

Supplement Article

Bridging the Gap Between Research and Practice: Implementation Science

Lesley B. Olswang^a and Patricia A. Prelock^b

Purpose: This article introduces implementation science, which focuses on research methods that promote the systematic application of research findings to practice.

Method: The narrative defines implementation science and highlights the importance of moving research along the pipeline from basic science to practice as one way to facilitate evidence-based service delivery. This review identifies challenges in developing and testing interventions in order to achieve widespread adoption in practice settings. A framework for conceptualizing implementation research is provided, including an example to illustrate the application of principles in speech-language pathology. Last, the authors reflect on the status of implementation

research in the discipline of communication sciences and disorders.

Conclusions: The extant literature highlights the value of implementation science for reducing the gap between research and practice in our discipline. While having unique principles guiding implementation research, many of the challenges and questions are similar to those facing any investigators who are attempting to design valid and reliable studies. This article is intended to invigorate interest in the uniqueness of implementation science among those pursuing both basic and applied research. In this way, it should help ensure the discipline's knowledge base is realized in practice and policy that affects the lives of individuals with communication disorders.

The discipline of communication sciences and disorders has accumulated a large body of basic and clinical knowledge since the creation of the American Academy of Speech Correction in 1925—the predecessor of the American Speech-Language-Hearing Association (ASHA). The discipline has strong research programs in a host of universities, accomplished researchers who receive billions of dollars from public and private funding agencies, and a thriving national association committed to the advancement of science. The research goals for the discipline have always been twofold: to not only increase our knowledge base concerning communication and its disorders, but to address the host of therapeutic issues that are needed to improve the quality of life for individuals with communication disorders. These two goals assume that the knowledge base will be incorporated into practice or, stated another way, that practice will be evidence-based. For society to realize a full return on investment, scientific discovery must find its way to application (Colditz, 2012).

Research-Practice Gap: What Is It and Why Does It Exist?

Considerable effort has been expended over the last several decades to facilitate the translation of research findings into practice. For example, ASHA strives to encourage evidence-based practice through journal publications, high-quality convention sessions, its establishment of the National Center for Evidence-Based Practice in Communication Disorders working with its members to conduct evidence-based systematic reviews, and most recently the development of the ASHA Practice Portal to facilitate access to evidence-based practice guidelines. These efforts clearly acknowledge the research enterprise. They also represent tangible attempts to address the current climate in health care and education, which is requiring the delivery of more effective and efficient services with diminishing resources.

Even with these targeted efforts to bridge research and practice, however, the gap between what we know and what we do remains a challenge for the discipline and the professions of speech-language pathology and audiology. This is not unlike other disciplines; certainly health care has faced and continues to face this dilemma (Brownson, Colditz, & Proctor, 2012; GroL & Wensing, 2013). The demand is increasing to provide more effective, efficient, and safe care

^aUniversity of Washington, Seattle

^bUniversity of Vermont, Burlington

Correspondence to Lesley B. Olswang: lolswang@uw.edu

Editor and Associate Editor: Rhea Paul

Received October 28, 2014

Revision received January 5, 2015

Accepted January 25, 2015

DOI: 10.1044/2015_JSLHR-L-14-0305

Disclosure: The authors have declared that no competing interests existed at the time of publication.

for patients, which can be done if current evidence-based knowledge is brought to bear on practice (Grol & Wensing, 2013).

Several factors contribute to the explanation for the continued gap between our knowledge base and evidence-based practice. First, the lag between discovery and application is exceptionally long. This is due in part to the length of the conventional research pipeline, which has been described as a continuum from basic science discoveries to clinical application in research settings under controlled conditions (efficacy research) to testing in applied settings under more natural conditions (effectiveness research) and finally to the broader application in the population at large (Mittman, 2014; Robey, 2004). Colditz (2012) cites the work of Green, Ottoson, Garcia, and Hiatt (2009) and highlights not only the length of time for research findings to be applied in medicine (17 years for 14% of original research to get translated to patient care), but also the various sources of leakage or loss of knowledge in the pipeline (e.g., time from inception to grant funding to publications to development of practice guidelines; see Figure 1). Second, an inherent problem exists in relying on journals and guidelines for dissemination: They place the responsibility on the practitioner to read, accurately interpret, and effectively apply the findings in their settings. This pushing of information into practice is compromised by several factors, including but not limited to the following issues: (a) relevance of the research findings to practice, (b) sufficient treatment descriptions that can be implemented with fidelity, (c) access to an organizational structure that embraces and supports the adoption of treatment innovations, (d) practitioners' motivation to change what they are currently doing, and (e) realized benefits for a targeted population sufficient to sustain application. In recent work, Yorkston and Baylor (2013) summarized the challenges affecting the application of evidence into practice for speech-language pathologists, including range and focus of research, interpretation of results for use in practice settings, and general consumer skepticism about relevance of findings to individual client needs. Researchers and practitioners alike agree that the

