

A Qualitative Examination of Current Guidelines for Evidence-Based Practice in Child Language Intervention

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In recent years, there has been growing emphasis on the use of evidence-based practice (EBP) in speech-language pathology (e.g., Dollaghan, 2004; Goldstein, 2002; Johnson, 2006; Justice & Fey 2004; Meline & Paradiso, 2003). EBP stresses that clinical decision making should entail consideration of evidence from multiple sources: systematic research, the clinician's own clinical experience, and the values and preferences of the person(s) being served. In what is probably the most commonly used definition, Sackett, Rosenberg, Gray, Haynes, and Richardson (1996) emphasized the first two of these. They stated that EBP is "the conscientious, explicit and judicious

use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research" (p. 71). The use of EBP enables clinicians to determine which of the available clinical methods are likely to be most effective in a specific situation. In addition, EBP can guide clinicians and the profession of speech-language pathology toward eliminating methods having no or minimal clinical effect.

The advantages of EBP have been well delineated by many authors representing many professions. Although most of the support for EBP has come from health care professions such as nursing, dentistry, dietetics, and physical and occupational therapies, there has also been support from a variety of professions outside of the medical world, such as social work and education. What are some of the advantages of EBP? The primary benefit is the delivery of optimally effective care to each individual. Apel and Scudder (2005) suggested that additional advantages of EBP include better accountability to clients and their families, to students in training, and to third-party payers. In addition, they suggested that EBP guides clinicians toward practice that is most in concert with the code of ethics and encourages a productive pattern of lifelong learning and remaining current with the evolving scientific literature.

Despite numerous articles, presentations, and workshops on the procedures and benefits of EBP, it has not become a regular part of clinical practice. A survey of 240 speech-language pathologists (SLPs) (Zipoli & Kennedy, 2005) revealed that decisions are made significantly less on evidence from the research literature than they are on individual clinical experience and the opinions of colleagues. Half of the respondents cited professional time as a barrier to using EBP; 22% or less identified the quantity and quality of available research, resources for conducting searches, and knowledge and skills of EBP as barriers.

ABSTRACT: Purpose: The present investigation examines the time, effort, and resources that evidence-based practice (EBP) requires, and looks at what types of results are obtained.

Method: Principles of EBP as outlined by the American Speech-Language-Hearing Association were applied to 3 treatment case studies.

Results: The cases took between 3 and 7 hr to complete and yielded different amounts and types of results. Individual article searches yielded better results than did searches of systematic reviews. Most evidence found was from small-group and individual case studies.

Conclusion: EBP is a necessary part of effective and ethical treatment. The resources needed, time involved, and availability of relevant information make current guidelines for EBP challenging for most full-time practitioners. Specific recommendations to address these concerns are offered.

KEY WORDS: clinical practice, intervention research, autism, vocabulary intervention, oral motor therapy

The potential barriers to using EBP that were reported by SLPs in Zipoli and Kennedy's survey (2005) speak to the feasibility of using EBP and the quality of the results obtained. Unfortunately, these topics have received little attention in the discussion of EBP. Gillam and Gillam (2006), Johnson (2006), and Meline and Paradiso (2003), for example, provided detailed procedures for conducting EBP searches and implementing the results in clinical practice. However, none of these articles discussed the time, energy, and effort entailed, other than to mention that this process takes time, and that clinicians may increase efficiency by working in groups. Moreover, there was little discussion of the quality of the results that may realistically be obtained when investigating treatment protocols for speech and language disorders. Fey (2006) discussed these issues, but they have not been previously examined directly. It is important to do so because recommendations that are too difficult and/or do not yield productive outcomes will not serve the purposes of EBP and may end up discouraging its use. To provide this missing perspective, we investigated the feasibility of SLPs engaging in EBP and the amount and type of information gained.

Current Guidelines for EBP

As characterized by the American Speech-Language-Hearing Association (ASHA, 2006), the process of EBP entails four steps: framing the clinical question, finding the evidence, assessing the evidence, and making the clinical decision. These steps are briefly described here and explained in detail on the ASHA Web site (www.asha.org) (see also Dollaghan, 2004; Gillam & Gillam, 2006; Johnson, 2006; Justice & Fey 2004; Meline & Paradiso, 2003). The first step is the formulation of a clinical question related to a specific case at hand. This process is designed to address a specific clinical situation rather than general clinical controversies or issues. The ideal question will be general enough that it guides the user to all of the relevant evidence yet specific enough that it does not direct the user to irrelevant or marginally useful information that would only serve to slow the process. The PICO format has been suggested as a constructive approach to the task of generating a well-constructed clinical question. PICO is an acronym for population (e.g., preschoolers with phonological disorders), intervention (e.g., receiving metaphon therapy), comparison (e.g., compared to those receiving articulation therapy), and outcome (e.g., improved speech intelligibility). The question to be addressed with EBP should ideally include each of these components (e.g., Do preschoolers with phonological disorders who receive Metaphon therapy demonstrate greater improvements in speech intelligibility than those who receive articulation therapy?).

Once the clinical question is formulated, the search for evidence that addresses the question begins. Current ASHA guidelines call for searches to begin by looking for systematic reviews of available evidence. As EBP has grown, a number of organizations have been developed both to produce novel systematic reviews and to expedite the search for existing systematic reviews. Chief among these is the Cochrane Collaboration, whose Cochrane Library is available at www.cochrane.org. This organization produces systematic reviews of research on health care interventions in many areas of practice and makes them available electronically. Other organizations include the Campbell Collaboration (www.campbellcollaboration.org), the Agency for Healthcare Research and Quality (www.ahrq.gov), and the Database of Abstracts of Reviews of Effects (DARE; <http://www.crd.york.ac.uk/crdweb/>).

Starting one's search for evidence with a look for systematic reviews is potentially an efficient approach. If a relevant review is located, an answer to a particular clinical question may be found quite readily. Should no systematic reviews be available, a search for relevant individual studies must be conducted. Electronic bibliographic databases such as the Educational Resources Information Center (ERIC), MEDLINE, and PsycINFO are preferred tools for searching topics within speech and language disorders. Following careful selection of databases and search terms, the clinician conducts a search for meta-analyses and individual studies published in peer-reviewed journals.

