i>	<i>Quality marker</i>
Study protocol	* Adequate description of protocol • Inadequate description of protocol or not stated
Assessor blinding	* Assessors blinded • Assessors not blinded or not stated
Sampling/allocation	* Random sample adequately described • Random sample inadequately described • Convenience sample or hand picked sample or not stated
Treatment fidelity	* Evidence of treatment fidelity • No evidence of treatment fidelity
Significance	* <i>p</i> value reported or calculable • <i>p</i> value neither reported nor calculable
Precision	* Effect size and confidence interval reported or calculable • Effect size or confidence interval, but not both, reported or calculable • Neither effect size nor confidence interval reported or calculable
Intention to treat (controlled trials only)	* Analyzed by intention to treat • Not analyzed by intention to treat or not stated

Note. * represents an indicator of high quality, • indicates absence of the quality indicator.

Table 3 (p. 1 of 9). Results of the evidence-based systematic review.

<i>Question 1: What is the influence of the speech-language pathology service delivery model on vocabulary?</i>												
<i>Citation</i>	<i>Participant characteristics</i>	<i>Eligibility criteria</i>	<i>Specific communication problem(s)</i>	<i>Service delivery model(s)</i>	<i>Treatment schedule</i>	<i>Amount and duration of treatment</i>	<i>Intervention</i>	<i>Outcome measures and major findings</i>	<i>Statistical significance</i>	<i>Effect size</i>	<i>Study limitations</i>	<i>Quality marker score</i>
Boyle, McCartney, Forbes, & O'Hare (2007)	N = 161 intended to treat N = 152 completed study protocol Grade range = not reported (age range corresponds to Grades 1–6 in United States) Age range = 6 to 11 years Mean age not reported M = 115; F = 46	Age between 6–11 years Standard score on the Clinical Evaluation of Language Fundamentals—Third Edition (CELF-3; Semel, Wiig, & Secord, 2000) receptive and/or expressive < -1.25 SD Nonverbal IQ > 75 No reported hearing loss, no moderate/severe articulation, phonology, or dysfluency problems or otherwise require specialist S/L therapy skills Parental consent	Heterogeneous group of children with “primary language delay” Participants therefore had either receptive, expressive, or mixed receptive and expressive language problems	Direct: Pullout individual with SLP Direct: Pullout group with SLP – Group size ranged from 2 to 5 Indirect: Pullout individual with speech-language pathology assistant Indirect: Pullout group with speech-language pathology assistant – Group size ranged from 2 to 5 Speech-language pathology assistants had a degree in psychology	3 sessions per week, each session lasting between 30–40 min	Average 38 sessions for each student Each student received between 90–120 min of intervention per week Each student received between 19 to 25 total hr of therapy “over a 15-week period”	SLPs and speech-language pathology assistants used a therapy manual that included procedures and activities in intervention areas identified by research; specific intervention targets for individual participants included comprehension monitoring, vocabulary development, grammar, and narratives	British Picture Vocabulary Test (Dunn, Dunn, Whetton, & Burley, 1997) administered immediately posttreatment (T2) and at 12-month follow-up (T3) Individual vs. group (T2) Individual vs. group (T3) Direct vs. indirect (T2) Direct vs. indirect (T3)	Not significant Not significant Not significant Not significant	d = -0.10 d = 0.01 d = -0.01 d = 0.005	Caveats to generalization: Description of “inservice training” provided to SLP assistants not reported Amount of treatment more intensive than in many U.S. schools Therapy targets (and therapy activities) differed across participants “Indirect” service narrowly defined as intervention from SLP assistants	7/7

(table continues)

Table 3 (p. 2 of 9). Results of the evidence-based systematic review.

<i>Question 1: What is the influence of the speech-language pathology service delivery model on vocabulary?</i>												
<i>Citation</i>	<i>Participant characteristics</i>	<i>Eligibility criteria</i>	<i>Specific communication problem(s)</i>	<i>Service delivery model(s)</i>	<i>Treatment schedule</i>	<i>Amount and duration of treatment</i>	<i>Intervention</i>	<i>Outcome measures and major findings</i>	<i>Statistical significance</i>	<i>Effect size</i>	<i>Study limitations</i>	<i>Quality marker score</i>
Kohl, Wilcox, & Karlan (1978)	<i>N</i> = 3 Grade range = not reported Age range = 7 to 8 years Mean age not reported <i>M</i> = 2; <i>F</i> = 1 Moderate cognitive impairment	Diagnosed as “trainable mentally retarded” but measures not reported; all had previous exposure to simultaneous sign language training	All participants were reported to have “limited spontaneous speech and articulation difficulties”	Single-subject design Pullout individual direct provided by SLP Classroom-based group direct provided to group of 3 students by special education student teacher No description of training given to teacher, or who trained the teacher	Pullout individual: Each student received direct instruction in two 15-min sessions per week, for 30 min per week total Classroom group: Each student received direct instruction in five 5-min sessions per week, for 25 min of direct instruction per week total in a small-group context; however, each student also was present during direct instruction to the two other students in the group sessions, resulting in an additional five 10-min sessions per week of passive exposure to sign training, for a total of 50 min per week	Pullout individual: 5 training sessions over 11 days resulting in 150 min total of direct instruction (5 × 30) Classroom group: 9 training sessions over 11 days resulting in 45 min total of direct instruction (9 × 5), and 90 min of passive exposure (9 × 10)	Instruction in the use of 12 manual signs for food that none of the participants had in their pretest repertoire; training procedures included modeling, physical guidance, time delay, and verbal and social praise for each approximation and correct response	Each student in the daily classroom small-group sessions reached criterion sooner (fewer school days and sessions) on their directly trained signs than on a comparable set of signs trained in pullout individual speech therapy sessions; also, generalization probes indicated that signs generalized best in the settings in which they were trained	Not reported or calculable	Percentage of non-overlapping data (an effect-size estimate that can be used with some single-subject designs) was not calculable for this study.	Study limitations: Small <i>N</i> (3 students) Lack of effect-size estimates Caveats to generalization: Different trainers for pullout individual and classroom small-group conditions Confound of setting (Pullout vs. classroom) and group size (individual vs. small group) Incomplete description of classroom training setting (e.g., number of students, location of work table in relation to other ongoing classroom activities) Incomplete description of training given to student teacher Vocabulary outcome measured only in a test-like context; no measures of spontaneous sign production	1/6

(table continues)

Table 3 (p. 3 of 9). Results of the evidence-based systematic review.

<i>Question 1: What is the influence of the speech-language pathology service delivery model on vocabulary?</i>												
<i>Citation</i>	<i>Participant characteristics</i>	<i>Eligibility criteria</i>	<i>Specific communication problem(s)</i>	<i>Service delivery model(s)</i>	<i>Treatment schedule</i>	<i>Amount and duration of treatment</i>	<i>Intervention</i>	<i>Outcome measures and major findings</i>	<i>Statistical significance</i>	<i>Effect size</i>	<i>Study limitations</i>	<i>Quality marker score</i>
Throneburg, Calvert, Sturm, Paramboukas, & Paul (2000)	<p><i>N</i> = 177 (32 receiving S/L services and 145 with typical S/L skills)</p> <p>Classroom-based collaborative: 62 no S/L services, 12 with S/L services (across grades); 74 total</p> <p>Classroom-based teacher – SLP independent: 49 no S/L services, 11 with S/L services (across grades); 60 total</p> <p>Pullout traditional: 34 no S/L services, 9 with S/L services (across grades); 43 total</p> <p>Control: not reported</p>	<p>Met state eligibility criteria for mild or moderate S/L impairments</p> <p>Students with language service: at least –1 <i>SD</i> on two standardized tests</p> <p>Students with speech service: at least –1 <i>SD</i> on one standardized test</p> <p>Students with no S/L service: Parental consent</p>	<p>Students with language service: Receptive and expressive delays in language form, content, or use; no organic or cognitive disorders</p> <p>Students with speech service: Articulation delays</p>	<p>Classroom-based collaborative: Vocabulary instruction in classroom from SLP, teacher, and graduate students collaboratively</p> <p>Classroom-based teacher – SLP independent: Vocabulary instruction in classroom from SLP and teacher independently</p> <p>Pullout traditional: Individual or group service depending on student grade level and S/L goals</p> <p>Control: Vocabulary exposure from curriculum in classroom from teacher</p>	<p>Classroom-based collaborative and classroom-based teacher – SLP independent: Once a week for 40 min; 15 min additional pullout weekly, for a total of 55 min per week</p> <p>Pullout traditional: A total of 50 min weekly</p>	<p>Classroom-based collaborative and classroom-based teacher – SLP independent: Service for 12 weeks; 660 total min of service (12 × 55)</p> <p>Pullout traditional: Service for 12 weeks; 600 total min of service (12 × 50)</p>	<p>Classroom-based collaborative: SLP, teacher, and graduate students co-delivered lessons targeting 5 curriculum vocabulary words per week; teacher reinforced lesson throughout week; 15 min additional pullout to address other S/L goals as well as vocabulary</p> <p>Classroom-based teacher – SLP independent: SLP delivered same vocabulary lessons but teacher not in the room; 15 min additional pullout to address other S/L goals as well as vocabulary</p>	<p>Investigator designed vocabulary tests of curricular vocabulary words that included defining word verbally, using word in a sentence, and recognizing word meaning from two choices</p> <p>Total test score:</p> <p>Collaboration vs. Classroom-based</p> <p>Collaboration vs. Pullout</p> <p>Classroom-based vs. Pullout</p>	<p>For students with S/L impairments, there were significant differences in vocabulary test gains between three service delivery groups (ANOVA <i>p</i> = .045). Duncan post hoc revealed that S/L impaired students in the collaborative setting made test gains significantly higher than those in both classroom-based and pullout settings</p>	<p>Effect sizes calculated based on posttest means and standard deviations; statistical significance was calculated and reported based on test gain</p> <p>Classroom-based Collaborative vs. Classroom-based Teacher – SLP independent <i>d</i> = 1.65 favoring collaboration</p> <p>Classroom-based Collaborative vs. Pullout traditional <i>d</i> = 0.3 favoring collaboration</p> <p>Classroom-based Teacher – SLP independent vs. Pullout <i>d</i> = 0.76 favoring pullout</p>	<p>Study limitations: Random assignment occurred only in classroom selection for comparing regular education students</p> <p>Confounding classroom and pullout service in classroom-based collaborative group</p> <p>Confounding individual and group therapy in pullout traditional group</p> <p>Caveats to generalization: Exactly how much time was spent on vocabulary curriculum in traditional condition not specified</p>	3/7

(table continues)

Table 3 (p. 4 of 9). Results of the evidence-based systematic review.

