

Research Article

Treating Children Ages 3–6 Who Have Speech Sound Disorder: A Survey

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Purpose: In a national survey, speech-language pathologists (SLPs) were asked about service delivery and interventions they use with children ages 3–6 who have speech sound disorder (SSD).

Method: The survey was e-mailed to 2,084 SLPs who worked in pre-elementary settings across the United States. Of these, 24% completed part or all of the survey, with 18% completing the entire survey.

Results: SLPs reported that they provided children ages 3–6 who had SSD with 30 or 60 min of treatment time weekly, regardless of group or individual setting. More SLPs indicated that they used traditional intervention than other types of intervention. However, many SLPs also reported using aspects of phonological interventions and providing phonological

awareness training. Fewer SLPs indicated that they used nonspeech oral motor exercises than in a previous survey (Lof & Watson, 2008). Recently graduated SLPs were no more familiar with recent advances in phonological intervention than were their more experienced colleagues.

Discussion: This study confirms previous findings (Mullen & Schooling, 2010) about the amount of service provided to children ages 3–6 who have SSD. Issues related to the use of traditional and phonological intervention with children who have phonological disorder are discussed, along with concerns related to evidence-based practice and research needs.

Key Words: speech sound disorder, service delivery, intervention, children

In recent years, two studies of clinical practice relating to speech sound disorder (SSD) in children have been published, including a survey of assessment practices (Skahan, Watson, & Lof, 2007) and a survey about the use of nonspeech oral motor exercises (NSOME) in treatment (Lof & Watson, 2008). However, there is no comparable information about the types of interventions that speech-language pathologists (SLPs) routinely use with children who have SSD, despite the fact that a large number of phonologically based modes of intervention have been published. The phonological interventions, which are directed at improving the speech sound system, are in contrast to traditional articulation treatment, which is directed at correcting isolated speech sounds. Traditional intervention was promulgated by Van Riper and his colleagues in the many editions of his pioneering work, including Van Riper (1939) and Van Riper and Irwin (1958).

Preschoolers who have SSD constitute ~75% of the population served in preschools and other settings (Mullen & Schooling, 2010). It is likely that most preschoolers identified with SSD will have phonological (system-wide) disorder rather than phonetic (isolated speech sound) disorder because children with phonetic disorder are unlikely to be identified before age 6 (Shriberg, Tomblin, & McSweeney, 1999). There is reason to think that if children with moderate-to-severe SSD are treated with the most efficacious, effective, and efficient interventions during the preschool years, the number of children who continue to require treatment during the school-age period could be substantially reduced (Gillon, 2005; Prezas & Hodson, 2010).

Any outcome that reduces the need for further intervention would have implications for the systems that serve these children, but more importantly, for the children and their families. That is, preschoolers with SSD are often not intelligible to persons other than family members, and they may be at risk for subsequent delays in becoming literate, especially if their SSD is severe or if they have concomitant language disorder (see Anthony et al., 2011, for a comprehensive review). Preschoolers with SSD may be affected by social disfavor and/or a poor self-image (McCormack, Harrison, McLeod, & McAllister, 2011; McCormack, McLeod, Harrison, & McAllister, 2010; Thomas-Stonell, Oddson, Robertson, & Rosenbaum, 2009). Not only do children with SSD become frustrated, but their families also often become frustrated in their attempts to communicate with their own children (McCormack, McLeod, Harrison, & McAllister, 2010; McCormack,

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McLeod, McAllister, & Harrison, 2010). Efficacious, effective, and efficient treatments for preschoolers with SSD are important for all of these stakeholders. However, little is known about which treatments SLPs currently use when working with preschoolers who have SSD.

Traditional Intervention for SSD

Traditional intervention is focused on the correction of individual phonemes, usually one phoneme at a time. It follows a well-known sequence of therapeutic goals, often beginning with ear training, followed by teaching of the speech sound in isolation, and then increasing the length, complexity, and meaningfulness of the utterance until the child uses the speech sound in conversation. Traditional treatment is also associated with certain criteria for the selection of phoneme targets, including developmental order of acquisition, stimulability, and effect on intelligibility. Finally, although behavioral modification techniques were not part of traditional treatment as presented by Van Riper and colleagues (e.g., Van Riper, 1939; Van Riper & Irwin, 1958), these techniques came to be associated with traditional intervention over time. Thus, it is common in traditional treatment to use positive reinforcement schedules, explicit criteria for passing from one step to another, modeling and cuing, and extensive taking of data.

Phonological Interventions

In the 1970s, the focus of research into child phonology became the speech sound system, that is, the phonology of the language, as well as the clinical application of this knowledge (Ingram, 1976). For example, McReynolds and colleagues (Elbert & McReynolds, 1978; McReynolds, 1972; McReynolds & Bennett, 1972) proposed that the clinician could treat distinctive features that were common to several of a child's speech sound errors. Subsequently, intervention based on phonological processes and using minimal pairs was reported by Weiner (1981) and by Blache, Parsons, and Humphreys (1981). An emphasis on the clinical importance of phonological processes was represented by the publication of Hodson and Paden's cycles therapy (1983, 1991). In 1983, Edwards published a comprehensive guide to selecting phonological goals for children with SSD. Since that time, a large number of phonological interventions have been reported in the research literature.

Although phonological interventions may be based on a variety of theoretical orientations, all of them have the goal of generalization from taught to untaught phonemes and to untaught phonological structures such as consonant clusters, as well as generalization to levels of discourse beyond the word. A recent book by Williams, McLeod, and McCauley (2010) documented many of these phonological interventions together with several for childhood apraxia of speech.