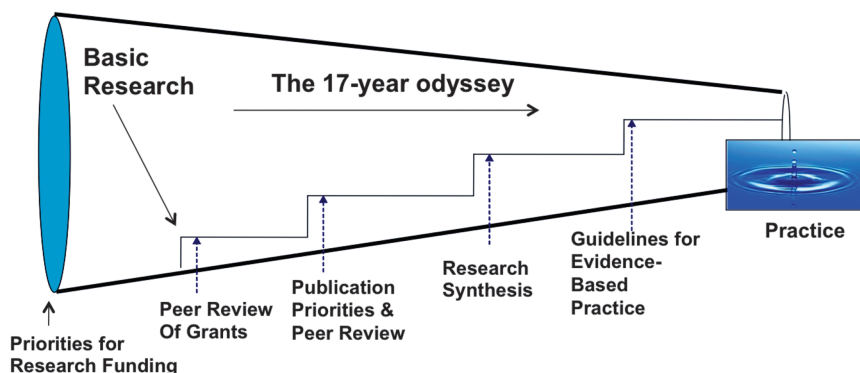
pushing approach alone does not work. What is required is a more active process that brings together researchers and practitioners with an attitude of making it happen, not just letting it happen (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004).

What Is Implementation Science?

An exciting new science has emerged that is addressing this more active approach. It has been described using a variety of terms, including implementation science, translational science, knowledge transfer, dissemination research, and scaling up (see Rabin & Brownson, 2012, for a discussion of terminology). The terminology can be daunting as can be the various nuances in research perspectives that the terms imply. However, in spite of the often subtle differences in the range of terms used to describe moving research to practice, a single underlying theme emerges: Implementation science is associated with research that investigates the best ways to ensure that evidence-based information is integrated into practice. *Implementation research* (the term we will use in this article) has been defined as “the scientific study of methods to promote the systematic uptake of proven clinical treatments, practices, organisational, and management interventions into routine practice” to improve service delivery (adapted from Implementation Science, <http://www.implementationscience.com/about/>). Implementation research offers a promising way of bridging the research-to-practice gap by advancing knowledge about how to adopt and integrate evidence into practice. At its core is the requirement that researchers and practitioners work together.

Implementation research systematically addresses the factors that contribute to the gap between research and practice by understanding the treatment context and identifying barriers to and solutions for the delivery of sustainable, effective treatments that will maximize positive outcomes for a large number of consumers. As such, this research requires that researchers engage with stakeholders to actively integrate research with practice goals

Figure 1. Depiction of pipeline of evidence from basic research to practice and policy, which assumes the research passes through a series of screens that ensures the quality of the science but seldom addresses the relevance and fit of the evidence for application in practice (adapted from Green, 2008, with permission from the author).



and needs. Researchers need to know and understand who the key stakeholders are and in what settings implementation should be targeted. Researchers must understand that many factors will affect implementation success and, in turn, that the strategies for addressing these factors need to be methodically examined and measured. Last, researchers need to appreciate that ultimately organizational structure will affect implementation success and sustainability. Stated simply, understanding implementation research is to understand the complex, multilevel nature of applying new knowledge to routine care.

What Is Involved in Implementation Research?

As the science of implementation has emerged over the past decade, researchers have sought to describe the core components of the implementation process. Numerous models have been developed to identify factors that could potentially influence the process of translating research findings into improvements in practice. These models provide a structure for implementation research, such as the frequently cited model proposed by Fixsen and colleagues (Fixsen, Blase, Naoom, & Wallace, 2009; Fixsen, Naoom, Blase, Friedman, & Wallace, 2005). In their 2005 monograph, they summarized implementation research in an effort to identify those constructs and processes that are essential to implementing scientific findings into practice. Subsequent to that, they argued for six functional stages of implementation (exploration/adoption, installation, initial implementation, full implementation, innovation, and sustainability), which are in turn comprised of core components (also called implementation drivers; Fixsen et al., 2009). These core components include the various factors that are involved in implementation, including the complexity of the innovation to be implemented, the relevant stakeholders involved in implementation (practitioners to organizations), and the setting. Each and all of these factors add to the challenge of moving new ideas into practice. In a similar manner, GroL and Wensing (2013) utilized various theories of change to develop the Implementation of Change Model for improving health care delivery. This model acknowledges principles underlying effective change as a foundation for examining factors that can influence the process of implementation in health care delivery. Aarons, Hurlburt, and Horwitz (2011) advanced a conceptual model of factors that influence the implementation of evidence into practice in public service settings. They, too, identified stages of implementation (i.e., exploration, adoption/preparation, actual implementation, and sustainability) and argued for core components or factors that emerge throughout the stages. In looking across various models, researchers agree that the process of implementation involves several stages, similar to those described by Fixsen et al. (2009) and Aarons et al. (2011) and are iterative in nature. They also agree that, at each stage, factors exist that will affect the success of moving evidence into practice. All of the models acknowledge that implementation of any innovation is complicated by the nature of the innovation

itself, the stakeholders involved, the setting and its organizational structure, and a host of challenges to sustainability. Although common factors emerge across models, some factors may be emphasized over others as a reflection of the particular theoretical orientation of a model.