The electronic databases are not restricted to peer-reviewed articles. They also include non-peer-reviewed information sources, such as conference proceedings, books, book chapters, opinion papers, technical reports, and theses/dissertations. Another potentially productive means of locating this literature is performing searches of the Internet via Google or other Internet search engines. Although this information lacks the quality safeguards imposed by peer review, it may still serve an important purpose, particularly when peer-reviewed sources are scarce. Nonetheless, it is well to be aware that expert opinion is not the same as experimental evidence (Robey & Schultz, 1998).

Once relevant evidence has been located, the next step in the process is to critically evaluate the quality of each study that yielded information. Quality is assessed with respect to issues such as sample size, validity and reliability of outcome measures, use of randomization in subject selection, use of blinding of study participants and personnel, and size of treatment effect. In addition, quality is assessed in terms of levels of evidence. "Level of evidence" refers to the notion that not all pieces of evidence are equally trustworthy—some sources provide higher quality, more reliable evidence; others provide lower quality evidence that may not have valid implications. There is no universal definition of "high-quality evidence."

There are many different published hierarchies of evidence with varying quality ranking systems (e.g., Harris et al., 2001; Phillips et al., 2001; Robey, 2004). Across the different hierarchies of evidence, more rigorous scientific methods generate higher level evidence. Well-designed randomized controlled trials (RCTs) are considered to generate higher level evidence than case studies and correlational studies. Information from gray literature such as committee reports and expert opinion is considered the lowest form of evidence. As shown in Table 1, different hierarchies vary in terms of the specifics regarding what constitutes evidence at each level. The Oxford Centre for Evidence-Based Medicine's evidence hierarchy (Phillips et al., 2001), for example, contains five primary levels, whereas those from the U.S. Preventive Services Task Force (Harris et al., 2001) and Robey contain three and four levels (respectively). These differences make it difficult to communicate an individual study's level of evidence unless a particular evidence hierarchy has been identified. When the hierarchy has not been specified, the term "high level" has commonly been used to refer to investigations that fall at the top of most hierarchies, and "low level" has been used for those at the bottom.

Following review and assessment of the quality and level of the evidence, the clinician can proceed to reflect on the other two sets of information that are important in EBP: their own clinical experience and judgment and the client's values and preferences. Little has been written about these dimensions of EBP within the profession of speech-language pathology. A procedure for achieving a proper balance among the three dimensions has not yet been

Table 1. Examples of three published hierarchies of evidence.

Level	Oxford Centre for Evidence-Based Medicine	U.S. Preventive Services Task Force	Robey
I	A. Systematic review (SR) of randomized control trials (RCTs) B. Individual RCT	RCTs	RCTs Meta-analysis of multiple controlled studies
II	A. SR of cohort studies B. Individual cohort study	1. Nonrandomized control trial 2. Cohort or case-control study 3. Multiple time series	Nonrandomized control trials
III	A. SR of case-control studies B. Case-control study	Expert opinion, descriptive studies, case reports	Observational studies with controls
IV	Case-series		Observational studies without controls
V	Expert opinion		

fully specified, although the integration of family and client values into the EBP process has been discussed (e.g., Gillam & Gillam, 2006; Hargrove, Busch, Lund, & Griffer, 2005). Gillam and Gillam, for example, suggested that in making clinical decisions for school-aged children, it is necessary to consider the student's and parents' cultural values, the kinds of activities the student finds motivating and pleasurable, the family's financial resources, the level of parent and student engagement expected, and the student's or parents' belief system about a particular treatment method. In terms of the clinician, Gillam and Gillam suggested that clinician-related factors should not be weighted as heavily as either the research-based evidence or the family's values. They did, however, state that when using EBP to consider treatment alternatives, it is necessary to consider the clinician's level of competence with the particular method, policies of the clinician's place of employment, data collected from the clinician's previous experience with the method, and the clinician's theoretical orientation. When clinicians are faced with ambiguous situations, Gillam and Gillam suggest weighting each of the three sets of information in terms of relative importance and making a final determination based on the profile.

After considering all three aspects of the process, the clinician will ideally be in a position to complete the final step in EBP, which is answering the clinical question in order to make the ultimate clinical decision. In situations in which there is abundant high-quality evidence with consistent results, the decision will likely be reasonably clear. Unfortunately, it is highly probable that the decision will not be that clear cut. For example, the available information may come from low, rather than the preferred high, levels of evidence (such as case studies). Alternatively, different pieces of evidence may provide different answers. Finally, it is conceivable that one high-quality piece of evidence suggests one answer to the question, whereas multiple lower quality pieces point to an opposing answer. There are no guidelines that tell practitioners how much evidence is necessary and/or sufficient to answer a question, how rigorous a study must be to be considered high level, or how to handle the ambiguity arising from inconsistent research findings.

Despite these recommendations for how to proceed, there are many questions that a clinician wishing to implement EBP will confront. Are resources available to search for and collect the available evidence? How much evidence is necessary, and what types should be considered? How can a decision be made when pieces of evidence conflict with each other? Perhaps most urgently, how

will this fit within a clinician's already busy schedule? The present study presents a detailed look at the efforts, energy, and time that it takes to develop and answer well-formed EBP questions. Three separate case studies involving the formulation and answering of EBP questions within child language disorders are presented. These case studies are presented in order to (a) document the course of actions involved, (b) track the time and resources required, (c) identify successful strategies and problem areas, (d) provide guidance to practitioners by offering examples of conducting EBP, and (e) illustrate what a practitioner might hope to locate in a search (by presenting a summary of the evidence found by each investigation). Recommendations for improving the clinical use of EBP are discussed following the case studies.