Phonological Versus Traditional Intervention

Phonological interventions differ from traditional intervention in a number of ways. First, phonological interventions have a linguistic/phonologic emphasis in contrast to the motor/articulation emphasis of traditional intervention

(Bernthal, Bankson, & Flipsen, 2009). Under the linguistic/phonologic emphasis, children are guided to discover relevant characteristics of the phonology of the ambient language rather than exclusively learn the motoric sequences needed to produce a phoneme accurately (Bernthal et al., 2009). Second, in phonological interventions, the clinician selects phoneme targets on the basis of how the targets are expected to affect the child's larger sound system (Edwards, 1983), in contrast to more traditional considerations of target selection, such as stimulability (Bernthal et al., 2009). Third, phonological interventions often focus on meaningful words rather than on sounds in isolation or on nonsense syllables (e.g., Blache et al., 1981; Hodson & Paden, 1983, 1991; Weiner, 1981; Williams, 2000a, 2000b), although Gierut, Morrisette, and Ziemer (2010) recently showed that teaching nonsense words may result in better generalization of target phonemes and improved system-wide effects on phonology. Fourth, in phonological interventions, clinicians often target more than one phoneme in the same session, and they often target multiple phonemes within relatively short periods of intervention (e.g., Edwards, 1983; Hodson & Paden, 1983, 1991; Williams, 2000a, 2000b). This approach is in contrast to the traditional teaching of a single phoneme, taking it from production in isolation to production in continuous speech (Bernthal et al., 2009; Van Riper, 1939). Fifth, phonological interventions may incorporate fewer steps in treatment sequences than the typical traditional hierarchy of intervention because the child's use of the targets in discourse or conversation is not the primary goal. Rather, generalization of the newly acquired sound or structure to more complex speaking tasks and also to other phonemes is expected to take place spontaneously, if gradually (e.g., Hodson & Paden, 1983, 1991; Weiner, 1981). Finally, phonological interventions are appropriate for children younger than the grade school-age children who are typically treated with traditional intervention because the preschool years constitute a period when children rapidly acquire the phonology of the ambient language (Stoel-Gammon & Dunn, 1985; Vihman, 1996).

The last difference between phonological interventions and traditional intervention stated above is an important one. Van Riper and colleagues (Van Riper, 1939; Van Riper & Irwin, 1958) developed their intervention techniques in the period before the Education for All Handicapped Children Act of 1975 (2006), that is, at a time when typically only children of school age were offered treatment. The techniques associated with traditional intervention were intended to teach children isolated speech sounds that had been inadequately learned. In contrast, phonological interventions seek to guide children's acquisition of the phonological system during the early years. Therefore, it is likely that traditional intervention will be less efficacious, less effective, and less efficient than phonological approaches for children whose SSD is primarily phonological in nature (Kamhi, 2006).

Efficacy of Interventions for SSD

During the period when traditional intervention was the primary means of intervening for SSD, there appeared to

be general acceptance that traditional intervention was efficacious, despite little research evidence to confirm this. One exception was that Diedrich and Bangert (1980) reported pretest/posttest data from large numbers of children in Grades 1–6 in school-based treatment for /s/ and /r/ errors, with most of the children selected from Grades 3 and 4. These data showed unambiguously that most of the children made progress in acquiring the target speech sounds.

Many of the recent interventions for phonological disorder are associated with documentation stating that they are efficacious (Williams et al., 2010). However, little research on phonological interventions achieves the gold standard for the demonstration of efficacy, which is the randomized controlled trial (RCT). The efficacy and effectiveness research for phonological and related interventions was reviewed and summarized by Baker and McLeod (2008, 2011), who concluded that most of the 134 reports they reviewed represented quasi-experimental designs (e.g., single subject) or nonexperimental case studies. Relatively few efficacy studies were RCTs (14.8%), and few were meta-analyses (1.5%), which are also considered to be at the highest level of evidence for purposes of evidence-based practice (American Speech-Language-Hearing Association [ASHA], 2004).

Service Delivery Models

One variable that can have an effect on the efficacy of interventions provided to preschoolers with SSD is service delivery, including the frequency and duration of sessions and the use of groups. In order to design studies and interpret results, when an intervention that has been shown to be efficacious is moved into higher level replication studies to investigate effectiveness and efficiency, researchers will need to know about typical service delivery patterns. SLPs who want to adopt an efficacious intervention need to consider the differences between the conditions under which they provide services and the conditions under which the intervention was found to be efficacious.

Mullen and Schooling (2010) reported data from the National Outcomes Measurement System (NOMS; ASHA, 2003) from K–12 and prekindergarten (pre-k) children for the 10-year period ending in 2007. Both the school-age and pre-k children were frequently seen in groups of two to four (for K–12, 82%, and for pre-k children, 63%). Pre-k children were more likely to be seen individually (25% vs. 9%). Both groups were likely to be seen in two sessions weekly, with sessions 21–30 min in duration. One unknown variable is whether preschool-age children with SSD receive a different amount of intervention if they are seen individually or in a group. A second unknown is whether groups are homogeneous, with all of the group members working on phonology, for example, or heterogeneous, with some group members working in areas other than phonology, such as language, voice, or fluency.

The Present Study

Given that the research base of phonological interventions for SSD has changed markedly over the past 30–40 years,

it is important to know what interventions are currently being used by SLPs to treat preschoolers who have SSD and whether those interventions are supported by research. Children ages 3 to 6 are the focus of the present study because the child's phonological system typically changes rapidly during this period and is virtually complete by ~6 years of age (Smit & Hand, 1997; Smit, Hand, Freilinger, Bernthal, & Bird, 1990). It is for this reason that most of the recent interventions for phonological disorder have been directed at preschoolers or early school-age children (Kamhi, 2006).

There appears to be little reported research about therapeutic practices, except for the study by Lof and Watson (2008), who carried out a survey of SLPs with a focus on the use of NSOME. They found that 85% of their respondents used NSOME as part of their intervention with children who had SSD. However, although Lof and Watson included a section in their survey dealing with other interventions used by the respondents, they did not report on those other interventions. The present study is intended to describe current therapeutic practice and service delivery with preschoolers who have SSD. The focus of the present study includes the question of which interventions and intervention techniques for SSD are used with children ages 3–6 who have SSD, as well as the question of which service delivery options SLPs use with this population.