<i>Question 1: What is the influence of the speech-language pathology service delivery model on vocabulary?</i>												
<i>Citation</i>	<i>Participant characteristics</i>	<i>Eligibility criteria</i>	<i>Specific communication problem(s)</i>	<i>Service delivery model(s)</i>	<i>Treatment schedule</i>	<i>Amount and duration of treatment</i>	<i>Intervention</i>	<i>Outcome measures and major findings</i>	<i>Statistical significance</i>	<i>Effect size</i>	<i>Study limitations</i>	<i>Quality marker score</i>
	Grade range = K to 3 Age range = not reported Mean age stated as “similar across groups” M = not reported; F = not reported						Pullout traditional: SLP addressed curriculum target vocabulary along with other individually determined S/L goals	Students with S/L impairments in the classroom-based collaborative condition exhibited greater gains compared to children in the classroom-based teacher – SLP independent condition and children in the pullout traditional condition For students with no S/L service, both collaborative and classroom-based models increased vocabulary more than control group of vocabulary exposure from curriculum in classroom from teacher	For students without S/L impairments , there were significant differences in vocabulary test gains between three service delivery groups (ANOVA $p = .001$). Duncan post hoc revealed that students without disabilities in both collaborative and classroom-based settings made test gains significantly higher than those receiving vocabulary exposure in classroom from teacher		Treatment fidelity was not specifically measured but was discussed in frequent meetings	

(table continues)

Table 3 (p. 5 of 9). Results of the evidence-based systematic review.

<i>Question 2: What is the influence of the speech-language pathology service delivery model on functional communication?</i>												
<i>Citation</i>	<i>Participant characteristics</i>	<i>Eligibility criteria</i>	<i>Specific communication problem(s)</i>	<i>Service delivery model(s)</i>	<i>Treatment schedule</i>	<i>Amount and duration of treatment</i>	<i>Intervention</i>	<i>Outcome measures and major findings</i>	<i>Statistical significance</i>	<i>Effect size</i>	<i>Study limitations</i>	<i>Quality marker score</i>
Howlin (1981)	<p>Cases: <i>N</i> = 16 boys with 2 control groups matched on age, IQ, and language ability</p> <p>Control 1: Untreated, used to measure “short-term” (6 month) effects</p> <p>Control 2: Older boys who had previously attended hospital and received outpatient services on an “irregular” basis, but no intensive home-based program; however, parents of these controls received “advice” on the use of behavioral methods; age matched at time of initial referral</p> <p>Grade range = Not reported</p> <p>Age range = 3 to 11 years</p> <p>Mean age cases: 73.9 months; initial referral 59.5 months</p> <p>Control 1: 76.8 months</p> <p>Control 2: initial referral 61.9 months</p> <p><i>M</i> = 16; <i>F</i> = 0</p>	<p>Diagnosed with autism and free from “overt neurological damage or other complicating factors such as deafness”; IQ and language level assessed with psychometric and language tests (not specified)</p>	<p>Cases: Mutism (31%), single-word speech (25%), phrase speech (44%), “language age” 25.0 months (<i>SD</i> = 21.2 months)</p> <p>Results tables imply presence of echolalia, stereotyped remarks, and problems with morphemic and syntactic rules, but not specified in participant description</p>	<p>Cases: Indirect Parents trained at home in use of behavioral techniques to treat nonlanguage targets (e.g., obsessive behavior, rituals, temper tantrums, constructive play, social skills) and language targets (e.g., language functions and linguistic structures)</p> <p>Control 1: No treatment</p> <p>Control 2: Outpatient services on an “irregular” basis, but no intensive home-based program; services and treatment targets not specified</p>	<p>Cases: No information on schedule of treatment parents provided their children</p> <p>“Therapists” made home visits to advise parents weekly (for first 6 months), then once or twice per month for next 12 months</p>	<p>Cases: Parent intervention at home lasted for 18 months; no information on amount of treatment parents provided their children</p> <p>No information on who or how parents were trained, or on amount of training</p>	<p>Language training procedures used by parents based on Lovaas (1977) and other behavioral programs</p>	<p>Cases vs. Control 1 – This comparison was not included in this EBSR as it did not meet the inclusion criteria</p> <p>Cases vs. Control 2 (18 months):</p> <p>Number of comprehensible utterances</p> <p>Percentage of socialized, spontaneous utterances</p> <p>Percentage of echolalic/autistic utterances</p> <p>Percentage of nonverbal utterances</p>	<p>Not significant</p> <p>Not significant</p> <p>Not significant</p> <p>Not significant</p>	<p><i>d</i> = .38</p> <p><i>d</i> = .11</p> <p><i>d</i> = -.21</p> <p><i>d</i> = .35</p>	<p>Study limitations:</p> <p>Makeup of control groups (untreated and irregular outpatient service) do not allow direct comparison of efficacy or effectiveness of indirect (parent training) to direct (e.g., SLP training) service delivery models</p> <p>Another major limitation is that the cases and the control 2 are not comparable at follow-up (32 month difference), which means the effect size should be interpreted with a great deal of caution</p> <p>Caveats to generalization:</p> <p>Inadequate description of content and amount of training parents received</p> <p>Inadequate description of schedule and amount of home-based intervention parents provided to their children</p>	2/7

(table continues)

Table 3 (p. 6 of 9). Results of the evidence-based systematic review.

<i>Question 5: What is the influence of the SLP service delivery model on language and literacy?</i>												
<i>Citation</i>	<i>Participant characteristics</i>	<i>Eligibility criteria</i>	<i>Specific communication problem(s)</i>	<i>Service delivery model(s)</i>	<i>Treatment schedule</i>	<i>Amount and duration of treatment</i>	<i>Intervention</i>	<i>Outcome measures and major findings</i>	<i>Statistical significance</i>	<i>Effect size</i>	<i>Study limitations</i>	<i>Quality marker score</i>
Bland & Prelock (1995)	N = 14; seven matched pairs with half in the "Language in Classroom" (LIC) group and half in the pullout group (matched ± 1 SD on the Clinical Evaluation of Language Fundamentals—Revised; CELF—R; [Semel, Wiig, & Secord, 1987] composite standard scores) Grade range = 1 to 4 Age range = 6;2 to 9;9 Mean age not reported but calculated as 7;11 M = 9; F = 5 Language disorders	Not reported All participants previously diagnosed with language disorder by school SLP and enrolled in therapy, by "standardized tests, informal assessments, and teacher observation"; no gross neurological, physical, or cognitive problems; students with chronic ear infections or hearing loss excluded	CELF—R composite standard score range of 61 to 88; "primary communication problem" includes verbal fluency, semantics, expressive organization, syntax, pragmatics, word finding, & oral & written expression	Classroom-based direct: LIC team-taught ("collaborative") by SLP and general education teacher (and student SLP); an indirect component is implied but not stated (training of teams, assume authors did the training but not stated) Pullout direct control group: not stated if pullout services were individual or group sessions	Classroom group: a) Team training sessions: 7 two-hour sessions at start of Year 1 b) Planning meetings: weekly or biweekly; 30–45 min per session c) Classroom service: one session per week; 30 to 45 min per session Pullout control group: One or two sessions per week; 30 to 45 min per session	Classroom group: a) Team training sessions: 1 hr total at start of Year 1 b) Planning meetings: 3 years duration assumed; total number and amount of meeting time not reported c) Classroom service: 3 years duration assumed; total amount of service not reported Pullout control group: 3 years duration assumed; total amount of service not reported	Classroom group: a) Training sessions: Topics including normal/disordered communication, classroom scripts, language/literacy connections b) Planning meetings: Planned lessons, identified student communication goals, brainstormed activities, gathered materials c) Classroom service: Team members alternately functioned as leader/instructor, helper, or data collector for classroom intervention lessons Pullout control group: Integrated academic curriculum into therapy	Language samples recorded, transcribed and analyzed (SALT) six times over 3-year study duration for: Word/Morpheme (e.g., different root words, mean length of utterance, type token ratio) Distributional summary (e.g., speaker turns, utterance length and completeness): Frequency & percentage of utterance types (e.g., number total utterances, percent intelligibility)	Not significant Not significant Classroom students produced more "intelligible and complete" utterances than pullout students (U = .025) Classroom students increased number of "intelligible and complete" utterances from year two to year three (T = .0069)	Effect sizes not reported or calculable	Study limitations: Small sample (7 in each group; 14 total participants) makes results difficult to generalize No confidence intervals stated for Mann-Whitney U or Wilcox T (e.g., .95), thus readers do not know if null hypothesis rejected Caveats to generalization: Weak discussion/explanation of why number of "complete and intelligible" utterances would be only language measure to show group differences; intelligibility was not described as a goal of the classroom lessons	3/6

(table continues)

Table 3 (p. 7 of 9). Results of the evidence-based systematic review.

<i>Question 5: What is the influence of the SLP service delivery model on language and literacy?</i>												
<i>Citation</i>	<i>Participant characteristics</i>	<i>Eligibility criteria</i>	<i>Specific communication problem(s)</i>	<i>Service delivery model(s)</i>	<i>Treatment schedule</i>	<i>Amount and duration of treatment</i>	<i>Intervention</i>	<i>Outcome measures and major findings</i>	<i>Statistical significance</i>	<i>Effect size</i>	<i>Study limitations</i>	<i>Quality marker score</i>
Boyle, McCartney, Forbes, & O'Hare (2007)	N = 161 intended to treat N = 152 completed study protocol Grade range = not reported (age range corresponds to Grades 1–6 in United States) Age range = 6 to 11 years Mean age not reported M = 115; F = 46	Age between 6–11 years Standard score on the CELF–3 receptive and/or expressive < –1.25 SD Nonverbal IQ > 75 No reported hearing loss, no moderate/severe articulation, phonology, or dysfluency problems or otherwise require specialist S/L therapy skills Parental consent	Heterogeneous group of children with “primary language delay” Participants therefore had either receptive, expressive, or mixed receptive and expressive language problems	Direct: Pullout individual with SLP Direct: Pullout group with SLP – Group size ranged from 2 to 5 Indirect: Pullout individual with speech-language pathology assistant Indirect: Pullout group with speech-language pathology assistant – Group size ranged from 2 to 5 Speech-language pathology assistants had a degree in psychology	3 sessions per week, each session lasting between 30–40 min	Average 38 sessions for each student Each student received between 90–120 min of intervention per week Each student received between 19–25 total hr of therapy “over a 15-week period”	SLPs and speech-language pathology assistants used a therapy manual that included procedures and activities in intervention areas identified by research; specific intervention targets for individual participants included comprehension monitoring, vocabulary development, grammar, and narratives	Clinical Evaluation of Language Fundamentals—Third Edition ^{UK} (CELF–3 UK; Semel et al., 2000) administered immediately posttreatment (T2) and at 12-month follow-up (T3) Receptive: Individual vs. group (T2) Individual vs. group (T3) Expressive: Individual vs. group (T2) Individual vs. group (T3) Receptive: Direct vs. indirect (T2) Direct vs. indirect (T3) Expressive: Direct vs. indirect (T2) Direct vs. indirect (T3)	Not significant Not significant Not significant Not significant Not significant Not significant	d = –0.08 d = –0.005 d = –0.02 d = –0.02 d = 0.15 d = –0.004 d = 0.06 d = 0.01	Caveats to generalization: Description of “inservice training” provided to SLP assistants not reported Amount of treatment more intensive than in many U.S. schools Therapy targets (and therapy activities) differed across participants “Indirect” service narrowly defined as intervention from SLP assistants	7/7

(table continues)

Table 3 (p. 8 of 9). Results of the evidence-based systematic review.