In an effort to bring some consensus to this literature and to help guide researchers in their planning of investigations, Damschroder et al. (2009) set about the task of creating a framework that brought together common themes across relevant fields of study. We review this framework in more detail to provide structure for the remaining content of this article. Damschroder et al. started with Greenhalgh et al.'s (2004) review of nearly 500 articles in 13 fields of research and then used a snowball sampling approach to identify new articles through colleagues engaged in implementation research and theories cited in Greenhalgh et al.'s synthesis or referenced in peer-reviewed journals. These theories addressed "dissemination, innovation, organizational change, implementation, knowledge translation, and research uptake" (Damschroder et al., 2009, p. 2). The Consolidated Framework for Implementation Research (CFIR; Damschroder et al., 2009) was the product of this metasynthesis effort to identify common factors that reflect the complexities of implementation. The CFIR was developed to provide "consistent taxonomy, terminology, and definitions on which a knowledge base of findings across multiple contexts could be built" (Damschroder et al., 2009, p. 2). In turn, the CFIR serves to guide researchers in their planning for and evaluation of the implementation of evidence-based interventions (assessments and treatment) into practice.

The CFIR is composed of five major domains (or factors) that influence the successful implementation of innovations into practice: intervention characteristics, outer setting, inner setting, characteristics of the individuals involved, and the process of implementation—each of which corresponds to variables for examination. A quick summary of these domains follows. Although they are described separately, in reality they overlap; each domain is interrelated. Intervention characteristics capture whether the innovation is simple or complex. For example, a simple innovation would be a hand-washing protocol in health care that is easy to learn and requires prompts or reminders. In contrast, a complex innovation would be a vocabulary-learning protocol that is applied across communicative contexts as is typically the case in speech-language pathology. Setting can be described from an outer context that includes economic, political, and social factors and an inner context, including the organizational structure, culture, and resources of a clinic, school, or hospital. The individuals involved in implementation include the various stakeholders (e.g., administrators, practitioners, and clients) and their characteristics, including attitudes about implementation (e.g., readiness/buy-in) and their roles in the organizational structure. Last, the process of implementation addresses the stages in moving an innovation into full practice, including exploration/planning, installation/educating, initial/limited implementation, full implementation, innovation, and

sustainability (including policy change). Implementation research, therefore, is designed to develop, refine, and test strategies that address each and all of these complex factors. Successful implementation of evidence-based interventions into health care and education environments requires a systematic exploration of these implementation strategies, determining what works under what conditions. We turn now to discussing these strategies.

Strategies are those rigorously executed activities used to overcome the challenges of implementing an innovation into practice. The strategies ultimately inform the research as independent variables. Numerous strategies exist as would be expected given the complexities of implementation described above. To bring some order to the discussion, Powell et al. (2012) proposed a compilation of implementation strategies on the basis of a review of 205 sources published between 1995 and 2011 that address the implementation process. They define an “implementation strategy as a systematic intervention process to adopt and integrate evidence-based health innovations into usual care” (Powell et al., 2012, p. 124, emphasis added). It is worth noting that innovations occur in education as well and include evidence-based assessments and treatments, practice guidelines, and empirically supported prevention programs. Powell et al. identified 68 strategies that emerged from their systematic review. To facilitate understanding of these strategies, they classified them into six categories that correspond to the implementation process: exploration/planning, educating, financing, restructuring, managing quality, and attending to the policy context. To illustrate, exploration/planning includes activities for gathering information from various stakeholders, such as conducting local needs assessment at a clinic, school, or hospital; determining stakeholder readiness or buy-in for innovation; and identifying specific barriers and facilitators of successful implementation. Education strategies address developing materials (e.g., education manuals, training manuals, measures of fidelity), the actual education and training of practitioners (e.g., educational meetings, trainings through didactic instruction, modeling, coaching, technology use), and methods of monitoring learning and performance. Financing strategies focus on developing incentives to use clinical innovations and providing support for training and assessing the economic value of implementing a new program. These strategies are important early in the process during initial implementation. As implementation is applied to the larger organization, restructuring strategies are used. These strategies are useful for altering staffing, professional roles, and physical and organizational structure to support innovation. Quality management strategies address innovation on a larger scale and emphasize adopting data-management systems and support networks to ensure fidelity and sustainability in implementing new programs. Last, strategies that attend to policy context address the promotion of clinical innovations through national organizations, including accrediting bodies, licensing boards, and legal systems. Thus, implementation research is the science of identifying, defining, and evaluating the strategies used to bring about desired outcomes. It is

important to note that all strategies present an opportunity for rigorous examination through measurement, using a variety of quantitative and qualitative data (see Proctor et al., 2011).

Some examples follow to help crystalize the opportunities for evaluation in implementation science. As mentioned previously, exploration/planning strategies include determining practitioner buy-in. That buy-in can be examined and measured through attitude rating scales. Education strategies include developing and refining training materials, executing the training, and examining fidelity in the implementation of a new protocol, which can be measured quantitatively and qualitatively through checklists or video review and through interviews. A financing strategy might include a cost–benefit analysis of the amount of effort in time and resources in relation to the realized outcomes. It is important to note that each stage of the implementation process and related strategies can be examined through a variety of outcome measures (see Proctor et al., 2011). Rigor in the examination process is key as it reinforces the science of systematically examining the implementation process and strategies used for achieving successful implementation. Only by understanding what enables innovations to be successfully implemented into practice will the research–practice gap be closed and will sustainable change in practice be accomplished.

What Does Implementation Research Look Like?

To provide a concrete example of implementation science in the discipline, we present a current research program in communication sciences and disorders that has moved through the research pipeline. This example illustrates early stages in the implementation process, factors affecting implementation using the CFIR framework, and strategies for implementation. Further, the example describes mixed methods with outcome measures utilizing quantitative and qualitative data. The example is meant to help investigators appreciate the structure of the first steps in moving an innovative intervention protocol out of the lab and into practice.