Method

Development of the Survey and Pilot Study

Survey. The survey instrument was designed to be used with the Axio electronic survey system (2011), which was developed at Kansas State University. Axio permits the investigator to administer the survey through e-mail and to provide follow-up through e-mail as necessary. The Axio system also allows several question formats, including multiple-choice questions, and it aggregates the data anonymously. The Human Subjects Committee at Kansas State University approved both the pilot survey and the main survey as being exempt from review.

Based on the literature concerning interventions for SSD and on the experiences of colleagues and others with the treatment process, we identified a variety of therapeutic approaches and procedures and conferred with experts in child phonology about areas that should be covered in the survey. (The final version of the survey may be seen in the online supplementary materials.) Seven areas were covered by the survey, administered in the following order: personal and demographic information (Section 1); service delivery (Section 2); choosing treatment targets (Section 3); treatment structure (Section 4); elicitation techniques (Section 5); models, inputs, and contingencies (Section 6); and use of named interventions (Section 7). For every question about therapeutic practices and techniques, the respondents saw the following choices about the frequency or percentage of time they used that practice: *Always* (100%), *Often* (70%–90%), *Sometimes* (40%–60%), *Occasionally* (10%–30%), *Never* (0%), and *Not familiar*.

The section on service delivery was intended to document the range of options the respondents used in their practice. Questions about service delivery covered practice sites, the percentage of the preschool caseload that consisted of children with SSD, scheduling of sessions, and description of groups. Questions in the survey sections about specific practices used in intervention sessions (Sections 3–6) were determined from published treatment manuals and program descriptions, books about SSD, and discussions with clinical supervisors and other knowledgeable persons in speech-language pathology. (Relevant citations for these sections may be found in the complete data tables posted in the online supplementary materials.) These sections were included in order to augment the findings from Section 7 of the survey, in which the respondents were asked about their use of named interventions. The named interventions are listed in Table 1, where they are shown with the earliest citations available. The instructions in Section 7 of the survey were as follows:

Below are the names of some approaches used in therapy for preschoolers with SSD. Please indicate all that apply to the therapy that you provide to preschoolers (children ages 3 to 6) with SSD. If you are not familiar with an approach, please check the “Not familiar” box.

Table 1. Named interventions included in the survey, with the earliest citations in parentheses

Name of intervention
Traditional (Van Riper, 1939; Van Riper & Irwin, 1958)
Sensory motor (McDonald, 1964)
Paired stimuli (Weston & Irwin, 1971)
Distinctive features (Elbert & McReynolds, 1978; McReynolds, 1972; McReynolds & Bennett, 1972)
Multiphonemic intervention (McCabe & Bradley, 1975)
Nonspeech oral motor exercises (NSOME— Christensen & Hanson, 1981; Dworkin, 1978; Marshalla, 1985)
Minimal pairs (Blache, Parsons, & Humphreys, 1981; Weiner, 1981)
Cycles (Hodson & Paden, 1983, 1991)
Metaphon (Dean & Howell, 1986; Howell & Dean, 1991, 1994)
Complexity/least knowledge (Elbert & Gierut, 1986; Gierut, 2001, 2007)
Maximal oppositions (Gierut, 1989, 1990, 1992)
Whole language (Hoffman, Norris, & Monjure, 1996; Norris & Hoffman, 1993)
Nonlinear (Bernhardt & Stoel-Gammon, 1994; Bernhardt & Stemberger, 2000)
PROMPT (Hayden, 2006; Hayden & Square, 1994)
Phonological awareness (Gillon, 2000, 2004; Hesketh, Adams, Nightingale, & Hall, 2000)
Multiple oppositions (Williams, 2000a, 2000b)
Morphosyntactic (Haskill, Tyler, & Tolbert, 2001; Tyler, 2002; Tyler, Lewis, Haskill, & Tolbert, 2002)
Commercially available programs, such as Earobics (1997) and Easy Does It (Strode & Chamberlain, 1997)

Note. The citations shown indicate the earliest publications where the type of intervention was mentioned, rather than an exhaustive list of sources. The citations were not included in the survey questions. The order shown here is not the order in which the interventions were presented in the survey, which was randomized.

The section on named interventions was placed after Sections 3–6 in order to avoid biases that could arise if the respondents saw the named interventions first.

Although the named interventions are ordered in Table 1 by earliest date of availability, the interventions were presented in random order to the participants. The named interventions were not accompanied by citations because citations could have caused confusion in some cases, for example, whether the respondent considered NSOME to be associated with Marshalla (1985) or with Rosenfeld-Johnson (1999) or with some other author. Descriptions did not accompany the named citations because attempts to generate short descriptions also carried the risk that SLPs would not recognize a description because it did not include particular features by which they themselves would have identified the intervention. Finally, researchers with experience in surveys in the communication sciences and disorders profession advised against including either citations or descriptions, for the reasons indicated above.

Pilot study. A pilot version of the survey was mailed to one SLP from each of the 50 states, with that person selected at random from the ASHA membership database. Only SLPs who indicated that they worked in the pre-elementary setting were included. One of the 50 e-mails was undeliverable. In the pilot version of the survey, the recipients were asked to provide feedback on each section (e.g., Were the questions comprehensive? Were the questions easy to answer? If not, what was the problem?). Five of the 49 recipients completed the pilot survey in its entirety. The mean time to complete the pilot survey was 30 min, 31 s. The feedback was not extensive, but it suggested that the questions were well written. A few questions with branching items had been included in the pilot version, but they did not yield useful information; consequently, the large majority of questions in the final version of the survey were multiple choice.

Survey Participants

The final version of the survey was e-mailed to 2,395 SLPs who were selected from the ASHA membership database using stratified systematic sampling. The group sampled in each state included all of the SLPs who indicated in their ASHA membership listing that they worked with pre-elementary school populations. From the list of SLPs identified in each state, every fifth name was selected. In other words, ~20% of each state’s SLPs who identified themselves as working in the pre-elementary setting were selected to receive the survey. A total of 2,084 e-mails were successfully delivered. Of these, 489 (24%) were attempted and provided usable data, and 379 (18% of the total and 78% of those who attempted the survey) were completed in their entirety. A total of 17 people reported that they provided diagnostic services only, and they were included with the nonresponders throughout the rest of the survey.