METHOD

This investigation into the validity and feasibility of current models of EBP began with the development of topic areas. In most clinical cases, topic areas and specific questions arise naturally from the caseload. A clinician, for example, may conduct an EBP search for reasons such as being assigned to a new clinical population or when seeking better ways to serve a specific client. Topic areas for this investigation were based on our experiences as clinicians and clinical supervisors. Three topic areas were selected: the use of augmentative/alternative devices for children with autism, intervention for children with expressive vocabulary deficits, and the use of oral motor interventions for children with phonological disorders. Each of the authors was assigned to one topic that was not within his or her primary clinical, teaching, or research expertise. This restriction was made so that each search would begin with a relative lack of specific knowledge about the extant literature on the topic. From this point on, each search was conducted individually, with bimonthly meetings to discuss progress.

As outlined above, there are a number of different proposals for conducting EBP searches. We followed ASHA's recommendations because they are those of our national association, they overlap well with the other models, and they are easily accessible to clinicians. The specific version of recommendations used was that posted within the Members Only section of the ASHA Web site during the 2005 calendar year. The investigators were free to develop a specific PICO question as long as it fit within the assigned topic area. Each then focused on searching for and reading the

available evidence, including systematic reviews, individual studies, and other sources.

During and after the collection of evidence, each piece of information was evaluated based on its relevance to the clinical question. This process typically began with a review of the scholarly abstract (if one was available). Articles and papers whose abstracts suggested that they might be relevant to the PICO question were retrieved and scanned. PowerPoint presentations and posters that were retrieved were reviewed in their entirety. Factors that were considered in determining the relevance of the individual pieces of evidence included the scientific quality of the research presented (see <http://www.sign.ac.uk/guidelines/fulltext/50/annexc.html> for examples of quality rating criteria for a variety of research methods), how closely the evidence matched the PICO question (e.g., the target population or the intervention practice), the level of evidence that was presented (see Table 1), the nature of the evidence (e.g., a summative review or individual investigation), and/or its source (e.g., peer reviewed or non-peer reviewed). Although each factor was weighed differently within the case studies, the two that received primary attention were the scientific quality of the study and how closely the evidence matched the PICO question. After the evidence was collected and analyzed, it was used to formulate a response to the clinical question.

A guiding principle throughout this investigation was to try to match our actions with the experiences that clinically based SLPs would face in conducting EBP searches. There were, however, a number of unalterable factors that likely made these searches different from those of most clinicians. As university faculty members, each of us must work with the primary literature on a daily basis. We have each conducted literature searches on at least a monthly basis, for multiple years. Few clinicians would spend this amount of time on literature searches, owing to limitations of time, training, and access to resources. Another distinguishing feature of our experience relative to that of most clinicians is the time we have to devote to research. Because research is inherent to the role of a university professor, seeking out, reading, and analyzing literature is built into our work days—a luxury afforded to few clinicians. A third difference is that, unlike most clinicians, each of us has a computer in a private office, high-speed Internet connection, and access to an extensive number of books and journals (both electronically and in print) through the university's library system. As a result, the amount of time we report for our searches is likely to be less than that of most full-time clinical SLPs.

Although not all differences between the university research and clinical worlds could be addressed, we did attempt to deal directly with the issue of availability of resources. To determine whether access to a university's library system had a significant impact on the searches, we chose to examine one of the three topic areas (intervention for children with expressive vocabulary deficits) in two ways, first using university resources and facilities, and then again using only those resources that were available through the local public library.

The individual EBP case studies are presented below. In order to evaluate the validity and feasibility of current models of EBP, qualitative descriptions of the processes, amounts of time, and results of each search are included. Each of the searches was conducted over multiple days during the late summer and early fall of 2005. All evidence presented, therefore, reflects the availability and state of research at that time. ASHA's procedures for conducting EBP searches were followed in each case, although they

were carried out in slightly different manners. This is because systematic details for conducting the most effective and efficient searches have not been identified (e.g., which type of evidence and/or which databases should be searched first). Each investigator, therefore, took a slightly different approach, which was a natural outgrowth of each of us independently interpreting and applying the guidelines.

RESULTS

The Use of Augmentative/Alternative Devices for Children With Autism (Brackenbury)

Framing the clinical question. The specific clinical question that was created for this topic was, "Does the implementation of light-tech, picture-based augmentative devices affect the amounts and types of communicative vocalizations in children with autism?" This question was developed from prior experiences with using sign language and/or picture-based communication systems with children who have language learning impairments other than autism. In these cases, many parents have asked what types of effects they can expect these alternative systems to have on their child's speech. The development of this question took approximately 10 min.

Finding the evidence. The process of answering the question began with two sets of electronic database searches. The first group of searches focused on systematic reviews, including the Cochrane Collaborative, the Campbell Collaboration, and the What Works Clearinghouse (from the U.S. Department of Education, www.whatworks.ed.gov). Beginning with the Cochrane Collaborative, the word *autism* was entered as the key word. Because autism has been a research topic of great interest over the past decade or more, a large number of hits were expected. Instead, a search of abstracts only resulted in 8 hits, and a search of the full site returned 23 hits. Many of these hits appeared to be irrelevant to autism. For example, one hit focused on medication effects on schizophrenia. Although this document was not read in its entirety, it likely came up as a hit because the word autism was included somewhere in the text. Of these 31 hits, only one appeared to be remotely related to the topic. This was a review related to the effects of parent-based intervention for children with autism. Although this looked like an interesting paper, it did not address the question. Despite this poor showing for this question, the Cochrane Collaborative was the only one of the three systematic reviews that returned any hits for the topic of autism. In total, the time spent searching these databases was 40 min.