Over the last two decades, a series of single-subject feasibility studies and a randomized control study have investigated the benefits of a multicomponent, short-term intervention for teaching conventional signals of communication (namely, eye gaze) to young children (10–24 months of age) with physical disabilities, such as cerebral palsy (Olswang & Bain, 2013; Olswang et al., 2014; Olswang, Feuerstein, Pinder, & Dowden, 2013; Olswang, Pinder, & Hanson, 2006; Pinder & Olswang, 1995; Pinder, Olswang, & Coggins, 1993). This intervention was designed as a targeted effort to increase children’s ability to produce triadic gaze (shifting gaze back and forth between an adult and an object of desire) as a way to demonstrate coordinated joint attention and facilitate successful interactions with caregivers and others. The multicomponent intervention

included a dynamic assessment and a direct, speech-language pathologist-delivered treatment to facilitate young children's production of gaze behaviors. The feasibility and the randomized control studies were conducted under controlled conditions with all clinical procedures provided by members of the research team. Following a conventional research program, the feasibility studies used time-series designs (Olswang et al., 2006; Pinder & Olswang, 1995; Pinder et al., 1993), and the randomized control study used a between-groups design (gaze treatment experimental group vs. standard care control group; Olswang et al., 2014). All of the research showed promising results, supporting both the assessment and treatment components of the intervention.

As this program of research moved forward, a fork in the road quickly emerged. The research could proceed to refine intervention under controlled conditions, for example, by attempting to better delimit dosage and examine individual differences in responsiveness. Or the research program could pursue better understanding of the intervention in the context of routine delivery of early intervention services to children with disabilities. With CFIR in mind, this latter path would acknowledge the complexity of the intervention, the real-world logistics that influence service delivery in birth-to-three settings, and the demands and priorities that early intervention practitioners must face every day. Taking the implementation path would more actively address important questions about the intervention in context. This would include identifying critical elements of the intervention that require fidelity in administration, determining best ways to train practitioners in delivery of the intervention, and discovering the relevance of practitioners' attitudes for successfully implementing the intervention. This was the path that was taken.

Early Stages in Implementation

The first step along the implementation research path would be to investigate the early stages in implementation; following Fixsen et al. (2005), these included exploration/adoption and installation. Corresponding to these stages, planning and education strategies would be used and evaluated (Powell et al., 2012). The description that follows captures the decisions that were made during the first steps in engaging the participants and executing the intervention protocol. Because this research continues to progress, the stages of implementation research discussed represent what has occurred and our preliminary impressions.

This pilot research utilized a collaborative iterative approach (Atkins, Frazier, & Cappella, 2006) between researchers and nine practitioners (including speech-language pathologists working in teams with occupational and physical therapists) at a birth-to-three center in the Seattle area. Using a mixed-method design (Palinkas et al., 2011) comprised of quantitative and qualitative data, the research investigated procedures and outcome measures for three implementation variables related to practitioners (Palinkas et al., 2011; Proctor et al., 2011): acceptability, adoption, and fidelity. These variables are not unique to implementation

research as they have long been associated with research addressing treatment efficacy. For example, Kazdin (1981) described the importance of examining treatment acceptability or the degree to which a treatment is viewed as "appropriate, fair, and reasonable" (p. 493). Wolf (1978) introduced the concept of social validity, which acknowledged social appropriateness of goals, procedures, and measures for adoption of a treatment. Last, fidelity has long been a part of intervention research as a variable describing the ability of individuals to administer procedures accurately and competently, otherwise termed internal integrity or procedural reliability (Billingsley, White, & Munson, 1980). Data associated with these variables are critical for defining the quality of treatment research that serves to provide evidence for practice (Goldstein, Lackey, & Schneider, 2014).

From the perspective of implementation research, *acceptability* addresses the practitioners' perceptions that the intervention will be "agreeable, palatable, or satisfactory" in their clinical setting (Proctor et al., 2011, p. 68). In the eye gaze pilot project, acceptability was assessed by querying the practitioners' beliefs about early intervention in general and their views about early communication along with perceived facilitators and barriers to implementation of a communication intervention into routine care. Qualitative data regarding their perceptions of early intervention were collected through a conversational interview (following Aarons & Palinkas, 2007), which was coded and analyzed for themes (following Braun & Clarke, 2006). Quantitative data were obtained via a written activity asking practitioners to list early communication behaviors. *Adoption*, also termed usability, refers to the practitioners' readiness to try the intervention (Proctor et al., 2011) and was measured by the Evidence-Based Practitioner Attitude Scale (Aarons, 2004). This instrument provided quantitative data (total Evidence-Based Practitioner Attitude Scale score and subscale scores reflecting different aspects of practitioner attitude, including openness, divergence, appeal, and requirements). Last, *fidelity* refers to the "degree to which an intervention is implemented as it is prescribed in the original protocol or as it was intended by the program developers" (Proctor et al., 2011, p. 69). Fidelity includes (a) adherence to the program protocol and (b) competence or quality of intervention delivery. An obvious challenge in implementation research is maintaining the fidelity of the original protocol while adapting it to meet the needs and priorities in an authentic setting. Quantitative measures were used to examine fidelity. Adherence was measured through direct observation and coding of videotape clips of the practitioners delivering the intervention, comparing practitioner performance with a template of critical elements to yield percentage accuracy (following Billingsley et al., 1980). Practitioner competence was measured through a 3-point rating scale of quality of performance (3 = *high quality*, 2 = *adequate quality*, 1 = *poor quality*) in the delivery of antecedent and consequence behaviors. Operational definitions for quality were developed. All quantitative fidelity data were examined for reliability. Last, practitioner feedback