<i>Question 5: What is the influence of the SLP service delivery model on language and literacy?</i>												
<i>Citation</i>	<i>Participant characteristics</i>	<i>Eligibility criteria</i>	<i>Specific communication problem(s)</i>	<i>Service delivery model(s)</i>	<i>Treatment schedule</i>	<i>Amount and duration of treatment</i>	<i>Intervention</i>	<i>Outcome measures and major findings</i>	<i>Statistical significance</i>	<i>Effect size</i>	<i>Study limitations</i>	<i>Quality marker score</i>
Howlin (1981)	Cases: <i>N</i> = 16 boys with 2 control groups matched on age, IQ, and language ability Control 1: Untreated, used to measure “short-term” (6 month) effects	Diagnosed with autism and free from “overt neurological damage or other complicating factors such as deafness”; IQ and language level assessed with psychometric and language tests (not specified)						CELF observational rating scales of child listening and speaking skills completed by parents and teachers at T2 and T3 Listening: Direct vs. indirect Individual vs. group Speaking: Direct vs. indirect Individual vs. group)	Not significant for parent or teacher ratings at either T2 or T3	Not reported or calculable	Study limitations: Makeup of control groups (untreated and irregular outpatient service) do not allow direct comparison of efficacy or effectiveness of indirect (parent training) to direct (e.g., SLP training) service delivery models	2/7

(table continues)

Table 3 (p. 9 of 9). Results of the evidence-based systematic review.

<i>Question 5: What is the influence of the SLP service delivery model on language and literacy?</i>												
<i>Citation</i>	<i>Participant characteristics</i>	<i>Eligibility criteria</i>	<i>Specific communication problem(s)</i>	<i>Service delivery model(s)</i>	<i>Treatment schedule</i>	<i>Amount and duration of treatment</i>	<i>Intervention</i>	<i>Outcome measures and major findings</i>	<i>Statistical significance</i>	<i>Effect size</i>	<i>Study limitations</i>	<i>Quality marker score</i>
	Control 2: Older boys who had previously attended hospital and received outpatient services on an “irregular” basis, but no intensive home-based program; however, parents of these controls received “advice” on the use of behavioral methods; age matched at time of initial referral							Expression	Not significant	$d = -.18$	Another major limitation is that the cases and the control 2 are not comparable at follow-up (32 month difference), which means the effect size should be interpreted with a great deal of caution Caveats to generalization: Inadequate description of content and amount of training parents received Inadequate description of schedule and amount of home-based intervention parents provided to their children	
							Comprehension	Not significant	$d = -.45$			
							Other measures: Number of phrases	Not significant	$d = 0.0$			
							Number of morphemes	Not significant	$d = -.33$			
							Number of transformations	Not significant	$d = 0.08$			
	Grade range = not reported						Mean length of utterance	Not significant	$d = -.39$			
	Age range = 3 to 11 years											
	Mean age cases: 73.9 months; initial referral 59.5 months											
	Control 1: 76.8 months											
	Control 2: initial referral 61.9 months											
	M = 16; F = 0											

we attempted to be consistent with published guidelines for appraising the quality of systematic reviews (Schlosser, Wendt, & Sigafoos, 2007). Final data coding categories included citation, participant characteristics, eligibility criteria (e.g., eligibility for specific disability categories, such as number of standard deviations below the mean on norm-referenced tests), specific communication problem(s), service delivery model(s), treatment schedule, amount and duration of treatment (e.g., dosage factors as per suggestions of Warren et al., 2007), intervention, outcome measures and major findings, statistical significance, effect size, limitations of the study, and caveats to generalization of study results. These coding categories comprise the column entries in the main results table (Table 3). Each author was randomly assigned to be either the “lead reviewer” or the “backup reviewer” for data extraction for each article in the EBSR corpus. Any disagreements on article summaries were resolved through a discussion with all authors, and discrepancies were resolved by consensus.

Effect-Size Calculation Procedures

Effect size is a method of quantifying the effectiveness of a particular intervention relative to some comparison intervention. In this case, it quantifies the size of the difference between outcomes for two groups who received essentially the same treatment but in the context of different service delivery models. See Schuele and Justice (2006) for a tutorial on the interpretation of effect size.

When possible, we report the effect sizes that were reported in the articles. When effect sizes were not reported but sufficient data (i.e., pre- and posttest means and standard deviations) were provided by the authors, we report effect sizes that we either calculated or estimated based on results of analyses of variance (ANOVAs) or *t* tests. Group effects were calculated using Cohen’s *d* with the formula $M1$ (mean posttest score for experimental group) – $M2$

(mean posttest score for control group) / pooled *SD*. With this method, an effect size ≥ 0.8 is considered to be large, an effect size = 0.5 is considered to be medium, and an effect size ≤ 0.2 is considered to be small (Cohen, 1988).

Effect sizes for single-subject designs (in which a single child’s performance is compared over one or more baseline periods with treatment periods) are calculated by computing the percentage of nonoverlapping data (PND). This value indicates the percentage of data points during the treatment phase that exceeds the most extreme data point in the baseline phase. With this method, higher PNDs indicate stronger effects (90% = very effective treatments; 70%–90% = effective treatments; 50%–70% = questionable treatments; <50% = ineffective treatments; Scruggs & Mastropieri, 2001). However, PND was not calculable for the one single-subject study included in this systematic review (Kohl et al., 1978) because of insufficient data.

RESULTS

Of the five studies that met the inclusion criteria, three addressed the influence of a speech-language pathology service delivery model on vocabulary skills (Question 1), one addressed the influence of a service delivery model on functional communication (Question 2), and three addressed the influence of a service delivery model on language and literacy outcomes more broadly (Question 5). This total exceeds five because two of the studies addressed more than one of the clinical questions. No studies were found relevant to the remaining 13 clinical questions. Table 3 provides the results of the EBSR, including descriptions of the participants and intervention reported in the studies, major outcomes, statistical significance, and effect-size estimates. Table 4 indicates the methodological quality ratings for each study.

Table 4. Appraisal table of the included studies.

<i>Citation</i>	<i>Study protocol</i>	<i>Assessor blinding</i>	<i>Sampling/ Allocation</i>	<i>Treatment fidelity</i>	<i>Significance</i>	<i>Precision</i>	<i>Intention to treat</i>
Bland & Prelock (1995)	Adequate description of protocol	Not stated	Convenience sample/ hand-picked sample	Evidence of treatment fidelity	<i>p</i> value reported or calculable	Neither effect size nor confidence interval reported or calculable	Not applicable
Boyle, McCartney, Forbes, & O’Hare (2007)	Adequate description of protocol	Assessors blinded	Random sample adequately described	Evidence of treatment fidelity	<i>p</i> value reported or calculable	Effect size and confidence interval reported or calculable	Analyzed by intention to treat
Howlin (1981)	Inadequate description of protocol	Not stated	Not stated	No evidence of treatment fidelity	<i>p</i> value reported or calculable	Effect size and confidence interval reported or calculable	Not stated
Kohl, Wilcox, & Karlan (1978)	Adequate description of protocol	Assessors not blinded	Convenience sample/ hand-picked sample	No evidence of treatment fidelity	<i>p</i> value neither reported nor calculable	Neither effect size nor confidence interval reported or calculable	Not applicable
Throneburg, Calvert, Sturm, Paramboulas, & Paul (2000)	Adequate description of protocol	Not stated	Random sample adequately described	No evidence of treatment fidelity	<i>p</i> value reported or calculable	Effect size and confidence interval reported or calculable	Not stated

Note. Shaded areas indicate the highest level of quality for that indicator.

Clinical Question 1

What is the influence of the speech-language pathology service delivery model on vocabulary? Three studies were identified that addressed this question (see Table 3). Boyle et al. (2007) compared four different models of speech-language pathology service delivery for children with S/L impairments including individual speech-language pathology treatment (direct), group speech-language pathology treatment (direct), individual treatment provided by a speech-language pathology assistant (indirect–consultative), and group treatment provided by a speech-language pathology assistant (indirect–consultative). This study was conducted in the United Kingdom, where services to students with communication disorders are provided via health service mechanisms rather than as part of the school system. Looking at the methodological quality ratings for this study (see Table 4), all seven quality indicators were applicable, and the study met the highest level for every methodological quality indicator assessed. Boyle et al. found minimal differences in effect-size estimates for student outcome measures (standardized test scores) between direct services provided by an SLP and indirect services provided by a speech-language pathology assistant ($d < .15$). In addition, effect-size estimates for differences in student outcome measures between group and individual therapy provided by an SLP and by a speech-language pathology assistant were small (post-treatment $d = -0.10$; 12-month follow-up $d = 0.01$). These findings led the authors to conclude that vocabulary (measured by a standardized test) services provided by a speech-language pathology assistant to children with primary language impairments were as effective as services provided by certified SLPs, and individual and group therapy were equally effective regardless of which type of provider was delivering the service.

Kohl et al. (1978) used a single-subject design to compare pullout individual service by an SLP with service provided in a classroom by a special education student teacher to a group of 3 students with cognitive disabilities. Looking at the methodological quality ratings for this study (see Table 4), one quality marker (intention-to-treat analysis) was not relevant because this was a single-subject design. This report provided adequate description of the study protocol but was lacking in all other areas such as assessor blinding and evidence of treatment fidelity. Results indicated that each student in the daily small-group classroom sessions reached criterion sooner on their directly trained manual signs (i.e., signs for 12 food items produced in a test-like task) than they did on a comparable set of signs trained in individual therapy sessions. Also, generalization probes indicated that signs generalized best in the settings in which they were trained. Kohl et al. did not provide sufficient data to analyze the findings statistically, nor were we able to compute effect-size estimates using the PND method previously described. This makes it difficult to determine if there were any practical effects related to the use of different service delivery models as described in this study.

The third study that addressed this question was conducted by Throneburg et al. (2000). They compared the effects of three service delivery models for teaching curricular vocabulary skills to students in kindergarten through third grade. The models were described as (a) a collaborative classroom model in which team teaching was provided by the SLP and the classroom teacher, (b) a classroom-based model in which the SLP provided intervention to a class of students without collaboration with the classroom teacher, and (c) a traditional pullout model. The researchers used a high-quality design including random assignment of participants to condition (see Table 4),

thereby increasing the level of confidence in the evidence gathered in this investigation. The authors reported that children in the collaborative classroom condition exhibited greater gains in curricular vocabulary compared to children in the classroom-based condition in which the SLP taught alone and compared to children receiving pullout direct therapy from an SLP. Effect sizes ranged from 0.3 to 1.65, with students receiving services through the collaborative classroom model showing the greatest gains ($d = 1.65$) compared to those who received services in a classroom-based model without collaboration, and statistically significant but more modest gains ($d = 0.3$) when compared with pullout services. Traditional pullout services also had a positive effect ($d = .76$) when compared with classroom-based treatment that did not incorporate collaboration with the classroom teacher. Our analysis and calculation of estimated effect sizes for this investigation suggest a clear advantage for classroom-based team teaching for improving children's curricular vocabulary knowledge versus pullout intervention.