The second electronic database search focused on individual studies. This search began with the database PsycINFO. This database was selected first because it includes a large number of child language publications (including all of the ASHA journals). PsycINFO, as well as other electronic databases, allows the user to search by entering many different types of information, including key words, author's name, journal title, and publication data. It also offers a "thesaurus," which is a standardized index of general terms under which articles may be found. This search began by entering the terms *autism*, *language*, and *intervention* into the thesaurus. Surprisingly, no articles were returned. The term *autism* was then entered by itself into the thesaurus, resulting in more than 9,500 hits. This field was limited to 151 by a subsearch for the

key words *language intervention*. This field was narrowed down to the titles of 50 most recent articles. Newer articles were reviewed first under the assumption that they would include references to relevant older articles. The entire list of articles was maintained in case this initial inspection did not prove fruitful. Two articles appeared to be particularly relevant to the question: "Communication Intervention for Children With Autism: A Review of Treatment Efficacy" by Goldstein (2002) and "Toward Functional Augmentative and Alternative Communication for Students With Autism: Manual Signs, Graphic Symbols, and Voice Output Communication Aids" by Mirenda (2003). Although the database search could have ended, at least temporarily, with these two articles, another search was initiated. The terms *autism* and *augmentative communication* were entered into the thesaurus of PsycINFO. More than 125 articles were identified. Of these, five articles (all published since 2000) were flagged as potentially relevant. The articles were Bondy and Frost (2001); Charlop-Christy, Carpenter, Le, LeBlanc, and Kellet (2002); Ganz and Simpson (2004); Matthews (2003); and Ogletree and Ham (2001). It is of interest to note that neither of the two articles found from the previous search was included in this list, even though both searches were conducted on the same database.

The search on PsycINFO took a total of 40 min and resulted in 7 flagged articles. Acquiring these articles was a relatively easy process because all were available electronically. This availability was due primarily to the university's agreements with a number of online information sources (including electronic versions of journals and clearinghouses for the like). It is unclear how many of these articles most clinicians would have access to electronically.

Assessing the evidence. To help prioritize which articles to read first, the abstracts were scanned to see which were reviews and which were individual research studies. Goldstein (2002) and Mirenda (2003) were chosen first because they appeared to be the most potentially relevant review articles. Goldstein presented evidence in support of the use of total communication (signs + spoken language) but did not address communication systems that involve pictures, symbols, or other output devices. Mirenda, on the other hand, wrote about the effectiveness of these devices and directly addressed the topic of changes in vocalization patterns after using these devices. She cited five previous studies that presented evidence of increased use of spoken language from children with autism after the introduction of picture/symbol boards, the Picture Exchange Communication System (PECS; Bondy & Frost, 2001), and voice output communications aids.

Although the Mirenda (2003) article appeared to answer the clinical question, a direct review of the evidence cited was necessary. Two of the five articles found from the PsycINFO search, Charlop-Christy et al. (2002) and Ganz and Simpson (2004), were then read. These were selected because the former was cited by Mirenda and the latter was published after Mirenda's article. Both investigations tracked the vocal output of children between 3 and 7 years of age (three per study) as they learned to use PECS. Charlop-Christy et al.'s participants were all diagnosed with autism; those in the Ganz and Simpson study were diagnosed with autism, developmental delay, and developmental delay plus specific language impairment. Dramatic gains in speech acts were observed in both studies after the children had learned to use PECS. Ganz and Simpson reported increases in the use of spoken words with little to no increase in non-speech vocalizations. Likewise, Charlop-Christy et al. reported that speech acts increased by at least 75%, and this increase was evident 1 year later.

Making the clinical decision. The time to review the four articles presented above was 90 min. The articles suggest that the answer to this clinical question is yes, the implementation of light-tech, picture-based augmentative devices can increase the amounts and types of communicative vocalizations in children with autism. The support for this answer, however, came exclusively from what is generally considered low levels of evidence (i.e., small case studies and observational reports). Despite this, the decision seems to be valid because all of the evidence reached the same conclusion, and there were no theoretical reasons to the contrary (although the opinions of clients and their families would need to be considered before a final decision could be made). The total time to develop this question, conduct the search, and answer the question was 3 hr.

Classroom Versus Pull-Out Methods of Vocabulary Intervention (Burroughs)

Developing the clinical question. The search concerning the treatment of expressive vocabulary delay began with the formulation of the following question: "Do preschool children with expressive vocabulary delays make larger gains in expressive vocabulary with individual treatment or with classroom-based treatment?"

Finding the evidence. The first step in the process of finding evidence was to search for systematic reviews. The Cochrane Collaboration Web site was searched first. Four searches were completed using the terms *language disorder*, *language delay*, *vocabulary*, and *language therapy*. This yielded 45 references, none of which were relevant to the question. The next search for systematic reviews was conducted at the DARE Web site. The same four searches were completed, yielding 39 resources, none of which proved to be relevant. Searching these two sites took 15 min. Note that the relative speed for this search was made possible because of considerable prior experience using the site. The time consumed in searching such Web sites would be considerably longer for those SLPs who need to familiarize themselves with the Web sites and the procedures for their use.

Because there were no systematic reviews available to address this clinical question, a search for individual studies was started. The first research database to be searched was PsycINFO. Eleven key word searches were performed, using combinations of the following terms: *expressive vocabulary delay*, *vocabulary delay*, *language delay*, *language disorder*, *vocabulary therapy*, *language therapy*, *classroom*, *classroom intervention*, *treatment*, *methods*, and *child language*. It took 55 min to complete these searches. Review of the titles and/or abstracts revealed that none of the 155 sources located in these searches provided evidence for the question.

The next database to be searched was Linguistics and Language Behavior Abstracts (LLBA). Ten minutes into this search, using the key words *language therapy* and *classroom*, a citation appeared for an article titled "A Comparison of Service Delivery Models: Effects on Curricular Vocabulary Skills in the School Setting" by Throneburg, Calvert, Sturm, Paramboukas, and Paul (2000). This article did address the question of a classroom model of treatment versus an individual pull-out model, but it focused on an older, school-age population. Therefore, it did not provide information specifically relevant to the question. However, review of the references in this article led to a promising reference that had not

yet appeared in the searches. This was an article by Wilcox, Kouri, and Caswell (1991) titled "Early Language Intervention: A Comparison of Classroom and Individual Treatment," which was published in the *American Journal of Speech-Language Pathology*. Although no citation for this article was found on LLBA, the article in its entirety was readily available at the ASHA Web site (www.asha.org). Review of the abstract indicated that it did contain information directly relevant to the question being posed. The search on LLBA continued for an additional 75 min, ultimately generating 549 potential resources. Aside from the Wilcox et al. resource, none appeared to address the question being asked.