Participant demographics. The survey respondents reported the following information about themselves: geographic state of employment, gender, year in which the master’s degree was conferred, full- or part-time employment,

and proportion of children ages 3–6 who had SSD in their caseload of children ages 3–6. Each state except for Alaska and Rhode Island had at least one respondent, and 98% of the respondents were female. The number of years post graduation with a master's degree was skewed toward more recent graduates; that is, although the range was from 2 to 44 years, the median was 15 years. A majority of the SLPs (77%) reported that they worked in full-time positions post graduation.

The respondents who discontinued the survey before the end always completed entire sections before discontinuing. In order to have the largest possible number of respondents for each section of the survey, the responses of those who discontinued the survey were included in the results up to the point where they discontinued. Therefore, it was important to demonstrate that the respondents who discontinued resembled the rest of the respondents in a relevant way. The variable *years since obtaining the master's degree* was chosen as the most relevant variable. After removing the respondents who provided diagnostic services only, the group that completed the survey in its entirety ($n = 361$) had a mean time since graduation of 18.3 years ($SD = 10.40$ years), whereas those who discontinued the survey at some point ($n = 111$) had a mean time since graduation of 19.1 years ($SD = 10.69$ years). No significant difference was found between those who completed the survey and those who responded to only part of the survey ($t = 0.712$, $df = 470$, $p = .477$).

Timing and Duration of the Survey

The survey was open for a period of 6 weeks in the summer of 2011. Participants received the initial e-mail and two reminders at 14-day intervals. The mean time the survey was open in the respondents' Web browsers was reported by Axio to be 6 hr, 9 min, but that duration likely does not accurately reflect the time it took to complete the survey. It is unclear why the survey was open for long periods of time, but the developers of Axio indicated that this situation was not unusual for Axio surveys. The mean time the survey was open suggests that at least some of the respondents might have opened the survey early in a workday and then completed sections sporadically throughout the day. The organization of the survey into sections may help explain why respondents who discontinued did so after completing an entire section. The sections themselves would have taken only a few minutes to complete, and thus could be done during a short break from other activities.

Results

Service Delivery

Children ages 3–6 with SSD as a percentage of caseload. Of the 464 respondents to this question, 52% indicated that half or more of their caseload of children ages 3–6 consisted of children with SSD, 44% indicated that fewer than half had SSD, and 4% indicated that they provided diagnostic services only.

Practice sites. The SLPs were asked in which service sites they provided any services at all to children ages 3–6 with SSD. They were free to indicate more than one. The data shown are from the total number of respondents ($n = 489$) who reported spending at least 10% of their time with the preschool population. The sites reported were preschool classroom (67%), early childhood center (48%), walk-in or bus-in to school (35%), client/caregiver's home (31%), kindergarten/first-grade classroom (21%), private practice (11%), and university clinic (2%). Based on these data, it appears that most service to preschoolers with SSD was delivered in preschools, early childhood centers, and schools, with some intervention delivered in homes. The inclusion of a kindergarten or first-grade classroom reflected the fact that the survey included children in the age range of 3–6 years, and some of the oldest children might have been served in those classrooms.

Scheduling of sessions. Of the 389 SLPs who indicated that they treated preschoolers in individual sessions, 42% indicated that they scheduled two 30-min sessions weekly, 28% indicated either one 30-min session or two 15-min sessions, and 30% responded to all other possibilities (which ranged from "1 15-minute session per week" to "5 60-minute sessions per week"). Based on these data, preschoolers who were scheduled individually typically received either 30 or 60 min of intervention weekly.

A total of 352 respondents used a combination of individual and group sessions, and of these, 49% indicated that the child received a total treatment time of 60 min weekly, 18% responded with 30 min weekly, and 33% chose a variety of other possibilities. Based on these responses, it appears that children ages 3–6 who were scheduled for a combination of individual and group sessions typically received either 30 or 60 min of intervention weekly.

There were 190 respondents who treated preschoolers in group sessions only, and of these, 48% indicated that the child received 60 min of treatment per week, 23% reported that the child received 30 min weekly, and 29% chose a variety of other responses.

Description of groups. Of the 339 respondents who treated preschoolers with SSD in groups, 78% scheduled groups of two to three children, 16% scheduled groups of three to four children, and 6% scheduled groups of more than four children. Respondents indicated that 66% of the groups were heterogeneous (i.e., with some children working in areas other than SSD such as language or voice), and 34% were homogeneous (i.e., with all of the children working on SSD).

Interventions Used With Preschoolers With SSD

In the results that follow, frequent use of a therapeutic option was defined as the aggregate of the often (70%–90%) and always (100%) categories. It should be noted that in all instances, the always category was small relative to the often category, typically equal to 10%–20% of the often category.

Use of named interventions. Although the named interventions section was the last part of the survey, these

results are reported first because they provide a structure for the remaining results. Respondents indicated all options that were applicable to their practice (see Table 2 for their responses). Table 2 shows that approximately half of the respondents used traditional intervention frequently (i.e., 70%–100%), and another third used it 40%–60% of the time. After traditional intervention, the respondents indicated frequent use of phonological awareness training (36%), minimal pairs (33%), cycles (32%), and whole language (19%). These data suggest that although these SLPs used traditional intervention most frequently, the same respondents used other interventions as well. It is notable that respondents used phonological awareness relatively frequently; however, another part of the survey suggested that phonological awareness was used as an adjunct to direct intervention for speech sounds.

Also notable in Table 2 is the response to NSOME, with 14% of respondents using NSOME frequently. The responses to the use of NSOME presented an unusual pattern in the survey in that most respondents were apparently familiar with the exercises, but ~30% of the respondents indicated that they never used them. This pattern was not replicated with any other intervention—in all other cases, small percentages of *not familiar* responses were associated with small percentages of *never* responses.