was obtained at the end of the project about the training process itself and feasibility in administering the intervention in their practice setting. A questionnaire was used to examine practitioner assessment of training and adoption barriers. This questionnaire yielded quantitative data via a rating scale of satisfaction with training and a checklist of barriers to adoption of the intervention (following Bartholomew, Joe, Rowan-Szal, & Simpson, 2007). A conversational interview was also conducted to obtain practitioner feedback about the training and adoption, which yielded qualitative data using theme analysis (Braun & Clarke, 2006).

Implementation of Research Phases

The research took place over three phases, which included strategies as described by Powell et al. (2012) and measurements across phases as described above. Phase 1 was baseline, in which pretest measures of both acceptability and adoption were administered as described above. In addition, this phase allowed for engagement of the practitioners through planning strategies, such that their input could be used in tailoring Phase 2. Phase 2 was dedicated to training and trial implementation (i.e., installation of the intervention) and examined fidelity. Training included education strategies of sharing a manual of the intervention with video exemplars and two sessions of face-to-face problem solving with practice videos. Trial implementation/installation required the participants to administer the intervention with an appropriate child. Measures included quantitative data to assess intervention fidelity. Phase 3 included posttraining acceptability and adoption measures of practitioner attitudes about delivering the intervention in their practice setting. In addition, practitioners' assessment of the training itself was gathered. Our hypotheses suggested the pre-/posttest data would show positive change in practitioner knowledge and attitudes about early communication and the importance of making this an early intervention focus. Fidelity outcome measures would demonstrate accuracy and competence in delivery of the intervention, similar to the results obtained in earlier research (Olswang et al., 2014).

Barriers and Facilitators of Implementation

In keeping with the purpose of this example, we turn now to sharing some insights about structuring research that addresses the first steps of the implementation process. From the perspective of CFIR, these insights will include barriers and facilitators that are related to the intervention itself, the setting, and the stakeholders. In addition, observations regarding successful implementation strategies will be shared. We hope these reflections will be useful for other investigators as they attempt to scale up and conduct implementation research.

An initial barrier emerged very early in the process when obtaining Internal Review Board (IRB) human subjects approval to conduct research in a clinical practice setting.

The inner setting created a hurdle. Because this research involved practitioners learning and delivering an experimental protocol in the context of standard care, issues concerning consenting participants surfaced along with questions concerning liability. This was particularly nettlesome because the birth-to-three center did not have its own IRB. The problem was eventually resolved, but the challenge significantly affected the research timeline. We raise a cautionary flag for researchers as they plan their research in the context of their IRB regulations. Worthy of note is the recent effort by the National Center for Advancing Translational Sciences to address and facilitate the IRB review process for implementation research (<http://www.ncats.nih.gov/news-and-events/features/irb-reliance.html>).

A second barrier appeared during the planning/exploration stage as recruitment unfolded. Although stakeholders (practitioners and administration) voiced considerable interest, the ability for practitioners to participate was limited. Approximately 25 early interventionists (speech-language pathologists, occupational therapists, physical therapists) across four sites were approached, and only nine from three sites consented. The reality of asking practitioners for time beyond their full day-to-day workload became quite apparent not only during recruitment, but as the study progressed with one practitioner dropping out and two others needing to make up sessions—not for lack of interest but rather the very real demands of life present a noteworthy challenge for implementation research. Fixsen et al. (2005) discuss variables affecting the success of implementing a new protocol into practice and emphasize the importance of staff selection. Although the eventual inclusion of only nine practitioners was disappointing, the commitment and enthusiasm of these individuals facilitated the success of the process. Further, these nine individuals are likely to become supportive leaders and coaches to their colleagues during later stages of implementation in the future (Fixsen et al., 2005).

The barrier of time is worth highlighting in regards to practitioner involvement and the complexity of the intervention being taught. As the research unfolded and feedback was obtained in planning the installation stage of implementation during Phase 1 of the study, the practitioners voiced their concern about attending the three planned training sessions. The original training was conceived entirely by the researchers. Given previous experience in the laboratory and training of speech-language pathologists to administer the intervention, a 3-day training utilizing education strategies that involved studying a manual, demonstrating the intervention protocol, and viewing video exemplars for problem solving was planned. The training also included homework that required practitioners to practice the intervention protocol with a child on their caseload. As a result of practitioner feedback and collaboration during the first meeting with participants, the actual training was changed to include only two longer training sessions with the homework assignments being modified. This experience illustrated the reality of the time constraints facing practitioners in their daily routines and the flexibility

that is required of researchers as they design what they believe to be optimum training. This reality is a reminder that implementation science involves collaboration between researchers and stakeholders at all stages of the process.