The next database to be searched was ERIC. The same searches were conducted and 263 sources were found, taking 50 min. Again, none of these provided information relevant to the question at hand.

Having found the one potential source of evidence, the search turned to the Science Citation Index to determine whether the Wilcox et al. (1991) article had been cited in any subsequent research. Twenty-two articles had cited this article. However, review of the titles and/or abstracts revealed that none of them provided any relevant evidence for the question being posed. At this point, the search was considered complete.

Assessing the evidence. The next step in the process was to review the evidence to determine whether it was (a) sufficiently relevant to the question to allow an applicable answer and (b) of sufficient quality to generate a meaningful answer. In fact, the evidence within Wilcox et al. (1991) was directly relevant to the population and intervention methods referred to in the question. The participants were preschool children and the treatment methods compared in the study were individual and classroom-based interventions. The number of participants in each group was small ($N = 10$). This level of evidence would rank no higher than a Level 2 in the hierarchies presented in Table 1, yet it was still of sufficient quality that the results could be considered informative regarding the question.

Making the clinical decision. The final step in the process was to answer the clinical question. Results of the Wilcox et al. study (1991) indicated that both treatment conditions (individual and classroom-based interventions) were equally effective in generating the use of target words in a treatment setting with preschool children. However, generalization to the home setting was superior as a group for those children who received classroom-based therapy.

In summary, this process, from the formation of the question to the review of the evidence, took approximately 4 hr. The thorough search generated only one piece of relevant evidence. In the end, in this specific case, the use of multiple databases was not particularly fruitful; use of LLBA alone would have produced the same final result.

Nonacademic search. This search was then performed again with only those tools that are likely to be available to practicing clinicians, choosing to use the county library as a resource for the search. No findings of the first search were used to guide this search. The first step again would have been to turn to a search for systematic reviews. Because the Cochrane and DARE databases are publicly available at no cost, these searches could have been performed at the county library just as they were from an office at a university. It was then reasoned that a clinician's first choice in searching for evidence might reasonably be the ASHA Web site. This is a more user-friendly site for non-academics and is likely to be a site that is frequented by ASHA members. The search began with the

term *vocabulary treatment*, which returned an overwhelming 3,700 sources. The search was narrowed with the addition of the term *classroom*, returning 1,170 sources. The second reference in this list was to the Throneburg et al. (2000) article, which, through its references, would lead to the Wilcox et al. (1991) article. Note that both of these articles would be available electronically to members of ASHA. The time for the ASHA Web site search from start to the retrieval of the Wilcox et al. article was 15 min.

Next, the library research database offerings were investigated. They offered ERIC, MEDLINE, and the Psychology and Behavioral Sciences Collection. The latter indexes only a portion of the resources available in PsycINFO. PsycINFO, LLBA, and the Science Citation Index were not available. Not surprisingly, no additional resources were found in searching the available databases.

In summary, results of the second search for evidence were encouraging in that by selecting the ASHA Web site as the starting place for the search for individual studies, the one available piece of evidence was located quite rapidly. Nonetheless, the remainder of the search would have been just as time consuming as the academic-style search. Furthermore, public libraries do not provide the cost-free access to journal articles that is available to users of university libraries. Therefore, a search that generated multiple sources of evidence in multiple articles could become quite costly.

Non-Speech Oral Motor-Based Treatments for Children With Articulation/Phonological Impairments (Hewitt)

Framing the clinical question. The clinical question developed was: "Do non-speech oral motor training exercises help children with severe phonological disorders acquire phonemes and increase their intelligibility?" A number of factors were considered in framing this question, including age range, severity, and what outcome measure would be most meaningful.

Finding the evidence. The search process undertaken to answer this question involved two steps. First, search terms were identified. These included the following: *oral motor*, *articulation disorders*, *phonological disorders*, *treatment*, and *intervention*. In addition, in accessing research databases, the following limits were applied: children; English language only. The following resources were consulted, in order: the ASHA Web site, using its search engine; the Cochrane database; the DARE database; PsycINFO; MEDLINE; and Google.

The first database searched in this process was the ASHA Web site using the search phrase *oral motor treatment*. This turned up a large number of relevant resources, including posters presented at the annual convention, position papers, and links to articles in ASHA journals, among others. Two of the resources located in this initial search were controlled treatment studies (Bush, Steger, Mann-Kahris, & Insalaco, 2004; Roehrig, Suiter, & Pierce, 2004), three were critical reviews (Kamhi, 2004; Ruscello, 2005; Watson & Lof, 2004), and one investigated links between infant motor development and later speech (Moore & Ruark, 1996). Total time spent on the ASHA Web site and reading the resources available via links there was approximately 2 hr.

Following exploration of the ASHA Web site, the Cochrane database was consulted. Inputting the search terms yielded nothing on the topic of oral motor intervention for phonology. Broadening the search to *phonology* and *speech sound disorders* in general yielded no hits either. This search took less than 10 min. (Note: a

later MEDLINE search revealed the existence of a review of speech and language therapy on the Cochrane Database [Law, Garrett, & Nye, 2003], but this was not located using the Cochrane interface.) Next, the DARE database was consulted, which did contain reviews of treatment efficacy for speech sound disorders, but nothing specific to oral motor treatment. The DARE search took approximately 30 min, including time to review the resources available on speech sound disorders.

The next step was to look for individual studies; the first database consulted was PsycINFO. The search term *oral motor intervention* yielded one item (Kumin, Von Hagel, & Bahr, 2001). It dealt with oral motor intervention for toddlers with low muscle tone and was thus not germane to the question. Subsequent searches were tried using the term *phonological disorders* as a first step, and then searching within the 153 results for the term *oral motor*. This yielded no articles. Searching for the term *intervention* among the 153 articles yielded 26. None dealt with oral motor treatment protocols. Switching to the term *articulation disorders* fared no better. Papers on a variety of aspects of phonological disorders and articulation disorders and their treatment were easy to find, but none seemed to bear on the topic at hand. This portion of the search took approximately 90 min, conducted over several sessions. The bulk of the time was taken by reviewing the many studies of phonological intervention to determine whether oral motor treatment was included in any of them.