Table 2 shows considerable variability in the number of SLPs who checked not familiar with respect to the various intervention choices. The nine best-known interventions were associated with not familiar percentages ranging from 0% to 19%, and they included primarily interventions that

were available by 1985, with the exception of commercially available programs (8%). The nine least-known interventions were associated with not familiar percentages ranging from 31% to 83%. These included primarily interventions that were available after 1985, with the exception of paired stimuli (31%) and multiphonemic (37%). These data suggest that the interventions associated with the highest rates of not familiar responses were those published since ~1985 (Table 1).

With respect to the respondents who were not familiar with particular interventions, one hypothesis is that recently graduated SLPs might have been more knowledgeable about recent advances in phonological (and other) interventions when compared to their more experienced peers. To determine if this was the case, the percentages of not familiar responses from respondents who graduated with a master's degree within the previous 10 years were compared to the percentages of responses from those who graduated 11–40 years prior. Interventions that were published since 1985 were included, except for commercial programs. The results of these comparisons are shown in Table 3. Except for the PROMPT program, with which the recent graduates were significantly more familiar than those who had graduated earlier, the two groups were similar in their rates of choosing the not familiar response.

Treatment targets. Table 4 shows which variables the respondents considered when they chose treatment targets, given the categories of traditional, functional, phonological process, phonological system, phonological awareness, and other considerations. (The complete Table 4 in the online supplementary materials shows representative citations for these

Table 2. Number and percentage of the 366 speech-language pathologists (SLPs) who responded to questions about named interventions, arranged by the sum of the *Often* and *Always* responses (i.e., frequently).

	Often+Always 70%–100%		Sometimes 40%–60%		Occasionally 10%–30%		Never 0%		Not familiar	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Traditional	179	49	121	33	52	14	12	3	2	0
Phonological awareness	132	36	140	38	77	21	17	5	0	0
Minimal pairs	120	33	117	32	113	31	15	4	1	0
Cycles	116	32	74	20	67	18	40	11	69	19
Whole language	71	19	94	26	114	31	56	15	31	8
Nonspeech oral motor exercises (NSOME)	53	14	50	14	143	39	110	30	10	3
Distinctive features	47	13	103	28	119	33	46	13	51	14
Multiphonemic	44	12	82	22	73	20	33	9	134	37
Sensory motor	43	12	92	25	124	34	44	12	63	17
PROMPT	42	12	33	9	50	14	84	23	157	43
Commercial program	39	11	94	26	133	36	69	19	31	8
Paired stimuli	23	6	99	27	85	23	46	13	113	31
Maximal oppositions	20	5	38	10	94	26	77	21	137	37
Morphosyntactic	18	5	67	18	92	25	37	10	152	42
Multiple oppositions	16	4	51	14	85	23	64	18	150	41
Complexity/least knowledge	11	3	17	5	43	12	40	11	255	70
Nonlinear	9	2	20	6	24	7	35	10	278	76
Metaphon	4	1	10	3	19	5	30	8	303	83

Note. Data do not include the 106 persons (21.7% of the total survey respondents) who did not respond to any items in this section or the 17 persons (3.4% of the total) who provided only diagnostic services.

Table 3. Percentage of respondents who indicated that they were not familiar with interventions published since 1985, together with results from two-sample z tests.

Intervention type	Graduated in previous 10 years (n = 105)	Graduated 11–40 years prior (n = 261)	z	p
PROMPT	32	47	-2.726	.006*
Maximal oppositions	40	36	0.711	.477
Multiple oppositions	46	39	1.223	.221
Morphosyntactic	47	39	1.396	.163
Complexity/least knowledge	69	70	-0.188	.851
Nonlinear	72	79	-1.385	.166
Metaphon	82	83	-0.227	.821

Note. Literature citations are shown in Table 1.

*p < .05.

elements.) Table 4 shows that traditional variables were frequently considered by one half to three quarters of the respondents, as were three of the four phonological process variables. The only other option used frequently by more than half of the respondents was functional words plus direct work on phonemes.

Treatment structure. Questions about treatment structure concerned the organizing characteristics for the course of intervention, categorized by the treatment orientations typically associated with each characteristic. Table 5 shows the percentages of respondents who used each characteristic

frequently. (The complete Table 5, together with citations, is provided in the online supplementary materials.) This table shows that ~60%–75% of the respondents frequently used parts of the traditional sequence of intervention, notably, production of the target in isolation, in phrases, in sentences, in structured discourse, and in conversational speech. Fewer than half of the respondents made frequent use of tasks associated with phonological or whole-language interventions. Approximately half made frequent use of behavioral methods to help structure the child's learning.

Table 4. Number and percentage of the 402 SLPs who responded to questions about choosing treatment targets, arranged within categories by the sum of the *Often* and *Always* responses.

Type of treatment targets	Often+Always 70%–100%	
	n	%
Traditional		
Speech sounds with biggest impact on intelligibility	294	73
Stimulability	283	70
Developmental order of acquisition	229	57
Functional		
Functional words plus direct work on phonemes	230	57
Needs/wants of the caregivers	57	14
Functional words only	47	12
Phonological process		
Phonological patterns with biggest impact to intelligibility	308	77
One or more speech sounds to target each process/pattern	216	54
Developmental order of phonological processes	216	54
Two or more speech sounds per session	126	31
Phonological system		
Targets based on consistency of error	134	33
Target morphosyntactic structures	93	23
Target complex structures along with singletons	70	17
Maximal oppositions	39	10
Productive phonological knowledge profile	30	8
Target nonstimulable sounds	27	7
Multiple oppositions	19	5
Phonological awareness		
Provide phonological awareness and direct treatment	181	45
Provide phonological awareness only	39	10
Other		
Targets based on oral motor planning	145	36

Note. Data do not include the 60 persons (12.3% of the total survey respondents) who did not respond to any items in this section or the 17 persons (3.5% of the total) who provided only diagnostic services.

Table 5. Number and percentage of the 385 SLPs who responded to questions about treatment structure, arranged within categories by the sum of the *Often* and *Always* responses, except as noted.