In spite of the barriers, the completion of the pilot allowed the investigators to learn important information about strategies that proved to be useful for moving a multi-component intervention into a birth-to-three center. Again using CFIR as a reference, the research design of baseline and follow-up phases using a conversational interview allowed for gathering important information regarding the inner setting and practitioners in regard to adopting a new early intervention protocol into practice. To be specific, these phases allowed for determining more about the context for implementation, specifically, what early intervention looks like in a practice setting, including what service delivery models are currently being used, the composition and roles of different professionals providing service, and the status of communication as a critical early intervention objective. Enthusiasm about participating in research was apparent, as observed by the practitioners' commitment to the training along with the extensive feedback they provided during the follow-up interview on training content and format. The results of this research have contributed valuable information concerning the early communication intervention and ways to think about moving this intervention into practice. Without the stakeholder input, researcher efforts to revise the intervention and plans for training would continue to operate under a guise of authenticity and usability. With stakeholder input, the realities of early intervention, including practitioner roles and responsibilities and cost-effective and efficient procedures for changing practice, have come to the forefront.

The education strategies, including the development of a manual and videotaped homework, will allow for a better understanding of the intricacies of the multicomponent intervention and the challenges in teaching it to practitioners. The fidelity data will provide necessary data to evaluate the success of the education strategies that were used, including revealing the essential components of the intervention that were more easily and successfully learned than others. Again the iterative process of working closely with practitioners will guide future research that will continue to examine the characteristics of the intervention in the context of service delivery in birth-to three centers and the effectiveness of different, more efficient education strategies that can involve more practitioners across more centers.

What Is the Status of Implementation Research in Communication Sciences and Disorders?

Our discipline has consistently been invested in science that investigates communication and communication disorders. Basic research has always been an integral part of our research, with clinical research increasing over the

years. To illustrate, Olswang and Bain (2013) conducted a review of the following three ASHA journals published between 2006 and 2010: *Journal of Speech, Language, and Hearing Research*; *American Journal of Speech-Language Pathology*; and *Language, Speech, and Hearing Services in Schools*. The focus of this review was to determine the degree to which published research focused on treatment in speech-language pathology and to what degree these studies represented the conventional research pipeline. The review revealed that a total of 763 articles were published in the three journals over the 5-year period. Seventy-four (10%) were classified as treatment studies. Of the total number of treatment studies published, 73% were judged to be efficacy studies, which represented early pipeline studies (i.e., research conducted in a laboratory under controlled conditions). Moving down the pipeline, 19% were judged to be effectiveness studies as defined by their being conducted in practice settings. These studies focused primarily on questions examining implementation of treatments in natural environments. Three of the effectiveness studies were extensions of efficacy research, and only one study addressed issues related to cost-effectiveness of standard care. None specifically examined strategies for implementation. In short, the review indicates a paucity of research addressing treatment in general, and even more troubling is the lack of research that directly investigates the movement of our knowledge base into practice.

This is not to say that such research is entirely missing from our discipline, but certainly the publication record reveals an important trend. Since the American Speech-Language-Hearing Foundation's 2014 Summit on Implementation Science, there has been a new energy around efforts to actively close the gap between research and practice. This issue of the *Journal of Speech, Language, and Hearing Research* is a tangible example of increased interest and forward momentum in expanding our view of research in our discipline. We have a pressing need for a different type of research or maybe a different path that translates more rapidly to the practice arena and is relevant to our stakeholders.

Conclusion and Implications for Future Research

All investigators, regardless of where they are in the research pipeline, face trade-offs between constraints when creating their study designs and efforts to optimize their findings (Krathwohl, 2009). Constraints will be encountered when addressing ethical standards (e.g., what can ethically be studied), institutional requirements (e.g., how far can an institution vary its required care), and available resources (e.g., is sufficient time and space available; Krathwohl, 2009). These constraints must be balanced with the optimum criteria for a study: credibility with the appropriate audience, relative weighting of internal and external validity, and resource allocation (Krathwohl, 2009). In implementation science, these trade-offs might appear slightly

different from those experienced in the laboratory, but conceptually they are the same. Our review of the literature revealed a host of challenges and questions that investigators conducting implementation research must address. For example, how do we set priorities that justify our introductions of new interventions in the context of what appears to be valuable standard care? How do we achieve the appropriate balance between intervention fidelity and adaptation so that practice settings can implement the interventions we study? How do we determine the cost/benefit ratio of what we do and are there unanticipated consequences? What impacts can we quantify and what actions are responsible for the impact observed? In fact, the Institute of Medicine (2010) suggests three critical questions that envelop the trade-offs: Why should we do something about a problem, what should we do about the problem, and how should we implement information about solutions to the problem in our particular discipline? Implementation research is a science, and as such, investigators will struggle to design the optimum studies to address how to best move evidence into practice. No easy answers are available for answering complex questions, but struggling with the trade-off between constraints and optimizing results will yield good science.

There are certainly a number of challenges and opportunities that we will face as we move implementation research forward in the discipline of communication sciences and disorders. One challenge is a critical need to close the gap between the needs of practitioners, communities, and policy makers and what our research currently provides. A second challenge is the peer-review process and the expectations for highly controlled and randomized intervention research protocols. Another challenge is addressing the paradoxes that exist when implementation research becomes a priority. For example, do we have sufficient evidence from controlled, laboratory studies to be recommending changes in practice? Perhaps we should seek the best available and not necessarily the best possible evidence from the laboratory as we move forward in conducting implementation research.