A new search was undertaken using MEDLINE. This search found 78 articles on the topic of phonological treatment. Among these, as with the PsychINFO search, studies investigating other types of treatments existed (e.g., Saben & Ingham, 1991). In addition, an RCT using a treatment/no treatment paradigm for phonological disorders was found (Almost & Rosenbaum, 1998). One review of treatment efficacy for functional phonological disorders in children was located (Gierut, 1998), as was a meta-analysis of speech and language intervention (Law, Garrett, & Nye, 2004). Neither of the latter two articles directly addressed the question. The search did turn up one treatment study dealing with orofacial myofunctional therapy on speech intelligibility, but it dealt with adults, not children (Ray, 2003). One relevant result returned from this search was a review paper by Forrest (2002a), and this directly discussed the question. The MEDLINE search, including perusal of abstracts and reading Law et al. and Forrest, took approximately 90 min.

Because the topic of non-speech oral motor treatment is popular, and also because the scholarly databases available to university-affiliated professionals may not be open to the general public, Google was also used to conduct a final search. Searching this public site turned up several commercial Web sites promoting particular approaches. Although some of them claimed to be research based, upon examination, citations provided were not experiments or critical reviews that could be used to answer the question. In addition, among the top few results was a PowerPoint presentation (Campbell, n.d.) that discussed the lack of experimental investigation of oral motor interventions and also critiqued its theoretical basis, in terms similar to those used by Forrest (2002a). One of the top-ranked Google sites was Apraxia-kids.org, which allowed search of the site itself. Searching in that site using the term *oral motor treatment* yielded many links, but most were irrelevant to the question of efficacy for phonological disorders, except for a short article by Lof (2003b, see also Lof 2003a) presenting a critique of oral motor treatment similar to Forrest's and Campbell's. This

article referenced several posters and presentations that had not previously turned up, which according to Lof all showed no effect of non-speech oral motor treatment on articulation or phonology. The Apraxia-kids.org site also had a link to an ASHA presentation that was not archived on the ASHA Web site, probably because it was presented before ASHA's system of archiving handouts (Forrest, 2002b; note that a later search found this link to no longer be working). This presentation contained an overview of many of the same points made in Forrest (2002a), but in addition, it presented data comparing treating a child with a phonological disorder using non-speech oral motor exercises, during which no improvement was achieved, and then treating the same child using a speech sound stimulatory protocol, which resulted in 100% accurate productions in all positions post treatment. The Google search turned up several articles that needed to be read in their entirety, and completing this process took approximately 90 min.

Evaluating the evidence. No evidence was located at Levels I or II of the hierarchies listed in Table 1. Two case studies presented as posters at ASHA were located (Bush et al., 2004; Roehrig et al., 2004). Roehrig et al. compared treatment outcomes for children receiving phonological intervention alone versus phonological intervention plus passive oral motor exercises. No advantage for the addition of the oral motor component to treatment was found. Bush et al. completed a single participant study that found no effect of oral motor treatment for a child with a phonological disorder.

Several resources located by these searches were critical reviews, which fall at the lowest end of the evidence continuum, because they primarily represent expert opinion. These uniformly discussed the lack of evidence for the efficacy of non-speech oral motor treatment for phonological disorders and listed several foundational problems with the theory behind it (Campbell, n.d.; Forrest, 2002a; Lof, 2003a; Kamhi, 2004; Ruscello, 2005; Watson & Lof, 2004). Note that Forrest 2002a reported on three additional case studies that were not located by the searches, none of which supported the efficacy of non-speech oral motor treatment. One other piece of evidence was included among those used to make the clinical decision. This was a study investigating whether speech emerges in infants from earlier oral motor behaviors (Moore & Ruark, 1996). They concluded that speech develops separately from early oral motor skills. This finding weakens support for the theoretical motivation for oral motor treatment for phonology, hence it is included here with the critical reviews.

Making the clinical decision. Results of this investigation turned up no Level I or II evidence. In other words, large-scale experimental treatment studies investigating non-speech oral motor treatment for phonological disorders did not exist. Case studies investigating the question were located, and all of these found non-speech oral motor exercises to be ineffective in improving phoneme production and intelligibility. In evaluating this evidence, it is important to consider that not only were these studies from a lower level in the evidence hierarchy, but they also would be considered of lower quality in that none had been published in peer-reviewed journals. Evaluating expert opinion played an important role in this clinical decision because such opinion is based on experimental evidence dealing with well-established principles of motor learning. All experts pointed out that non-speech oral motor treatment as practiced by SLPs typically fails to follow these principles, making it highly unlikely that any benefit to oral motor development would be seen. In addition, experts in the development of the oral motor

system seem to have reached a consensus that the systems for speech and non-speech develop somewhat independently. Thus, working on non-speech tasks should not be expected to develop speech abilities. The final conclusion reached was that non-speech oral motor exercises for phonological disorders currently lack a research basis and a theoretical basis. Therefore, the clinical decision is to not use non-speech oral motor treatments for improving phonology. The entire process of developing the question, selecting search terms, searching for evidence, evaluating evidence, and making the clinical decision took approximately 7 hr, most of it spent not in searching but in reading.

DISCUSSION

All three of the case studies were successful in that there was enough evidence to answer each of the clinical questions. The evidence, however, was consistently at the lower end of the levels of evidence hierarchies. The data that were found included a controlled cohort investigation, case control studies, reviews of these studies, and expert opinion. No RCTs on any of the topics were found. The majority of the evidence retrieved was from searches of individual studies.