Treatment structure	Often+Always 70%–100%	
	<i>n</i>	%
Used in most/all interventions		
Production of target in meaningful word	333	86
Traditional sequence (sequence maintained in list below)		
Child identifies target in clinician's speech	119	31
Child evaluates clinician's production, incl. errors (<i>n</i> = 370) ^a	135	36
Production of target in isolation	225	58
Production of target in nonsense syllable	132	34
Production of target in meaningful word (see above)		
Production of target in phrases	288	75
Production of target in sentences	283	74
Production of target in structured discourse	235	61
Production of target in conversational speech	257	67
Phonological interventions		
Use minimal pairs for perception + production	158	41
Auditory bombardment	149	39
Focused stimulation	116	30
Spend a set number of sessions or minutes on process/pattern	104	27
Spend a set number of sessions or minutes on speech sound target	79	20
Behavioral methods		
Determine criterion for passing to next step	206	54
Use reinforcement schedules, etc.	185	48
Other		
Language-based, pronunciation as needed	95	25
Use NSOME during the session	44	11

Note. Data do not include the 104 persons (21.3% of the total survey respondents) who did not respond to any items in this section or the 17 persons (3.5% of the total) who provided only diagnostic services.

^aThis option was moved from another section.

Elicitation techniques. Table 6 shows the percentage of respondents who used various elicitation techniques frequently. (The complete Table 6 may be seen in the online supplementary materials, together with relevant citations.) Table 6 shows that certain traditional techniques of elicitation,

such as phonetic placement, iconic gestures, and various types of cues, were used frequently by approximately two thirds of the respondents. Approximately half of the respondents used one particular phonological technique frequently, namely, developing a label for a phoneme.

Table 6. Number and percentage of the 383 SLPs who responded to questions about elicitation techniques, arranged within categories by the sum of the *Often* and *Always* responses.

Elicitation technique	Often+Always 70–100%	
	<i>n</i>	%
Traditional		
Use phonetic placement	265	70
Use iconic gestures	250	65
Use verbal, pictured, or graphic cues	249	65
Modify different speech sound into target sound	125	33
Phonological		
Develop a label for a speech sound	197	51
Use minimal pairs for perception, then production	83	22
Other		
Use NSOME for awareness	74	19
Use NSOME for strength and mobility	57	15
Use oral motor reflexes	47	12
Use ultrasound or electropalatography	5	1

Note. Data do not include the 106 persons (21.7% of the total survey respondents) who did not respond to any items in this section or the 17 persons (3.5% of the total) who provided only diagnostic services.

Few respondents used NSOME or related techniques on a frequent basis.

Models, inputs, and contingencies. Table 7 shows the percentage of respondents who frequently used a variety of models, inputs, and contingencies in intervention. (The complete Table 7, along with relevant citations, is provided in the online supplementary materials.) The data in this table show that half or more of the respondents frequently used picture-naming tasks (with or without a clinician model) and the cloze procedure to elicit productions from the child. Fewer respondents (one quarter to one third) used specifically phonological inputs frequently. In terms of SLP responses that were contingent on the child's production, approximately three quarters of the respondents frequently provided knowledge of performance, knowledge of results, and corrective feedback for incorrect productions. Other types of contingencies were not reported frequently.

Summary

The key findings from this survey of service delivery and therapeutic practice for children ages 3–6 who had SSD were as follows:

- The children typically received 30 or 60 min of treatment per week, and that total was the same whether the child was seen alone, in a group, or in a combination of group and individual sessions. Groups often had two to three members, and they were typically heterogeneous, that is, not all of the children had SSD.
- Traditional intervention was used frequently by more respondents (49%) than other types of interventions (Table 2). This finding was corroborated by the specific techniques typically associated with traditional intervention that majorities of the respondents also used frequently in their work with preschoolers with SSD (Tables 4, 5, and 6).
- Two phonological interventions (minimal pairs and cycles) were each used frequently by approximately one third of the respondents (Table 2). Phonological considerations were frequently taken into account in the area of target selection (Table 4) by a majority of the respondents. Phonological aspects of treatment structure (Table 5), elicitation techniques (Table 6), and models and inputs (Table 7) were used frequently by fewer than half of the respondents.
- Behavioral techniques were frequently used by half or more of the respondents (Tables 5 and 7).
- The responses concerning NSOME (Table 2) were associated with a unique pattern. That is, NSOME were familiar to the respondents, but 30% of the respondents reported that they never used this intervention. (Similar patterns may be seen in the complete Tables 5 and 6 in the online supplementary materials.)
- In terms of adjuncts to direct work on speech, phonological awareness training was used frequently by ~45% of the respondents (Table 4). Approximately one quarter of respondents frequently used a language-based approach with pronunciation work as needed (Table 5). More than half of the respondents frequently worked on both functional words and phonemes (Table 4).
- The survey respondents were familiar to some degree with all of the interventions presented to them (Table 2). Nevertheless, certain interventions that have been published since ~1985 were not familiar to many of the

Table 7. Number and percentage of the 370 SLPs who responded to questions about models, inputs, and contingencies, arranged within categories by the sum of the *Often* and *Always* responses.

Models, inputs, and contingencies	Often+Always 70%–100%	
	<i>n</i>	%
Models and inputs—most interventions		
Picture naming with clinician's models	255	69
Picture naming without clinician's models	204	55
Cloze procedure	184	50
Spoken model but no visual stimulus	80	22
Models and inputs—phonological		
Auditory bombardment	126	34
Additional minimal pairs for later stages	90	24
Contingencies—most interventions		
Provide knowledge of performance	287	78
Provide knowledge of results	271	73
Provide corrective feedback for incorrect productions	259	70
Have child evaluate own productions	114	31
Have stepwise error correction procedure for incorrect productions	48	13
Have children in group evaluate each other's productions	40	11
Ignore incorrect productions	23	6

Note. Data do not include the 119 persons (24.3% of the total survey respondents) who did not respond to any items in this section or the 17 persons (3.5% of the total) who provided only diagnostic services.

respondents. The percentage of respondents reporting that they were not familiar with particular interventions published after 1985 ranged from 37% for maximal oppositions to 83% for metaphon (Table 2). PROMPT, which is not a phonological intervention, was significantly more familiar to recent graduates than to those who graduated earlier; however, recent graduates and earlier graduates were equally unfamiliar with recent phonological advances for treating SSD (Table 3).