To complete our discussion of implementation research, we need to take advantage of the opportunities to collaborate in our evaluation of treatment strategies through practice-based research (Croke & Olswang, 2015). We can also consider combining our practice-based research methods with multisite randomized controlled trials to demonstrate external validity (Katz, Murimi, Gonzalez, Njike, & Green, 2011). This paradigm shift will require us to consider the context before research is initiated. Our research focus traditionally has been top down, and context is seldom considered as we define problems, identify causes, and develop interventions. Implementation research pushes researchers to think from the bottom up—starting with the context and where we need to be in practice (Green, Glasgow, Atkins, & Stange, 2009). To achieve our goal of more evidence-based practice, we need more practice-based evidence (Green, Glasgow, et al., 2009).

Louis Pasteur offers a poignant reflection on how we might think about our future discoveries: “To him/her

who devotes his/her life to science, nothing can give more happiness than increasing the number of discoveries, but his/her cup of joy is full when the results of his/her studies immediately find practical applications” (Kutner, 2011, p. 1194).

Acknowledgments

This research was supported in part by a grant from the University of Washington, Institute of Translational Health Sciences, Small Pilot Project Grant, “Integrating an evidence-based communication intervention for young children with physical disabilities into a community early intervention center,” awarded to Lesley B. Olswang, December 2013–January 2014.

References

- Aarons, G. A. (2004). Mental health provider attitudes toward adoption of evidence-based practice: The evidence-based practice attitude scale (EBPAS). *Mental Health Services Research, 6*, 61–74. doi:10.1023/B:MHSR.0000024351.12294.65
- Aarons, G. A., Hurlburt, M., & Horwitz, S. (2011). Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Administration and Policy in Mental Health, 38*, 4–23. doi:10.1007/s10488-010-0327-7
- Aarons, G. A., & Palinkas, L. A. (2007). Implementation of evidence-based practice in child welfare: Service provider perspectives. *Administration and Policy in Mental Health and Mental Health Services Research, 34*, 411–419. doi:10.1007/s10488-007-0121-3
- Atkins, M. S., Frazier, S. L., & Cappella, E. (2006). Hybrid research models: Natural opportunities for examining mental health in context. *Clinical Psychology: Science and Practice, 13*, 105–108. doi:10.1111/j.1468-2850.2006.00012.x
- Bartholomew, N., Joe, G., Rowan-Szal, G., & Simpson, D., (2007). Counselor assessments of training and adoption barriers. *Journal of Substance Abuse Treatment, 33*, 193–199. doi:10.1016/j.jsat.2007.01.005
- Billingsley, F., White, O., & Munson, R. (1980). Procedural reliability: A rationale and an example. *Behavioral Assessment, 2*, 229–241.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*, 77–101. doi:10.1191/1478088706qp063oa
- Brownson, R., Colditz, G., & Proctor, E. (2012). *Dissemination and implementation research in health: Translating science to practice*. New York, NY: Oxford University Press.
- Colditz, G. (2012). The promise and challenges of dissemination and implementation research. In R. Brownson, G. Colditz, & E. Proctor (Eds.), *Dissemination and implementation research in health: Translating science to practice* (pp. 3–22). New York, NY: Oxford University Press.
- Croke, P. J., & Olswang, L. B. (2015). Practice-based research: Another pathway for closing the research-practice gap. *Journal of Speech, Language, & Hearing Research*. Advance online publication. doi:10.1044/2015_JSLHR-L-15-0243
- Damschroder, L., Aron, D., Keith, R., Kirsh, S., Alexander, J., & Lowery, J. (2009). Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. *Implementation Science, 4*, 50–64. doi:10.1186/1748-5908-4-50