Clinical Question 2

What is the influence of the speech-language pathology service delivery model on functional communication? One study (Howlin, 1981) was identified that addressed this clinical question. In this study, the effects of language treatment provided by parents to their children with autism at home were compared with the effects of language treatment for children who received “irregular outpatient” service in a hospital. Table 4 indicates the study's methodological quality ratings. We judged that Howlin (1981) provided an inadequate description of the type, amount, and content of the training that the parents received and of the intervention provided to their children at home; however, Howlin did report sufficient data to enable us to calculate statistical significance and effect sizes. Our computation of effect-size estimates revealed that service delivery had little to no effect on the participants' functional communication skills. When compared to hospital-based outpatient treatment, the home-based treatment provided by trained parents had a small positive effect on the number of comprehensible utterances ($d = 0.38$) and a reduction in the percentage of noncommunicative and meaningless verbalizations (“nonverbal utterances”; $d = 0.35$), but minimal effect on the percentage of socialized spontaneous utterances ($d = 0.11$) or the percentage of echolalic/autistic utterances (e.g., immediate echolalia, delayed echoes, stereotyped remarks, repetition of self; $d = -0.21$). Unfortunately, these results provide little information on the relative effectiveness of indirect service (i.e., parent training) compared to direct service (i.e., hospital based) because descriptions of both service types were inadequate. Data comparing indirect service (parent training) to the no-service control condition were not relevant to the current systematic review because comparison of any service delivery model with no treatment does not specifically address the role of type of service delivery model on student outcomes. Although the Howlin study passed through the filters for the current review, it might better be considered an “exploratory” study (Mullen, 2007), providing some evidence that training parents to implement a specific language program at home with their children with autism shows promise of being efficacious.

Clinical Question 5

What is the influence of the speech-language pathology service delivery model on language and literacy? Three studies (see Table 3)

contributed data to address this clinical question. Bland and Prelock (1995) compared the effectiveness of a classroom-based collaborative service model that was team taught by the teacher and SLP to direct pullout service by an SLP. In terms of methodological quality (see Table 4), Bland and Prelock provided an adequate description of the study protocol and reported the statistical significance of the findings, but they did not provide enough statistical data for us to calculate effect-size estimates. Although the authors stated that participants in both groups improved their overall language performance over several years (though no individual or group data were reported), their statistical analysis revealed no differences between groups on student outcome language measures with the exception of “number of intelligible and complete utterances” (transcribed using the software program Systematic Analysis of Language Transcripts; Miller & Chapman, 1986) favoring the collaborative condition. Due to methodological limitations, our analysis suggests that this study provides only minimal support for the authors’ conclusion that the use of a classroom-based collaborative service model had positive effects on the language production of participants with communication disorders.

The two additional studies that addressed this question have been described previously in the section on Clinical Question 1. Boyle et al. (2007) compared different versions of pullout models on a standardized measure of receptive and expressive language—group versus individual therapy, and direct (services delivered by an SLP) versus indirect therapy (services delivered by a speech-language pathology assistant). Results from Boyle et al. indicated that service delivery had no effect on the children’s language outcomes ($d \leq 0.15$) as measured by the Clinical Evaluation of Language Fundamentals—Third Edition UK (CELF-3^{UK}; Semel, Wiig, & Secord, 2000).

Howlin (1981) examined the effects of indirect (trained parents delivering treatment at home) to direct (clinicians delivering treatment in hospital outpatient settings) treatment on formal and informal measures of language use for children with autism. The six effect sizes calculated from Howlin ranged from -0.45 to 0.08 . In this study, treatment provided in an outpatient setting (control group) had a small positive effect over treatment provided by trained parents (experimental group) on mean length of utterance ($d = -0.39$), number of morphemes ($d = -0.33$), and the Comprehension subtest ($d = -0.45$) of the Reynell Developmental Language Scales (RDLS; Reynell, 1969). The type of service delivery model employed had no discernible effect on the number of sentence transformations ($d = 0.08$), number of phrases ($d = 0$), or Expressive Language subtest of the RDLS ($d = -0.18$).

DISCUSSION

Along with the authors of this report, SLPs who provide intervention to students in schools may find these results disconcerting. It is both a matter of concern and illuminating that our systematic search for experimental evidence revealed only five studies that met our criteria. The unavoidable conclusion is that clinicians have little research evidence on which to base decisions about service delivery options. Given the small number of studies, no conclusions are justified—even regarding trends in the research literature for informing school service delivery choices. This is not a situation in which high-quality evidence is available to indicate that specific service

delivery models are not effective, or that one model is clearly better than another. Rather, this is a situation in which insufficient high-quality evidence is available to support any strong conclusions about differential benefits of service delivery models used in school settings.

We also had some concerns about some of the characteristics of the five studies that did meet our criteria that might be critical for their interpretation but were not necessarily highlighted by the structured review. Our point is to raise awareness of the challenges in conducting applied research in school settings so more and better studies can be designed in the future. The study by Boyle et al. (2007) of direct and indirect individual and small-group pullout services, in particular, must be interpreted in light of several important factors. First, indirect service was operationally defined narrowly by this study’s authors as the use of highly trained speech-language pathology assistants to implement intervention. As conceptualized by ASHA (2002), indirect service includes a number of workload activities for the SLP in addition to training and supervising speech-language pathology assistants (e.g., consulting with general education and special education teachers on the use of facilitative communication behaviors in their classrooms in order to positively affect their students’ functional communication abilities). Second, the speech-language pathology assistants had undergraduate degrees in psychology; had undergone an extensive training program; and were using a detailed, standardized manual developed by SLPs to guide their intervention activities. This level of training and support appeared to be a critical factor in the fidelity with which the assistants provided language treatment, and thus to the effectiveness of their intervention service. We expect that these conditions would need to be replicated in order to obtain similar results in additional studies. Third, group size varied between 2 and 5 students in the investigation, but group intervention was treated as a single variable, which confounds the interpretation that student communication outcomes were not affected by the size of the intervention pullout group. Fourth, the primary student outcome measures investigated by Boyle et al. were standardized test scores (e.g., British Picture Vocabulary Test; Dunn, Dunn, Whetton, & Burley, 1997), leaving open the question of whether similar results would occur with more authentic measures of language use and function that are coordinated closer to the school curriculum.

The results of the study by Kohl et al. (1978) likewise must be interpreted cautiously. Limitations of that study included a small number of participants and relatively narrow language targets (i.e., signs for 12 food items). Another limitation was the fact that the trainer was not held constant in both conditions (i.e., an SLP provided intervention in the individual pullout condition and a student teacher in the classroom group condition).

Although the study by Throneburg et al. (2000) included many positive characteristics, it also exemplifies some of the challenges of studying service delivery in the real-life context of schools. As an example, the researchers emphasized the importance in the study of having assigned time during the school day for joint planning between the teacher and SLP (approved by administrators and with substitute teachers), which was funded by a grant. Although this may have been a critical “active ingredient” to the success of the model in this study, it was not investigated directly as an experimental variable, and the extant literature on classroom and collaborative service delivery models has not experimentally verified this or other key ingredients of complex alternative delivery models.

Relationship of Current Findings to Other EBSRs

Two related EBSRs (Cirrin & Gillam, 2008; McGinty & Justice, 2006) that have appeared previously in the literature each included at least one of the studies that was included in the current review. Cirrin and Gillam (2008) included the study by Throneburg et al. (2000) in their EBSR of language intervention practices for school-age children with spoken language disorders. That review excluded studies with participants who were not classified as “specific language impaired” and studies with preschool children. The study by Boyle et al. (2007) was published after Cirrin and Gillam went to press, accounting for differences between the evidence corpus in the Cirrin and Gillam study and in the present EBSR. McGinty and Justice (2006) found three studies (Throneburg et al., 2000; Valdez & Montgomery, 1997; Wilcox, Kouri, & Caswell, 1991) that met their inclusion criteria (which included preschool children) in their attempt to answer the clinical question comparing classroom-based to pullout language intervention (individual or group), as shown by improvements in language skills in the areas of phonology, morphology/syntax, pragmatics, and/or vocabulary.

Analysis of Throneburg et al. (2000) by Cirrin and Gillam (2008) and McGinty and Justice (2006) yielded similar results to the analysis in the present EBSR. For the two additional studies on service delivery models identified by McGinty and Justice, their analysis revealed that Valdez and Montgomery’s (1997) findings (showing no differences in child outcomes when comparing classroom-based and pullout conditions) needed to be interpreted with caution due to limitations of the study’s methodology. McGinty and Justice reported that methods used by Wilcox et al. (1991) led to greater confidence that classroom-based team teaching by the SLP and special education teacher could be credited for a large positive effect in preschool children’s productive vocabulary use compared to a pullout condition. McGinty and Justice concluded that “taken together, the convergent findings from Throneburg et al. and Wilcox et al. suggest an advantage for classroom-based team-teaching models over pullout intervention, at least in the domain of vocabulary” (p. 12). We were more cautious about concluding such an advantage because only one of these two studies was conducted with elementary school-age children and was included in the current review.

Excluded Studies With Implications for Informing Clinical Practice

As we searched for articles that met our inclusion criteria, it became apparent that a number of studies did not meet our criteria but still included empirical evidence that could help inform clinical practice. Many of these articles fall into the category of “exploratory” studies (Mullen, 2007) that address the feasibility of specific intervention approaches but do not use an experimental or quasi-experimental design with control groups (as required for the current review). Other articles were excluded because participants were outside of our specified age range (e.g., preschool) or had not been identified with S/L impairments, or because it was not clear that the service providers were SLPs. Each author of the present EBSR was invited to list those excluded studies that, in his or her opinion, provided empirical evidence that could help inform decisions on service delivery models. No attempt was made to compute interrater reliability for these selections. Appendix B includes the authors’ original abstracts of these articles that readers can consult for

additional guidance in their evidence-based decision making concerning treatment contexts, along with the reasons they were rejected from the present EBSR.

Limitations

Limitations of the present EBSR should be considered by SLPs, who are reminded to interpret our findings with caution. It is important to note that this EBSR focused only on elementary school-age students who had been identified with a communication disorder, which limited the number of studies that could be included. This EBSR did not include studies of S/L service delivery models with preschool-age students (<5 years), older students (>12 years), or students who were considered at risk but without identified language disabilities. The net result was that this EBSR did not capture completely the range and scope of the extant research currently available on alternative service delivery models for S/L intervention. Other studies addressing the effects of various service delivery models with these populations (see Appendix B) may have provided SLPs with additional evidence or insights to assist with clinical decision making. Second, the choice of clinical questions in this review necessitated limiting included studies to RCTs or other experimental designs. Because other study designs could not answer the proposed clinical questions, we may have excluded sectors of the practice of S/L intervention (Johnston, 2005). Thus, it is probable that some evidence that could be quite useful to school clinicians did not meet the inclusion criteria for this review. However, if EBSRs are to have comparable meaning, scientific rigor is essential. Also, confidence in the stability and validity of results is enhanced when studies are designed to directly assess causal relationships.