There were differences in the types and amounts of evidence that were available for each question. Both the autism and expressive vocabulary searches revealed experimental studies that directly answered the questions (albeit very few investigations were found and they were all at low levels on evidence hierarchies). The oral motor search, on the other hand, did not find direct support for using this method with children who have speech disorders. The small amount of evidence in favor of oral motor approaches to phonology was from expert opinions expressed on commercial Web sites and one observational study without controls that was done on adults. The evidence against using oral motor therapy was also at the lower end of the hierarchies but did include case-controlled studies of the target population. The controversies surrounding oral motor therapy are not surprising given these results. The research evidence (which is limited but generally not in favor of its use) is in apparent conflict with clinical practice, in that many clinicians do use non-speech oral motor exercises for phonological impairments. Cases like these are likely to remain controversial until large-scale investigations are completed. The differing results of the three searches we conducted show that engaging in EBP may lead to a direct answer to a clinical question, but sometimes does not. Moreover, the variability in available evidence from one question to another leads to variability in the time and effort involved with searching, reviewing, and critically analyzing the evidence.

The case studies took from 3 to 7 hr to complete, from development of the question to determining its answer. The use of high-speed Internet connections was critical to the ease and speed of the searches. It is likely that the process would have taken much longer to complete without them. Our access to a number of individual study databases, previous experiences with using these databases, ability to quickly download relevant articles, and experience with critically reviewing the research literature were also important in boosting our efficiency. It is highly probable that clinical SLPs (who are likely to have fewer of these resources and less experience) would require more time to complete these same searches. In their demonstration of EBP guidelines, Gillam and Gillam (2006)

stated that, "one strength of this [their] procedure is that it does not require an undue amount of time" (p. 305). Although the definition of "an undue amount of time" differs for each individual and topic, it is doubtful that most SLPs can afford to take 3 to 7 hr (or more) to provide evidence for each of the clinical decisions that must be made. The results of this investigation, therefore, reflect Fey's (2006) concerns about the amount of time involved in EBP.

The Cochrane Collaborative has been suggested as an important resource for conducting EBP (e.g., Johnson, 2006; Justice & Fey, 2004). Although this database appears to have great potential for EBP in speech-language pathology, this and other systematic reviews failed to reveal relevant information. One problem with these databases is their exclusive focus on RCTs, so much so that no other types of evidence are included. By doing so, systematic reviews may give the false impression that all other levels of evidence are useless. Debates currently exist, for example, in the related field of psychology concerning the utility of RCTs as the best or only models for evaluating complex behavioral interventions (Fishman, 2000; Stricker, 2000). Another concern with this focus on RCTs is that there are so few available in the area of child language that our field is barely represented at all. A further concern in working with the Cochrane Collaborative Web site specifically is its lack of user-friendly and intuitive features. During the searching, for example, the site repeatedly removed the user from a screen within a search back to the full main index.

Recommendations for the Field

The results of this examination of EBP suggest that the complex task of seeking evidence to justify our clinical practice is a heavy burden to place on clinicians. If our profession is to embrace the principles of EBP, clinicians will need assistance. It is reasonable for them to look to national organizations such as ASHA for help. ASHA has begun to meet this challenge by providing information on its Web site, making the Web site more searchable, and making full-text journal articles in a searchable archive available to all ASHA members. Moreover, an Advisory Committee for Evidence-Based Practice has been established, as well as a National Center for Evidence-Based Practice in Communication Disorders. The Committee is working with the National Center to establish guidelines for producing systematic reviews that have been generated by members' requests. These steps are important because clinicians need help in speeding up the process and in having access to resources such as full-text journal articles, as well as training in how to conduct efficient and effective searches for evidence. In addition, it would be helpful if one or more of the ASHA journals regularly solicited and featured "state of the practice"-type manuscripts that would outline the current evidence base in specific areas. The Academy of Neurologic Communication Disorders and Sciences (ANCDS) has made an important contribution in this regard. For the past 10 years, their focus has been to disseminate evidence-based guidelines for practice with the neurogenic population through their Web site (<http://www.ancds.org/>) and through articles most commonly found in *The Journal of Medical Speech-Language Pathology*. Another recent development aimed at filling this need is the new scholarly journal, *Communicative Disorders Review*, which is exclusively devoted to review articles. Finally, Web sites that are devoted to presenting EBP reviews are available (see, for example, www.speechandlanguage.com/ebp [AGS, 2007]).

As the field of communication disorders develops its approach to EBP, care must be taken. We must be cautious about basing too much of our clinical decision making on particular types of research evidence. One cannot conclude, for example, that because no one has investigated an intervention that it is certain to lack merit. In doing so, the field may begin to drift away from trying interventions for which systematic reviews have not been conducted. This could, in turn, make such approaches less likely to attract researcher interest and not be explored to their full potential. Clinical excellence will not be served if old ideas that have remained untested but may yet be valid are dropped from consideration, nor will it be served if treatments that are difficult to study are avoided.

Another factor important to keep in view as the field works to implement EBP is how evidence hierarchies are viewed. Although it has been suggested that higher levels of evidence are preferred (Robey & Schultz, 1998), one should not dismiss evidence just because it is at a lower level, nor should evidence from higher levels achieve automatic credulity (see Fey, 2006). When there is no evidence at higher levels, practitioners of EBP must use the evidence that is available. Likewise, the so-called lower levels of evidence (such as case studies) may at times provide more clinically relevant information (Barlow & Hersen, 1984).

The area of child language may be particularly vulnerable to problems with study design and application to clinical settings. One reason for this is that most approaches for child language disorders do not work quickly. This opens the door for many nontreatment factors within the child's life that can have an influence on the outcomes of treatment (not the least of which is their general development). One of the conundrums facing treatment research is that increasing internal validity by applying strict experimental controls decreases external validity. In other words, a study may demonstrate a causal connection between an intervention and improvement (i.e., high internal validity) by controlling so many factors (e.g., age, severity, number of sessions) that the results would not carry over to a day-to-day clinical setting (resulting in low external validity). External validity is crucial to ensuring the real-world applicability of an intervention, yet the practical realities of treatment implementation are not necessarily given weight when controlled research studies are developed or evaluated.

Finding relevant evidence, even with the best resources in the world, will not be possible until more treatment research is conducted. It is beyond the scope of this article to list the reasons for, much less provide solutions to, the problem of lack of treatment research in our field. But it is important to acknowledge that the profession, including clinicians, researchers, and funding organizations, needs to put a much higher priority on intervention research. Increased resources to support university research, and increased prestige for conducting it, are two long-overdue reforms. The field is responding to the need to change. ASHA representatives, for example, have increased efforts to communicate with federal agencies about the need for funding of intervention efficacy research.