Discussion

This survey of how SLPs work with children ages 3–6 who have SSD was designed to investigate similar issues from a number of different vantage points. The respondents reported the specific interventions they used with this population, as well as their use of specific features of the interventions.

Service Delivery

The respondents indicated that they worked with preschoolers with SSD in a wide variety of sites ranging from the children's homes to early childhood centers to preschool classrooms. This fact represents a challenge for researchers who are designing effectiveness and efficiency studies of intervention regimes. It could be difficult, for example, to monitor the intervention process in such diverse settings.

The amount of treatment time that children in this age range were reported as receiving for SSD (usually 30 or 60 min a week) is similar to what Mullen and Schooling (2010) found in their report on the NOMS project (ASHA, 2003), which showed that such children typically received two 21- to 30-min sessions per week, usually in group treatment, and in groups of up to four children. As Baker and McLeod (2011) pointed out with respect to the Mullen and Schooling service delivery data, there is little research on service delivery that supports this amount and distribution of time as either efficacious or optimum.

It is difficult to make the case that service was based on children's individual needs when the majority of children with SSD received 30 or 60 min per week of service regardless of group versus individual sessions, the nature and size of groups, and treatment in one area or two (e.g., phonology and phonological awareness). Brandel and Loeb (2011) reached a similar conclusion in their survey about the determinants of treatment intensity in general.

There is little research on the effectiveness of group versus individual treatment for children with SSD, although individual and group treatment have been shown to be equivalent for children with language disorder (Boyle, McCartney, Forbes, & O'Hare, 2007; Cirrin et al., 2010; Dickson et al., 2009). To the authors' knowledge, there is one study that focused on children with SSD (Sommers, 1962), and in that study, children performed equally well in individual and group sessions. However, the participants were school-age children rather than preschoolers. In any case, the

published studies of group versus individual treatment appear to include only groups that were homogeneous with respect to the nature of the communication disorder. Children may have fewer opportunities for incidental learning of phonology in heterogeneous groups.

Interventions Used With Preschoolers Who Have SSD

Use of traditional and phonological interventions. The survey data show that more SLPs frequently used traditional intervention (Table 2), and specific aspects of traditional intervention (Tables 4–6), than other options. This result may be compared to results of surveys done in Great Britain and in Germany. According to Joffe and Pring (2008), speech clinicians in Great Britain apparently did not use traditional intervention, opting instead for “auditory discrimination training,” use of minimal pair contrasts, and phonological awareness training. However, according to Teutsch and Fox (2003), SLPs in Germany preferred to use traditional intervention.

The respondents to the present survey used other interventions besides traditional, in particular, minimal pairs and cycles (Table 2); they also used a number of features associated with phonological interventions (Tables 4–7). However, the respondents generally were not familiar with, or did not use, phonological interventions that incorporate features of the traditional sequence, such as that of Gierut (2001; use of nonsense syllables in the complexity/least knowledge program) or of Williams (2003; use of criterion-based sequences in the multiple oppositions program). Consequently, it is unclear why traditional intervention, especially the more advanced steps in the sequence, was used for preschoolers with phonological disorder, despite the extensive literature on phonological approaches published in recent decades. This literature suggests that the entire phonological system rather than particular phonemes should be the SLP's concern, and that phonologically based intervention may be more appropriate for children with SSD.

The parts of the traditional sequence that majorities of respondents used frequently, namely, production of the target phoneme in phrases, structured discourse, and conversational speech (Table 5), are part of a regime that Elbert and Gierut (1986) called *training deep* as opposed to *training broad*. In *training deep*, “the child is given a lot of information about a very narrow aspect of the target phonological system” (Elbert & Gierut, 1986, p. 102), including the use of massed practice. In contrast, the goal of *training broad* is “to expose the child to the full range of target sound production, but not necessarily to perfect production in specific treatment items” (Elbert & Gierut, 1986, p. 103). The children then reorganize their phonology and generalize these new sounds or structures to conversation and possibly to other sounds without much additional assistance from the SLP. An example of this approach is the cycles program (Hodson & Paden, 1983, 1991), in which the entire focus is on citation-form words, without steps for phrases, discourse, or conversation. It is therefore possible that the 61%–75% of

survey respondents who used the advanced steps in training deep were providing unnecessary intervention.

Another consideration is that certain early steps in training deep are known to be effective with children whose disorder is phonological. In particular, Rvachew and Nowak (2001) showed that the selection of treatment targets based on the developmental order of acquisition of phonemes is as efficacious as selection based on complexity/least knowledge (Elbert & Gierut, 1986; Gierut, 2001, 2007). In fact, the concept of developmental order may be incorporated into phonological interventions when phonological processes are selected as treatment targets and when phoneme exemplars are chosen for target processes (e.g., Hodson & Paden 1983, 1991).

Based on the data from this survey, it is possible that SLPs who treated preschoolers were using hybrid interventions, influenced primarily by traditional intervention, but also by minimal pairs and cycles approaches. For example, an SLP may use target selection procedures that are phonological in nature but then use some of the traditional intervention sequences. Alternatively, an SLP may use traditional target selection procedures but then use phonologically based methods. The phonological efforts may, in fact, influence the way the SLP uses traditional intervention. For example, the survey respondents indicated that they used a nonsense-syllable stage less often than other, more communicative stages of traditional treatment, which aligns with the typical phonological emphasis on meaningful words. On the other hand, the respondents often used steps at higher levels in the traditional sequence, such as sentences, despite the fact that phonological interventions typically do not have steps at those levels. Hybrid approaches such as these have not been studied with respect to efficacy (Baker & McLeod, 2011).

Use of NSOME. The survey results showed that NSOME were familiar to all but 3% of the respondents, and ~67% used NSOME occasionally, sometimes, often, or always. Although Lof and Watson (2008) found that 85% of the SLPs they surveyed used NSOME, differences in method between the two studies may preclude direct comparisons. However, it is worth noting that in recent years, several authors (e.g., Forrest, 2002; Hodge, 2002; Lof & Watson, 2008; McCauley, Strand, Lof, Schooling, & Frymark, 2009) have argued that NSOME are generally not appropriate for use with individuals with SSD.