Additional limitations stem from the number and quality of the studies that were identified for our EBSR. Pring (2004), critiquing the lack of appropriate outcome research in S/L therapy, argued that the shortage of research and the difficulties of conducting studies of the necessary quality mean that few studies qualify for inclusion, thus rendering the results of systematic reviews of little value. With only five studies serving as the corpus for our review, and weaknesses in the studies themselves, clinicians are advised to exercise caution when interpreting the results.

Clinical Implications

Based on the results of our EBSR, direct S/L intervention procedures implemented in classroom settings have not been put to adequate experimental tests to determine their effectiveness in facilitating the development of S/L abilities in school-age children with disabilities. However, some evidence suggests that classroom-based direct S/L services are at least as effective as pullout intervention for some intervention goals (e.g., vocabulary) and that intervention in classroom settings may facilitate generalization of new skills to other natural settings. Little empirical information is available about the effectiveness of indirect consultative models in facilitating the acquisition of communication skills in elementary school-age children with S/L impairments. It does seem clear that highly trained speech-language pathology assistants who are supervised and directed by SLPs and are using SLP-prepared manuals to guide language intervention can provide effective services for some children with language problems. Some evidence also suggests that children with complex needs may benefit from services that include a parent-training component.

SLPs must provide services that are consistent with the requirements of federal policy. Service delivery models for students with disabilities are not directly addressed in IDEA (2004). Instead, IDEA states that children must be provided a free, appropriate public education in the least restrictive environment (LRE). LRE stipulates "to the maximum extent appropriate, children with disabilities are educated with nondisabled children" (34 CFR 300.550). This implies the need for an array of environments and services that meet the evolving learning requirements of children with disabilities. In addition, federal regulations state that "placement decisions must be based on the individual needs of each child with a disability. Public agencies, therefore, must not make placement decisions based on a public agency's needs or available resources, including budgetary considerations and the ability of the public agency to hire and recruit qualified staff" (*The Federal Register*, 1999, p. 12,471).

What Should SLPs Do Given the Paucity of External Research Evidence?

Clinicians who are committed to EBP must consider the quantity and quality of research evidence supporting a specific service delivery model relative to the individual needs of each student and the practical constraints of practice in school settings. EBP does not require clinicians to use research evidence as the *only* basis for clinical decisions. In fact, it actually requires that clinicians consider research evidence in light of factors related to student, parent, and clinician beliefs and values, as well as the clinician's expertise (Gillam & Gillam, 2006). SLPs also must keep in mind that the most natural setting possible (i.e., LRE) must be used for intervention for students with disabilities. In addition, clinicians can use scientific thinking, theory, and reason to back their instructional procedures when strong external evidence is not available (Stanovich & Stanovich, 2003). Lacking adequate research-based evidence, clinicians must rely on reason-based practice and their own data until more data become available.

EBSRs of the experimental literature on service delivery models, like the one reported in the present article, will help SLPs in this EBP decision process as they attempt to find, synthesize, and evaluate the external evidence. However, given the paucity of evidence on the efficacy and effectiveness of alternative service delivery models for elementary school-age children with S/L disabilities, SLPs need to continue to turn to internal and client factors in their clinical decision-making process. This means that SLPs in schools should evaluate the evidence on service models with particular attention to maximizing student participation in ecologically relevant intervention activities.

Further, SLPs can collect data on children who received treatment in their own practices via the same kind of service model over the course of several semesters. These data would suggest the range of outcomes that the SLP could expect for a specific service delivery model. SLPs must continue to evaluate the functional outcomes of the S/L service delivery models they choose by documenting instances in which their students demonstrate use of individualized language targets correctly (without prompts or cues) in natural speaking situations. In addition, clinicians should obtain information on changes in the type and amount of students' functional language abilities in daily classroom activities from parents, teachers, and other professionals who work with the children on their caseloads (Gillam & Gillam, 2006).

In summary, until the research base expands and confirms the efficacy and effectiveness of specific service delivery models for the wide range of school-age students with communication problems, SLPs working in school settings will need to select service models carefully, monitor students' progress on a regular and frequent basis, and validate the effectiveness of the intervention program for each student on their caseloads.

Filling Gaps in the Evidence Base

SLPs who work in schools need information from experimental or quasi-experimental studies that examine the effectiveness of the wide range of classroom-based and collaborative direct service models implemented for students with S/L disabilities. We found no studies that met our criteria that investigated outcomes for students who received regularly scheduled face-to-face direct intervention services within their general or special education classroom compared with treatment of the same type and intensity in pullout settings. This was surprising given the amount of literature and expert opinion articles promoting classroom-based intervention models.

The authors recognize the challenges and barriers associated with conducting such research, including the fact that randomized assignment of students to treatment approaches must be explained to and accepted by parents, teachers, and school administrators, and even then, may violate the individualized planning requirements of IDEA (2004). On the other hand, lack of evidence on direct comparisons of classroom-based direct versus individual pullout treatment for school-age children with primary and secondary S/L disabilities continues to be problematic for SLPs who work in schools. Although the handful of studies that met our criteria provide some modest support for the use of classroom-based models to teach vocabulary to early elementary students, innovative means and methods must be sought to increase the quantity and experimental quality of research on this question.

Research is also needed to identify the optimal combination of service delivery variables to fit different needs of different students. Our evidence search failed to uncover any experimental studies that systematically investigated the factors that influence the success of classroom-based and indirect consultative models for delivering S/L intervention. For example, studies are needed to identify such factors as the number of classroom opportunities needed for a student to increase performance of a particular communication skill (e.g., number of opportunities in a 30-min lesson, in an hour, in a day, in a week, etc.); how SLPs can help teachers engineer classrooms to afford multiple opportunities to practice new language skills; and how language goals can be integrated efficiently into a classroom's existing structure and routines, with realistic amounts of time invested by the classroom teacher and the SLP.

Another major gap in the evidence is that no studies were found that met our criteria that examined the effectiveness of indirect consultative and "inclusive" service delivery models for communication intervention for populations with S/L problems secondary to other primary disabilities (such as autism, developmental cognitive delay, or developmental delay). When an SLP serves students with these disabilities in the capacity of a related service provider in inclusive classrooms, a number of adults must work collaboratively to individualize students' education programs, determine related services, and coordinate their activities to have impact on the students' educational (and communication) outcomes (Giangreco, 2000). Given that current legislation, societal pressures, and professional

policies often emphasize a philosophy and preference for inclusive settings for children with disabilities, SLPs and other IEP team members need evidence to indicate whether integrated communication services for these students yield better outcomes in curriculum-relevant communication skills than pullout sessions do.

Although it is common for educators and parents to assume that “more is always better,” there has been almost no systematic study of the effects of the frequency, number, or length of S/L treatment sessions, treatment intensity, or how different schedules of service affect the communication performance of students with S/L or other primary disabilities (Warren et al., 2007). This represents a major gap in the evidence on the dosage of intervention required to make significant progress on S/L targets for school-age children who receive services in school settings. An example of this type of research was a study by Jacoby, Lee, Kummer, Levin, and Craghead (2002), who determined the average number of treatment units needed to achieve improvements in functional communication for preschool children receiving individual therapy in a hospital setting. This study also provided some preliminary data on which children showed differential gains and needed more treatment units. Jacoby et al. found that younger children received the greatest benefit per unit of therapy provided, and that children with lower initial functional communication abilities required more units of therapy to demonstrate improvement than did children with higher initial ability levels. Research on the basic clinical question of the effects of intervention dosage on students’ functional language abilities is needed by SLPs who work in school settings with older children in Grades K–12. Readers are referred to Warren et al. (2007) for a detailed discussion and recommendations for research on differential treatment intensity in communication intervention.

Additionally, we were surprised to find that even the basic question of treatment efficacy for students in group therapy versus individual therapy remains largely unanswered for school-age children with a variety of S/L disabilities. An exception was the Boyle et al. (2007) study that was reviewed in the present EBSR, which collapsed group sizes between 2 and 5 students as a single variable. With respect to research on group size, research reviewed in the ASHA technical report on workload and caseload size (ASHA, 2002) provides modest support for several clinical hypotheses: (a) Service provided to students in large groups appears to minimize opportunities for individualization of interventions; (b) when instructed in smaller instructional groups (3 or fewer), students with a wide range of disabilities are more engaged and have better outcomes; and (c) among desired student outcomes, communication skills in particular appear to be positively influenced by small treatment group size and negatively influenced by larger treatment group size. Unfortunately, none of the studies reviewed in the school workload technical report used high-quality experimental or quasi-experimental designs, which limits conclusions about the effect of group size on student communicative outcomes.

Our review of these studies raises questions about what types of evidence are appropriate measures for demonstrating the effectiveness of alternate service delivery models. In schools, SLPs are charged not only with facilitating improved fundamental language skills, but also with providing therapy that enables students to progress in the general or special education curriculum. It is an open question whether measures of finite or discreet language skills (such as grammatical markers or improved performance on standardized tests) are appropriate for measuring the effectiveness of functional curriculum-related goals of school-based S/L intervention. Future

studies of the effectiveness of classroom-based and indirect–consultative service models must consider how best to measure student communicative outcomes that are most critical to success in school.

CONCLUSION

The current evidence base does not justify any broad conclusions about which service delivery models are preferable for which elementary school–age children with which specific communication needs. The optimal combination of service delivery variables, such as intervention setting, dosage, and service provider roles, is likely to differ for individual children. In addition, public education policy (IDEA 2004 in particular) requires that the choices for special education services be based on the specific needs of each student. Thus, for the time being, IEP teams must rely more on reason than research in making service delivery decisions for individual students.

This systematic review of EBP of service delivery models for children with S/L problems is a narrow sample of what needs to be done given the extensive scope of practice of communication disorders in schools. In general, the quantity and quality of research for informing EBP optimally in schools must be enhanced. Specifically, resources are needed for conducting studies on effective service delivery options for children (i.e., birth–21 years) who are served by school-based SLPs. The results of this EBSR could serve as a stimulus for funding agencies such as the Institute for Educational Science of the U.S. Department of Education and the National Institutes of Health (e.g., the National Institute on Deafness and Other Communication Disorders and the National Institute on Child Health and Human Development) to give priority to optimizing the research base supporting EBP for speech-language pathology service delivery models in schools.