It may be unrealistic to expect clinicians to conduct thorough reviews of evidence on their own. Basic competence as critical consumers of research is nonetheless vital for all clinicians to achieve. Therefore, emphasis on critical analysis of treatment ideas and research, as well as training in methods of EBP, is needed in graduate education and during the clinical fellowship year. Practicing clinicians may need to augment their current abilities via continuing education and self-study.

One possibility to improve the current situation is better links between clinicians and academia. When academics are consulted in their areas of particular expertise, they may already know of relevant EBP resources to assist in clinical decision making. A virtual community might be developed on the ASHA Web site, possibly under the auspices of the Academic Affairs unit, enabling clinicians to locate and connect with academics who are willing to answer queries.

Recommendations for Clinicians

SLPs agree that EBP should be used in helping to make clinical decisions and report a generally favorable attitude toward the concept of EBP (Zipoli & Kennedy, 2005). However, half of the clinicians polled stated that they had insufficient professional time to complete the process of EBP. The results of the present investigation suggest that these concerns are valid. How can individual clinicians incorporate EBP in a meaningful and realistic manner? The first step is for clinicians to be critical evaluators of their own clinical practices. Periodic self-assessments of how and why therapy is conducted in a particular manner are important. The following questions need to be revisited regularly: What are the reasons that this treatment should work? What is the research evidence for this treatment? What clinical evidence exists for this treatment's efficacy? Clinicians must be vigilant about personal bias in self-assessment. It is crucial to be aware that positive changes may or may not be directly related to the treatment and that a lack of improvement may or may not be because of extra-clinical factors (e.g., a lack of motivation or parent support). By critically evaluating one's own practices and taking steps to improve them, EBP becomes a personal way to improve services (rather than a mandate from others). One suggested text for clinicians wishing to improve their skills as critical evaluators is *Asking the Right Questions: A Guide to Critical Thinking* (Browne & Keeley, 2006).

In the case studies described here, and in other database searches, numerous difficulties with finding all of the evidence available on a topic arose. A primary recommendation for facilitating database searching is to engage the support of a reference librarian. Reference librarians, especially those who specialize in EBP, can conduct searches that are far more comprehensive and efficient than those of academics or clinicians (e.g., Price, 2005; Wessel, Tannery, & Epstein, 2006). In the absence of such professional assistance, a key word search on the ASHA Web site appears to be a worthwhile starting point. ASHA members have full-text availability of many resources on the Web site, including conference presentations and ASHA journals. After completing an ASHA search, other databases such as MEDLINE (or the open-access alternative, PubMed) should be consulted. We also recommend consulting Google Scholar because it has the aim to reference all scholarly articles and it may locate additional resources. These public sources of scholarly articles can assist clinicians in locating relevant abstracts, although the problem of lack of access to full articles remains. As a last resort, clinicians may try an ordinary Web search using Google or other popular search engines. However, caution will be needed in locating objective evidence using Google-type searches. Clinicians are urged to carefully evaluate all claims, particularly those made by Web sites that have a financial interest in a particular approach.

The manner in which a search is conducted will determine the utility and completeness of results. The key words selected for searching are critical to success in locating relevant resources.

Although the thesaurus feature of proprietary electronic databases is meant to facilitate the search process, it did not appear to help with these cases. We recommend the following steps:

- Enter the chosen search words as key words in the databases in the order suggested above.
- Keep track of the key words that have been tried and combined.
- Search the key words of any relevant studies turned up by your first search.
- Search among the citations listed in any useful articles you find.
- Search using the names of the authors of relevant studies, as a quick means to locate further work in the area.

Identifying relevant evidence is only half the battle, of course. What follows can be even more difficult and time consuming. It is imperative that clinicians be critical consumers of research, carefully considering a range of issues when deciding whether a piece of evidence has merit. Clinicians should consult the evidence hierarchies to determine where the study ranks, but in addition should use their own critical reasoning to evaluate the quality of the study. Not least is whether a proposed intervention as described in a research protocol is replicable under everyday clinical conditions. We recommend that clinicians consider multiple factors when deciding whether the evidence located is helpful in answering their questions. For example, not all small *n* designs lack rigor, and not least because they are more common than large *n* group studies, due consideration to the degree of experimental control exerted in such studies is important. If a single-participant design study is conducted with control for extraneous variables, and the effect is replicated across several participants, single participant designs can provide moderately high-quality evidence. With regard to large *N* group designs, it is important to scrutinize such factors as individual differences, whether the population studied is relevant to the clinical population, and details of intervention protocol to determine whether the experimental circumstances can be replicated in the clinic.

Until there is a significant increase in the evidence base for child language practice, concerns regarding the time involved in EBP cannot easily be resolved. SLPs can consider working together and forming EBP clubs (like journal clubs). One suggested way to facilitate this process would be for ASHA and state associations to investigate the issuing of continuing education units for reports from EBP clubs. If this occurred, employers might allow some time for clinicians to engage in these activities (just as they may provide time for other continuing education opportunities). Another idea is for clinicians within a school district or geographic area to form an EBP club in association with a university. Training students and clinical fellows to engage in EBP by responding to questions, providing data, and discussing results with practicing clinicians would be a positive experience for everyone involved.

CONCLUSION

These three case studies documenting experiences with EBP provide support for its worth in improving clinical decision making. EBP can both improve and validate clinical services, and it promotes increased interactions between clinicians and researchers. Nonetheless, it is difficult to incorporate into everyday clinical settings because it is time consuming and can be quite frustrating. Evidence for the question that one is seeking to answer may be

limited, contradictory, or nonexistent. Those who are working toward making EBP more feasible and informative should be applauded. The best way to effectively promote EBP in the area of language disorders, and in the field as a whole, is to acknowledge its limitations while working to address them. Likewise, we encourage clinicians to engage in EBP to the best of their abilities and be mindful of advancements in its practice.

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