Use of other interventions along with direct speech intervention. The survey respondents often incorporated interventions for other aspects of communication such as phonological awareness, functional communication, and whole language. They may have done so because their clients had more than one area of deficit. Brandel and Loeb (2011) found that clinicians were more likely to add a child to the caseload if the child had difficulties in more than one area. However, working on two or more areas in a session may result in less direct work on phonology in a given session.

There is contradictory evidence about whether additional time is needed to cover both areas when phonological awareness is used as an adjunct. Denne, Langdown, Pring,

and Roy (2005) suggested that treatment time may need to be increased if both areas are targeted, whereas Gillon (2005) found that when intervention combined phonological awareness training with direct work on speech sounds, both skills improved.

Another treatment adjunct is the teaching of functional words in addition to direct work on phonology. Teaching intelligible words that are functional for the child is as important as direct work on phonology for some children; however, there appears to be little information about whether extra time is needed to do this and still maintain progress on the phonological system. Finally, language-based methods for SSD have a small research base (Kamhi, 2006), and it is likely that direct treatment of phonology may be necessary for children with substantial delays (Kamhi, 2006).

Lack of familiarity with recent phonological advances. The respondents' lack of familiarity with recent phonological interventions could have been due to the fact that the named interventions were presented without citations or descriptions. Nevertheless, many interventions were familiar to the large majority of respondents by name, including phonological awareness, which is a relatively recent intervention. Consequently, the large numbers of respondents who were not familiar with recent phonological interventions raise the professional issue of how and where SLPs acquire this knowledge.

Both recent graduates with a master's degree and less recent graduates reported that they lacked familiarity with most of the recent interventions, with the exception of PROMPT. Familiarity with PROMPT, which is used for childhood apraxia of speech, may stem from a recent focus of the profession on childhood apraxia of speech (e.g., Shriberg & Campbell, 2003). The reasons for the lack of familiarity with other recent interventions are not known. The present study did not include questions about the content of course work and practicum for SSD, nor were there questions about how practicing SLPs learn about recent phonological interventions. Finally, even if practicing SLPs were interested in implementing a particular program, they would not necessarily have access to a complete procedure manual. Most of the developers of particular interventions have not made complete procedure manuals available, either publicly or commercially, to clinicians who are interested in using the interventions. Notable exceptions are Hodson and Paden's (1983, 1991) books on cycles treatment; Howell and Dean's (1991, 1994) books on metaphon intervention; Elbert and Gierut's handbook (1986) relating to least knowledge; and a book on morphosyntactic intervention by Haskill, Tyler, and Tolbert (2001). Partial manuals (dealing largely with goal selection) are available for nonlinear interventions (Bernhardt & Stemberger, 2000) and for multiple oppositions (Williams, 2003). Manuals are important because they help to document the procedures and conditions under which the treatment in question was efficacious, beyond what might be reported in published articles about the interventions and their efficacy.

The state of research in clinical phonology is not advanced to the point where optimal interventions for particular

clinical profiles are known (but see Dodd & Bradford, 2000, concerning children with inconsistent production). For the most part, phonological interventions have not been compared with each other, with the exception of studies by Dodd et al. (2008), Rvachew and Bernhardt (2010), and Rvachew and Nowak (2001). However, phonological interventions have been compared with traditional intervention (Klein, 1996; Mann, Smit, Weltsch, & Hilgers, 2010; Pamplona, Ysunza, & Espinosa, 1999; Teutsch & Fox, 2003). In these studies, phonological interventions have generally been shown to be more efficacious than traditional intervention—a finding predicted by phonological theory.

Clinical Implications

The common practices reported here can best be described as eclectic, that is, drawing procedures and orientations from diverse sources. SLPs working with children ages 3–6 who have SSD can compare their practices to what is reported here. They can also consider how their practice might change as newer phonological interventions come into wider use, and they may also seek out information about those phonological interventions that are not familiar to them. With respect to published efficacy research, SLPs have an opportunity to consider how closely the experimental conditions resemble their own, and what impact, if any, those conditions might have on outcomes.

Limitations and Future Research

One limitation of the present study may be the fact that the named interventions were not described to the respondents and were not accompanied by citations, for reasons delineated in the Method section. Nevertheless, the concordance between the use of named interventions and the detailed procedures drawn from those interventions supported the finding of lack of familiarity with many of the interventions. This issue could be explored in different ways. For example, focus groups of SLPs who serve preschoolers with SSD could be interviewed about the decisions they make in treatment and the rationales and background that they bring to making those decisions. Alternatively, surveys that focus in depth on these issues would accomplish this goal. This information would expand the knowledge base about clinical practice with this population.

Another limitation is that that actual length of time the respondents spent on the survey is not known. The time that the survey was open in browsers ($M = 6$ hr, 9 min), coupled with the fact that approximately one fifth of the respondents discontinued the survey, suggest that it was longer than would be ideal. The arrangement of questions into distinct sections may have partially offset the effects of length, but future surveys should be shorter in duration. Respondents could also be asked to estimate the amount of time they actively work on a survey.

Several avenues of research are suggested by the results of this survey. The first is that research is needed into the

delivery of phonological interventions to preschoolers in a variety of settings in order to determine the optimal amount of treatment time the child should receive, the efficacy of group treatment (including heterogeneous vs. homogeneous groupings), and the relative efficacy of the common practice of treating two different areas of communication in the same amount of scheduled time. A second area of research is the issue of how practicing SLPs learn about phonological interventions (e.g., in course work, practicum, or inservice). A related research area would be topics in which SLPs express interest with respect to recent phonological interventions, as well as their preferred mode of delivery (e.g., inservices, course work, or access to manuals). Finally, research into preservice classroom and clinical teaching in the area of clinical phonology may be needed, based on the fact that recent master's graduates were as unfamiliar with recent phonological interventions as those who graduated earlier.

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