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APPENDIX A. TERMS USED IN THE SYSTEMATIC SEARCH OF THE LITERATURE

Model

- Pullout
- “Classroom direct” OR “classroom based” OR “collaborative consultation”
- Indirect OR Hanen OR home OR community OR consultative OR consulta* OR
- Frequen* OR intens* OR “dosage of service” OR dose
- “Parent training”

Disorder

- “Speech impairment” OR “language impairment”
- “Cognitive disability*”
- Autis* OR “autism spectrum disorder” OR “pervasive development disorder” OR Asperger* OR ASD OR PDD OR PDD-NOS OR Savant Syndrome
- “Complex communication needs”
- “Developmental delay*” OR “developmental disab*”
- Deaf OR “hard of hearing” OR “hearing impaired”
- “At risk” AND (“language disability” OR “learning disability”)
- “Multiple disabilities” OR “severe disabilities”
- Mental retardation OR MR

Other

- “Push in”
 - “Curriculum based” OR “dynamic assessment” OR “zone of actual development” OR “zone of proximal development”
 - “Resource room”
 - Inclusion
 - Monitor OR assistant
 - “Instructional support”
 - “Team teaching” OR “co-teaching” OR “parallel teaching”
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APPENDIX B (P. 1 OF 9). STUDIES SELECTED BY THE AUTHORS THAT DID NOT MEET INCLUSION CRITERIA BUT MAY INFORM CLINICAL PRACTICE ABOUT SCHOOL SERVICE DELIVERY MODELS

<i>CLASSROOM-BASED DIRECT SERVICE</i>		
<i>Reference</i>	<i>Article abstract—Study description and results</i>	<i>Reason for rejection from present EBSR</i>
Ellis, Schlaudecker, & Regimbal (1995)	The effectiveness of a collaborative consultation approach to basic concept instruction for kindergartners was investigated. An 8-week intervention program was designed that included consultation and training from a school speech-language pathologist (SLP), university faculty, a classroom teacher, and a physical education teacher. Experimental and control groups each consisted of children with a mean age of 5;6 (years;months; $N = 20$), representing a variety of ethnic and racial backgrounds. Pre- and posttest scores on nine target concepts were compared. Analysis of variance showed that children in the experimental treatment group scored significantly higher on the target concepts in posttesting than did controls.	Participants did not have identified disabilities (i.e., “at risk”)
Farber & Klein (1999)	The Maximizing Academic Growth by Improving Communication (MAGIC) comprehensive classroom teacher and SLP collaborative intervention program was developed and initially implemented in 12 kindergarten and first-grade classes to determine whether children receiving this language-enriched program performed significantly better than control peers on a curriculum-based test and on teacher reports of classroom communication. Results indicated that weekly classroom intervention resulted in significantly higher scores on the subtests of listening and writing for the children involved in the MAGIC program. Students in the treatment groups demonstrated significantly higher abilities in understanding vocabulary and cognitive–linguistic concepts in addition to increased writing skill development for producing relevant sentences with correct mechanics and spelling.	Participants did not have identified disabilities (i.e., “at risk”)
Hadley, Simmerman, Long, & Luna (2000)	Evaluation of a collaborative service delivery model involving an SLP and regular teachers of two inner-city, primary-grade classrooms found that, in comparison to children in standard practice control classrooms, experimental students showed superior gains in receptive vocabulary, expressive vocabulary, beginning sound awareness, and letter–sound associations as well as generalization to a novel phonological awareness task.	Participants did not have identified disabilities (i.e., “at risk”)
Kaufman, Prelock, Weiler, Craghead, & Donnelly (1994)	A communication skills unit (CSU) was designed and implemented collaboratively by a teacher, SLP, and student SLP. The CSU was developed to increase students’ metapragmatic awareness of explanation adequacy. Two third-grade classrooms were compared: one participated in the CSU and one did not. Pre- and posttests were administered to both classrooms, requiring students to view a videotape of two children helping each other with math problems, rate the explanations viewed on tape, and justify their ratings. Students’ justifications were then coded on three levels by the researcher. Results indicated that only the students who participated in the CSU showed significant improvement in rating and justifying the adequacy of an explanation. The teacher observed marked improvement in her students’ abilities to ask questions and respond to requests for information solicited by peers.	Participants did not have identified disabilities (i.e., “at risk”)
Rafferty, Piscitelli, & Boettcher (2003)	This study compared language development and social competence among 96 preschool children with disabilities in inclusive and segregated classes. Pretest ability was the strongest predictor of progress. Participants in inclusive classes had higher posttest scores in language development and social skills, but more behavior problems, than peers in segregated classes.	Participants were preschool age; did not address the clinical question

APPENDIX B (P. 2 OF 9). STUDIES SELECTED BY THE AUTHORS THAT DID NOT MEET INCLUSION CRITERIA BUT MAY INFORM CLINICAL PRACTICE ABOUT SCHOOL SERVICE DELIVERY MODELS

<i>CLASSROOM-BASED DIRECT SERVICE</i>		
<i>Reference</i>	<i>Article abstract—Study description and results</i>	<i>Reason for rejection from present EBSR</i>
Roberts, Prizant, & McWilliam (1995)	The interactions of young children and their SLP during out-of-class and in-class language intervention were compared for 15 children with disabilities attending a mainstreamed child care center. Children were pair matched and randomly assigned to either in-class or out-of-class special services. After 3 months, treatment sessions were videotaped. The results indicated that some, but not all, aspects of both the SLP's and the children's interactions differed during in-class versus out-of-class treatment sessions. During out-of-class sessions, the SLP took more turns than during in-class sessions. Children complied more with requests during out-of-class sessions and responded less to requests during in-class sessions. The results suggest that because in-class and out-of-class models have differential effects only on some aspects of clinician and child behavior, selection of service delivery models must be determined by a myriad of factors. Furthermore, these findings suggest that, in the absence of more conclusive data, it is premature to equate a particular mode of service delivery with a higher degree of treatment efficacy.	Participants were preschool age; did not address the clinical question
Seifert & Schwarz (1991)	The ability to understand and use basic concepts is a key to academic success. This study demonstrated that short-term, large-group basic concept instruction significantly improved the basic concept scores of children in Head Start as measured by the Boehm Test of Basic Concepts—Revised (Boehm, 1986). The intervention combined direct instruction with interactive and incidental teaching techniques, enabling the SLP to serve children effectively.	Participants were preschool age; participants did not have identified disabilities (i.e., "at risk")
Valdez & Montgomery (1997)	This study was designed to address the paucity of empirical data regarding the outcome of treatment approaches for preschool children with communication disorders. Specifically, this study examined the differences in effectiveness between the inclusion model of speech-language treatment and the traditional pullout model of speech-language treatment. African American children in an inner-city Head Start program with documented speech-language delays were randomly assigned to groups using the two treatment approaches. Results supported the research hypothesis that there is no significant difference between these two models of speech-language treatment. Findings suggest that the inclusion model is just as effective as a traditional pullout model in conducting speech-language services for children with mild, moderate, and severe communication disorders.	Participants were preschool age
Wilcox, Kouri, & Caswell (1991)	This investigation focused on the effectiveness of classroom versus individual interventions in promoting initial lexical acquisition for young preschool children with language delays. Twenty children ages 20–47 months were randomly assigned to individual and classroom-based early intervention programs. Progress was measured in terms of children's spontaneous and productive use of the target items in treatment and home-based generalization settings at mid- and posttreatment measurement points. Results indicated that use of target words as measured by treatment data was equal for children in the two intervention conditions. Differences were apparent when home generalization data were considered. Children in the classroom intervention condition demonstrated a greater degree of productive use of target words in the home generalization measures than did children in the individual intervention condition. The children also demonstrated differences in their use of target words in treatment versus home settings. A fair amount of individual variation was apparent in lexical learning in each of the treatment conditions, and pretreatment cognitive aptitude was found to play a role in this variation for children in the classroom intervention condition. It was concluded that, with respect to initial lexical training, classroom-based intervention is associated with superior generalization of lexical targets to the home environment. Additionally, given differences in children's target word use in different settings, it was concluded that treatment progress data in isolation are not likely to provide complete information regarding children's lexical learning.	Participants were preschool age

APPENDIX B (P. 3 OF 9). STUDIES SELECTED BY THE AUTHORS THAT DID NOT MEET INCLUSION CRITERIA BUT MAY INFORM CLINICAL PRACTICE ABOUT SCHOOL SERVICE DELIVERY MODELS

<i>INDIRECT-CONSULTATIVE SERVICE</i>		
<i>Reference</i>	<i>Article abstract—Study description and results</i>	<i>Reason for rejection from present EBSR</i>
Alpert & Kaiser (1992)	This study, involving 6 mothers of preschoolers with language impairments, found that mothers could be taught to correctly apply four milieu language teaching procedures (model, mand-model, time delay, and incidental teaching) and that use of the procedures is associated with positive effects on various aspects of child language.	Participants were preschool age; did not directly compare training models
Baxendale & Hesketh (2003)	Both direct (clinician to child) and indirect (clinician to caregiver) approaches are currently used in the management of children with language delay, but there is as yet little evidence about their relative effects or resource implications. This research project compared the Hanen Parent Program (HPP; Pepper, Weitzman, & McDade, 2004) in terms of its effectiveness and consequent suitability for an inner-city UK population with clinic-based, direct intervention. Thirty-seven children ages 2;6 to 3;6 with a diagnosis of language impairments and their parents took part. The children were allocated on a geographic basis to receive therapy either as part of an HPP or in a clinic. The children's language was assessed using the Preschool Language Scale—3: Spanish edition (PLS—3: Spanish; Zimmerman, Steiner, & Pond, 1993) and an analysis of audio-taped parent and child interaction at three assessment points—one pretherapy and two posttherapy—over 12 months. Two parent language measures were also analyzed. Significant gains in language scores were shown by 71% of the children over 12 months. There were no statistically significant differences in child language scores between the two therapy groups at any assessment point. However, the HPP was twice as intensive (in terms of therapist time) as clinic therapy based on average group size, which has resource implications. Results suggest that there are parent and child factors that need consideration when choosing an appropriate intervention program for a child with language impairments.	Participants were preschool age
Bernhardt, Smith, & Smith (1992)	This study evaluated a 2-year collaborative language intervention program involving the parents, SLP, and teachers of a 4-year-old boy with a pervasive developmental disorder with autistic features. The intervention goals were transdisciplinary, addressing specific communication development needs as well as social, cognitive, and behavioral areas. Intervention strategies included both direct therapy sessions and indirect home/preschool facilitation. The boy developed some of the language and social skills necessary for preschool success and demonstrated greater communication skills, but these skills did not replace his acting out behaviors.	No experimental or quasi-experimental design (no control); did not address the clinical question; participants were preschool age
Broen & Westman (1990)	The effectiveness of parents as teachers of speech production skills was assessed by comparing changes in the phonological skills of their children, made during a period with no intervention, to changes that occurred when parents served as teachers, and by comparing those changes with changes that occurred in a contrast group who received no intervention. Twenty children, 12 in the experimental group and 8 in the contrast group, served as participants. All children were between 4 and 5 years of age at the beginning of the study. Parents were taught in weekly sessions to model, reinforce, and in other ways to teach their children. Both teaching goals and teaching materials were provided, and progress was monitored weekly. The speech production skills of children in the experimental group improved significantly when parents did the teaching. This was true for both within-subject and across-subjects comparisons.	Participants were preschool age; did not directly compare training models
Charlop & Carpenter (2000)	Traditional incidental teaching was modified and a naturalized parent training speech program, Modified Incidental Training Sessions (MITS), was designed and used with 3 boys with autism. MITS led to acquisition of the target behavior for all 3 boys, whereas only 1 boy acquired the target behavior with traditional incidental teaching. Training also led to generalization of target phrases in the MITS mode only.	No SLP; did not directly compare training models; did not address the clinical question