- Fixsen, D. L., Blase, K. A., Naoom, S. F., & Wallace, F.** (2009). Core implementation components. *Research on Social Work Practice, 19*, 531–540.
- Fixsen, D. L., Naoom, S., Blase, K., Friedman, R., & Wallace, F.** (2005). *Implementation research: A synthesis of literature*. Tampa: University of South Florida, The National Implementation Research Network (FMHI Publication #231).
- Goldstein, H., Lackey, K., & Schneider, N.** (2014). A new framework for systematic reviews: Application to social skills interventions for preschoolers with autism. *Exceptional Children, 80*, 262–280. doi:10.1177/0014402914522423
- Green, L. W.** (2008). Making research relevant: If it is an evidence-based practice, where's the practice-based evidence? *Family Practice, 25*(Suppl. 1), i20–i24. doi:10.1093/fampra/cmn055
- Green, L. W., Glasgow, R. E., Atkins, D., & Stange, K.** (2009). Making evidence from research more relevant, useful and actionable in policy, program planning and practice: Slips “Twixt cup and lip.” *American Journal of Preventive Medicine, 37*(6, Suppl. 1), S187–S191.
- Green, L. W., Ottoson, J., Garcia, C., & Hiatt, R.** (2009). Diffusion theory and knowledge dissemination, utilization, and integration in public health. *Annual Review of Public Health, 30*, 151–174. doi:10.1146/annurev.publhealth.031308.100049
- Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O.** (2004). Diffusion of innovations in service organizations: Systematic review and recommendations. *Milbank Quarterly, 82*, 581–629.
- Grol, R., & Wensing, M.** (2013). Implementation of change in healthcare: A complex problem. In R. Grol, M. Wensing, M. Eccles, & D. Davis (Eds.), *Improving patient care: The implementation of change in health care* (2nd ed., pp. 3–17). Oxford, United Kingdom: Wiley. doi:10.1002/9781118525975.ch1
- Grol, R., Wensing, M., Bosch, M., Hulscher, M., & Eccles, M.** (2013). Theories on implementation of change in healthcare. In R. Grol, M. Wensing, M. Eccles, & D. Davis (Eds.), *Improving patient care: The implementation of change in health care* (2nd ed., pp. 18–39). Oxford, United Kingdom: Wiley. doi:10.1002/9781118525975.ch2
- Institute of Medicine.** (2010). *The future of nursing: Leading change, advancing health*. Retrieved from <http://www.iom.edu/Reports/2010/The-Future-of-Nursing-Leading-Change-Advancing-Health.aspx>
- Katz, D. L., Murimi, M., Gonzalez, A., Njike, V., & Green, L. W.** (2011). From controlled trial to community adoption: The multisite translational community trial. *American Journal of Public Health, 101*, e17–e27.
- Kazdin, A.** (1981). Acceptability of child treatment techniques: The influence of treatment efficacy and adverse side effects. *Behavior Therapy, 12*, 493–506. doi:10.1016/S0005-7894(81)80087-1
- Krathwohl, D.** (2009). *Methods of educational and social science research: An integrated approach*. Long Grove, IL: Waveland Press.
- Kutner, J. S.** (2011). A significant milestone for palliative care: Imperative for dissemination and implementation research. *Journal of Palliative Medicine, 14*, 1194–1195.
- Mittman, B.** (2014, March). *Developing an integrated implementation research agenda: Guidance from prevailing frameworks*. Keynote presented at the Implementation Science Summit: Integrating Research into Practice in Communication Sciences and Disorders, Carlsbad, CA.
- Olswang, L., & Bain, B.** (2013). Treatment research. In L. A. Golper & C. Fratalli (Eds.), *Outcomes in speech-language pathology* (2nd ed., pp. 245–264). New York, NY: Thieme.
- Olswang, L., Dowden, P., Feuerstein, J., Greenslade, K., Pinder, G. L., & Fleming, K.** (2014). Triadic gaze intervention for young children with physical disabilities. *Journal of Speech, Language, and Hearing Research, 57*, 1740–1753.
- Olswang, L., Feuerstein, J., Pinder, G. L., & Dowden, P.** (2013). Validating dynamic assessment of triadic gaze for young children with severe disabilities. *American Journal of Speech-Language Pathology, 22*, 449–462.
- Olswang, L., Pinder, G. L., & Hanson, R.** (2006). Communication in young children with motor impairments: Teaching caregivers to teach. *Seminars in Speech and Language: Current Issues in Providing Services to Infants and Toddlers, 27*, 199–214.
- Palinkas, L., Aarons, G., Horwitz, S., Chamberlain, P., Hurlburt, M., & Landsverk, J.** (2011). Mixed method designs in implementation research. *Administration and Policy in Mental Health, 38*, 44–53. doi:10.1007/s10488-010-0314-z
- Pinder, G. L., & Olswang, L.** (1995). Development of communicative intent in young children with cerebral palsy: A treatment efficacy study. *Infant-Toddler Intervention, 5*, 51–69.
- Pinder, G. L., Olswang, L., & Coggins, T.** (1993). The development of communicative intent in a physically disabled child. *Infant-Toddler Intervention, 3*, 1–17.
- Powell, B., McMillen, C., Proctor, E., Carpenter, C., Griffey, R., Bugner, A., . . . York, J.** (2012). A compilation of strategies for implementing clinical innovations in health and mental health. *Medical Care Research Review, 69*, 123–157. doi:10.1177/1077558711430690
- Proctor, E., Silmere, H., Raghavan, R., Hovmand, P., Aarons, G., Bunger, A., . . . Hensley, M.** (2011). Outcomes for implementation research: Conceptual distinctions, measurement challenges, and research agenda. *Administration and Policy in Mental Health and Mental Health Services Research, 38*, 65–76. doi:10.1007/s10488-010-0319-7
- Rabin, B., & Brownson, R.** (2012). Developing the terminology for dissemination and implementation research. In R. Brownson, G. Coditz, & E. Proctor (Eds.), *Dissemination and implementation research in health: Translating science to practice* (pp. 23–51). New York, NY: Oxford University Press.
- Robey, R.** (2004). A five-phase model for clinical-outcome research. *Journal of Communication Disorders, 37*, 401–411.
- Wolf, M.** (1978). Social validity: The case for subjective measurement or how applied behavior analysis is finding its heart. *Journal of Applied Behavior Analysis, 11*, 203–214. doi:10.1901/jaba.1978.11-203
- Yorkston, K., & Baylor, C.** (2013). Evidence-based practice: Applying research outcomes to inform clinical practice. In L. A. Golper & C. Fratalli (Eds.), *Outcomes in speech-language pathology* (2nd ed., pp. 265–278). New York, NY: Thieme.