APPENDIX B (P. 4 OF 9). STUDIES SELECTED BY THE AUTHORS THAT DID NOT MEET INCLUSION CRITERIA BUT MAY INFORM CLINICAL PRACTICE ABOUT SCHOOL SERVICE DELIVERY MODELS

<i>INDIRECT-CONSULTATIVE SERVICE</i>		
<i>Reference</i>	<i>Article abstract—Study description and results</i>	<i>Reason for rejection from present EBSR</i>
Dyer, Williams, & Luce (1991)	There is a growing body of literature suggesting that effective communication intervention for children with autism and other severe handicaps should be focused in the child's natural environment. This article describes a teacher-training program that uses the SLP to train classroom teachers in the use of communication intervention strategies in the classroom. Descriptive data support the usefulness of this model in the classroom setting.	No experimental or quasi-experimental design (no control); did not address the clinical question
Eiserman (1995)	This study, involving 40 preschool children with speech/language disorders, compared the costs and effectiveness of a home parent-training intervention and a clinic-based, low parent involvement intervention. Longitudinal effects were comparable, supporting the feasibility of offering options to parents and the need for broadly trained interventionists.	Participants were preschool age
Eiserman, Weber, & McCoun (1992)	This study investigated the appropriate roles of parents and SLPs in early intervention by longitudinally comparing the costs and effects of two programs for preschoolers with speech disorders: a home parent-training program and a clinic-based, low parent involvement program. Results from follow-up testing 1 year after the intervention ended corroborated the results immediately following intervention. Specifically, the home parent-training group performed at least as well as the clinic-based group on measures of speech and language functioning as well as on a measure of general development. On one variable measuring personal/social skills and one measuring adaptive behavior, the home parent-training group performed significantly better than the other group. Results of the cost analysis indicated that, excluding the value of parent time, there was no meaningful difference in program costs. The implications of this study are that parents can be given significant responsibilities in early intervention and that program administrators have the viable option of training parents to provide the primary early intervention services. Findings support the need for therapists to be trained to work with parents as well as with the child.	Participants were preschool age
Elder (1995)	This study addressed two major questions derived from social-interactive theory: What are the effects of an in-home communication training program for parents on (a) the acquisition of child-training skills (imitating/animating and expectant waiting) by parents of developmentally delayed children who have severe language impairments and autistic features and (b) the acquisition of communication behaviors in the children themselves? Questions regarding the social value of the intervention and effects on parent-child interactions were also addressed. Four mothers were taught two parent-training skills (imitating/animating and expectant waiting) during two in-home training sessions. Following the parent training, the mothers conducted training sessions in their homes with their children for 10 min three times per week for 8-12 weeks. All sessions were videotaped and frequency counts were taken of the target parent skills and child target behaviors. A single-subject experimental research design was used incorporating a multiple baseline across two parental child-training skills (i.e., imitating/animating, expectant waiting). As is customary in single-subject experimentation, data were analyzed visually and direct behavioral counts showed that all four mothers demonstrated increases in the frequency with which they used the child-training skills following treatment. Increases in four child behavior frequencies (i.e., vocal utterances, social responding, social initiating, and intelligible words spoken) were also noted. The ECO Scales Interaction Profile (MacDonald & Gillette, 1989) results supported direct behavioral count data, showing significantly improved parent-child interactions for the subject dyads over three conditions ($p < .034$). Additionally, Parental Consumer Satisfaction Questionnaire results indicated that the intervention was positively perceived by the parents. Furthermore, the utility of single-subject experimentation procedures in clinical nursing practice was clearly demonstrated in this research, and the findings support nurse-conducted, in-home parent training as a practical and socially valid means of addressing the complex needs of chronically disabled children and their families.	No SLP; did not directly compare training models; did not address the clinical question

APPENDIX B (P. 5 OF 9). STUDIES SELECTED BY THE AUTHORS THAT DID NOT MEET INCLUSION CRITERIA BUT MAY INFORM CLINICAL PRACTICE ABOUT SCHOOL SERVICE DELIVERY MODELS

<i>INDIRECT-CONSULTATIVE SERVICE</i>		
<i>Reference</i>	<i>Article abstract—Study description and results</i>	<i>Reason for rejection from present EBSR</i>
Gibbard, Cogan, & MacDonald (2004)	Parents and professionals can both play a role in improving children’s expressive language development, and a number of alternative models of delivery exist that involve different levels of input by these two groups. However, these alternative treatments have not been subject to rigorous comparative analysis in terms of both cost and clinical effectiveness. This study compared, from the viewpoint of the health care provider, parent-based intervention (PBI) for preschool children presenting with expressive language delay with current practice observed in an actual health care setting where parents of the child follow a professional’s advice on a review basis. Two groups of children were compared on a variety of expressive and receptive language assessment measures. One group (<i>n</i> = 10) received standard individual general care. The comparison group (<i>n</i> = 12) received PBI. After the 6-month study, the results indicated that the children who received PBI made significantly greater language gains than did the children who received current practice. In addition, a cost-effective analysis showed that although the language gains delivered by PBI did incur some additional costs for the health care provider, there was no significant increase in cost per outcome gain over general care. Options in the implementation of PBI are discussed that could potentially save costs for health care providers and increase the value of a PBI-based approach.	Participants were preschool age
Girolametto, Weitzman, & Clements-Baartman (1998)	This study explored the effects of training 6 mothers to use focused stimulation to teach specific target words to their toddlers with Down syndrome. Following treatment, trained mothers used the focused stimulation technique more often than did mothers in the control group. Concomitantly, their children used target words more often, as reported by parents and observation of free play.	Participants were preschool age; did not directly compare training models
Girolametto, Weitzman, & Greenberg (2004)	This study investigated whether child care providers could learn to facilitate peer interactions by using verbal support strategies (e.g., prompts, invitations, or suggestions to interact) during naturalistic play activities. Seventeen caregivers were randomly assigned to experimental and control groups, stratified by center so that staff from one center could attend the training program together. The experimental group received inservice training on how to facilitate peer interaction; the control group received training on adult-child communication strategies. Caregivers in the experimental group were taught to facilitate children’s interactions with their peers by using indirect referrals (e.g., alerting children to situational information, offering praise) and direct referrals (e.g., telling a child what to say to a peer, inviting children to play together). At posttest, the caregivers in the experimental group used more verbal supports for peer interaction than did the caregivers in the control group. Specifically, they used more utterances to promote communication between peers and to invite children to interact together. In turn, the children in the experimental group initiated interactions with peers more often and engaged in extended peer sequences more often than did the children in the control group. The results support the viability of this training model in early childhood education settings and suggest that future research of its effects with children who have disabilities is warranted.	Did not directly compare training models; did not address the clinical question
Hemmeter & Kaiser (1994)	In this study, 4 parents were trained to use enhanced milieu teaching with their preschool children with developmental delays. The parents learned to use the strategies in the clinic and generalized them to the home. Positive effects were observed on children’s spontaneous communication and target use, and on parent and child affect.	Participants were preschool age; did not directly compare training models; did not address the clinical question

APPENDIX B (P. 6 OF 9). STUDIES SELECTED BY THE AUTHORS THAT DID NOT MEET INCLUSION CRITERIA BUT MAY INFORM CLINICAL PRACTICE ABOUT SCHOOL SERVICE DELIVERY MODELS

<i>INDIRECT-CONSULTATIVE SERVICE</i>		
<i>Reference</i>	<i>Article abstract—Study description and results</i>	<i>Reason for rejection from present EBSR</i>
Howlin, Gordon, Pasco, Wade, & Charman (2007)	This study assessed the effectiveness of expert training and consultancy for teachers of children with autism spectrum disorder in the use of the Picture Exchange Communication System (PECS; Bondy & Frost, 2001). Method: Design: Group randomized, controlled trial (3 groups: immediate treatment, delayed treatment, no treatment). Participants: 84 elementary school children, mean age 6.8 years. A 2-day PECS workshop for teachers plus 6 half-day, school-based training sessions with expert consultants over 5 months. Outcome measures: Rates of: communicative initiations, use of PECS, and speech in the classroom; Autism Diagnostic Observation Schedule-Generc (ADOS-G; Lord, Rutter, DiLavore, & Risi, 1999) domain scores for Communication and Reciprocal Social Interaction; scores on formal language tests. Controlling for baseline age, developmental quotient (DQ) and language; rates of initiations and PECS usage increased significantly immediately post-treatment (Odds Ratio (OR) of being in a higher ordinal rate category 2.72, 95% confidence interval 1.22–6.09, $p < .05$ and OR 3.90 (95% CI 1.75–8.68), $p < .001$, respectively). There were no increases in frequency of speech, or improvements in ADOS-G ratings or language test scores. The results indicate modest effectiveness of PECS teacher training/consultancy. Rates of pupils' initiations and use of symbols in the classroom increased, although there was no evidence of improvement in other areas of communication. Treatment effects were not maintained once active intervention ceased.	No SLP; did not directly compare training models; did not address the clinical question
Iacono, Chan, & Waring (1998)	A group of 5 preschool children (ages 2;3–3;6) with developmental disability or Down syndrome and their mothers participated in a study into the efficacy of a parent-implemented language intervention. Each parent was included in the team as a consultee, with an SLP and special educator acting as consultants within a collaborative consultation process. Treatment for each child was developed using this process, with specific strategies to increase language production skills decided by the team. Strategies were used within an interactive model of early language intervention. The effectiveness of treatment was determined within a multiple baseline design. For 3 children, the impact of treatment was evident, but the results were not replicated for the other 2 children. Descriptive analysis of mothers' communicative behaviors indicated that, following treatment, the mothers tended to direct more utterances to their children, use more models and more (although limited) teaching strategies, and use fewer questions and directives.	Participants were preschool age; did not directly compare training models
Kaiser (1995)	This study explored the effects of teaching 3 novice trainers to teach 3 parents to implement milieu teaching with their preschool children who had language delays. Results demonstrated improved skills among trainers and increased use of the procedures by parents. Two of the 3 children showed increases in their targeted language responses following parents' milieu teaching.	Participants were preschool age; did not directly compare training models
Kaiser, Hancock, & Nietfeld (2000)	This study examined the effects of parent-implemented enhanced milieu teaching on the language performance of children who have autism or pervasive development disabilities. Participants were 6 preschool children with autism and their mothers. Although results varied across individuals, overall results offered support for the effectiveness of naturalistic language interventions implemented by parents with children who have autism or pervasive development disabilities. Results revealed that parents can learn enhanced milieu teaching procedures and generalize and maintain their use over time and across settings. Furthermore, results showed that children's social communication was enhanced across settings and measures.	Participants were preschool age; did not directly compare training models

APPENDIX B (P. 7 OF 9). STUDIES SELECTED BY THE AUTHORS THAT DID NOT MEET INCLUSION CRITERIA BUT MAY INFORM CLINICAL PRACTICE ABOUT SCHOOL SERVICE DELIVERY MODELS

<i>INDIRECT-CONSULTATIVE SERVICE</i>		
<i>Reference</i>	<i>Article abstract—Study description and results</i>	<i>Reason for rejection from present EBSR</i>
Kaiser, Hemmeter, & Ostrosky (1996)	The purpose of this study was to evaluate the effectiveness of parent-implemented responsive interaction on the language and communication skills of preschool children with disabilities. Twelve parents participated in individual training sessions. A multiple-baseline design across groups of families was used to evaluate the parents' use of the intervention strategies and the effects of the intervention on the children's language skills. Results indicated that all parents learned to use the procedures in the clinic setting and generalized their use of the procedures to interaction sessions conducted in the home. Although there was variability in child outcomes, positive effects were observed for all children. Maintenance sessions conducted 6 months after the end of training indicated that the parents maintained their use of the procedures. In addition, changes in child language skills observed during intervention were maintained. All parents indicated that they were highly satisfied with their participation in the intervention and the effects of the intervention on the language and communication skills of their children.	Participants were preschool age; did not directly compare training models
Laski, Charlop, & Schreibman (1988)	Parents of 4 nonverbal and 4 echolalic autistic children were trained to increase their children's speech by using the Natural Language Paradigm (NLP), a loosely structured procedure conducted in a play environment with a variety of toys. Parents were initially trained to use the NLP in a clinic setting, with subsequent parent-child speech sessions occurring at home. The results indicated that following training, parents increased the frequency with which they required their children to speak (i.e., modeled words and phrases, prompted answers to questions). Correspondingly, all children increased the frequency of their verbalizations in three nontraining settings. Thus, the NLP appears to be an efficacious program for parents to learn and use in the home to increase their children's speech.	No SLP; did not directly compare training models; did not address the clinical question
Lederer (2001)	The purpose of this study was to assess the influence of a 10-week parent-child intervention group on the vocabulary development of late-talking toddlers. Ten parent-child dyads participated. A focused stimulation approach was used. Results demonstrated efficacy of this model in increasing the children's overall and target vocabulary acquisition. Parents reported satisfaction with the program in terms of their child's vocabulary and social development, own language facilitation skills and anxiety levels, parent-peer support opportunities, and preference for this model.	Participants were preschool age; did not directly compare training models
Mobayed, Collins, Strangis, Schuster, & Hemmeter (2000)	In this study, a home-based interventionist effectively taught 4 mothers to embed the mand-model procedure in daily activities to teach expressive language skills to their young children with speech delays. During the intervention phase, parents were provided with feedback along with specific encouragement to use the individualized instructional program daily. The intervention resulted in children's acquisition of target verbal responses across settings.	No experimental or quasi-experimental design (no control); did not address the clinical question
Pierce & Schreibman (1997)	A study involving 2 children (ages 7-8) with autism and 8 typical peers investigated the efficacy of pivotal response training implemented by multiple peers in enhancing the social competency of the children with autism. After treatment, the participants engaged in high levels of interactions, initiations, varied toy play, and language use. Results support using peer trainers to promote social behavior in children with autism.	No SLP; did not directly compare training models; did not address the clinical question
Rocha, Schreibman, & Stahmer (2007)	Young children with autism have deficits in initiating and responding to joint attention bids. This study was designed to examine a parent-implemented intervention targeting joint attention responding in children with autism. Parents were trained to increase their joint attention bids using behavior analytic techniques to facilitate appropriate responding. Parents effectively employed joint attention intervention techniques. As parent joint attention bids increased, children's responses increased. Children's joint attention initiations also increased, even though they were not direct targets of intervention. Findings suggest that parent behaviors during and after intervention impact generalization and maintenance of behavior changes.	No SLP; did not directly compare training models; did not address the clinical question

APPENDIX B (P. 8 OF 9). STUDIES SELECTED BY THE AUTHORS THAT DID NOT MEET INCLUSION CRITERIA BUT MAY INFORM CLINICAL PRACTICE ABOUT SCHOOL SERVICE DELIVERY MODELS

<i>INDIRECT-CONSULTATIVE SERVICE</i>		
<i>Reference</i>	<i>Article abstract—Study description and results</i>	<i>Reason for rejection from present EBSR</i>
Ruscello, Cartwright, Haines, & Shuster (1993)	A group of 12 preschool children with phonological process errors was selected, and individual participants were randomly assigned to one of two treatments that differed in relation to service delivery. Group I received a treatment that was administered exclusively by the clinician. Group II received a combination that included clinician-administered treatment and parent-administered instruction with the Speech Viewer system. Results indicated that both groups improved significantly, but they did not differ significantly from each other in the degree of change. Implications with respect to the service delivery options and their respective components are discussed.	Participants were preschool age
Schwartz, Anderson, & Halle (1989)	Four teachers of students with severe disabilities were taught to implement a naturalistic time delay procedure within their normal classroom routines to improve the language skills of their students. Following a short training program, the teachers increased their use of three types of opportunities for time delay; however, they required special training to capitalize on untrained opportunities for delay. Verbatim samples of the students' speech indicated that teachers of students with severe disabilities can be taught to use the time delay procedure within their normal classroom routine and that their use of delay may have beneficial effects (e.g., increases in mean length of utterance, responsivity, and movement along a continuum of spontaneity) on the speech of their students.	No SLP; did not directly compare training models; did not address the clinical question
Seung, Ashwell, Elder, & Valcante (2006)	This retrospective study examined the efficacy of in-home father training on the communicative outcomes of children with autism. The in-home training consisted of two components: expectant waiting and imitation with animation. Efficacy of parent training was examined by measuring the ratio of utterances produced by the parents to the utterances produced by the children and the number of verbal imitations by the parents. Outcomes of the children's verbal production were examined by measuring the number of (a) single-word utterances, (b) different words produced, and (c) verbal response to questions. Following training, there was a decrease in the ratio of parent to child utterances and an increase in the use of imitation by the parents and the number of single words and different words produced by the children. Results of this study suggest that the parents had learned to wait for their children to communicate verbally during communicative interactions and to interact more efficiently with their children by using verbal imitation. Overall, the results of this study support the efficacy of parent training that focuses on the promotion of social reciprocity, and have important implications for clinicians and future research.	No experimental or quasi-experimental design (no control)
Smith & Camarata (1999)	This study focused on naturalistic language teaching by teachers in consultation with a language clinician and examined the feasibility of using naturalistic language teaching procedures to solve the communication problems of 3 children (ages 4–6 years) with autism conducted by the child's general education teacher in collaboration with the child's language clinician. The results of a multiple-baseline study across children indicated successful implementation of naturalistic language teaching procedures in the school settings by all general education teachers and improved intelligibility of the language skills of all of the children with autism in generalized spontaneous language use. These results are discussed in terms of previous research demonstrating the effectiveness and benefits of naturalistic teaching procedures and in terms of the implications for educational practices involving children with autism.	Participants were preschool age; did not directly compare training models; did not address the clinical question

APPENDIX B (P. 9 OF 9). STUDIES SELECTED BY THE AUTHORS THAT DID NOT MEET INCLUSION CRITERIA BUT MAY INFORM CLINICAL PRACTICE ABOUT SCHOOL SERVICE DELIVERY MODELS

<i>DOSAGE</i>		
<i>Reference</i>	<i>Article abstract—Study description and results</i>	<i>Reason for rejection from present EBSR</i>
Barratt, Littlejohns, & Thompson (1992)	<p>Forty-two preschool children referred to a speech therapy department were randomly allocated to receive intensive individual speech therapy or the more traditional once-weekly approach. Boys and minority ethnic groups were referred most frequently. Speech therapy improved expression more than comprehension, as measured on the Reynell Developmental Language Scales (Reynell, 1969). The mean improvements were 0.5 SDs (95% confidence intervals (CI) 0.3 to 0.7) and 0.3 (95% CI 0.1 to 0.5), respectively. There was a greater improvement in children receiving intensive compared with weekly therapy in the expression scores: 0.8 SDs (95% CI 0.5 to 1.1) versus 0.2 SDs (95% CI -0.1 to 0.5). White and non-White children had similar improvements in comprehension scores, but White children had greater improvement in expression scores (1.1 SDs vs. 0.3 SDs). This difference was seen in both therapy groups.</p>	Participants were preschool age
Handleman & Harris (1983)	<p>Four autistic, moderately retarded 5- to 6-year-olds were taught four sets of nonverbal imitation items under individual or paired (couplet) instruction conditions and were probed for generalization of their partners' responses. Results indicated that compared to one-to-one instruction, couplet training had a disruptive effect for 2 participants. One participant learned responses faster when provided with couplet training than when instructed individually. The fourth participant displayed little difference between the two training conditions. In all cases, the percentage of partner's material learned during couplet instruction was consistently low. Although one-to-one instruction may be effective for teaching basic skills, for some children, these skills can be taught as well when they are paired with other students. Couplet training can also facilitate the transition of children to less restrictive environments.</p>	No SLP; did not directly compare training models; did not address the clinical question
Jacoby, Lee, Kummer, Levin, & Craghead (2002)	<p>This study was conducted to determine the average number of treatment units needed to achieve improvements in functional communication. The participants, ages 3 to 6 years, consisted of 234 children who received speech-language pathology services over a 2-year period at Children's Hospital Medical Center (CHMC) in Cincinnati, OH. Participants had disorders of articulation and/or language and were rated on all areas of deficit using the American Speech-Language-Hearing Association functional communication measures (FCMs) of articulation/intelligibility, spoken language production, and spoken language comprehension. Results indicated that as the number of treatment units increased, the children's FCM levels improved. These improvements were statistically significant for participants with articulation/intelligibility and spoken language production disorders only. Younger children received the greatest benefit per units of therapy provided. Children with lower initial functional abilities generally required more units of therapy to demonstrate improvement than did children with higher initial ability levels. Children with an associated factor (i.e., anoxic brain damage, syndromes, hearing loss, etc.) generally required more units of therapy than did those who had no other factors, although the results were not statistically significant. The majority of participants (76.5%) improved by at least one FCM level following 20 hr or more of therapy. There was improvement of two FCM levels in 38.5%, and more than two levels in 18.5% of the overall group. This study indicates that improvement in FCM abilities is made with treatment, and that the degree of improvement is correlated with the number of treatment units provided.</p>	Participants were preschool age

Evidence-Based Systematic Review: Effects of Different Service Delivery Models on Communication Outcomes for Elementary School Age Children

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