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Caregiver Coaching in Early Childhood Intervention

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Everyday life activities provide development-enhancing learning opportunities for young children. Since parents, teachers, child care providers, and other caregivers are with infants and toddlers more frequently and for longer periods of time than early childhood intervention practitioners, caregivers need to know how they can support their child's learning within the context of their interest-based activities in the home, community, and early childhood classroom. Coaching is an adult learning strategy and interaction style that may be used by early childhood intervention providers to build the competence and confidence of caregivers to use responsive strategies within these development-enhancing activities that will achieve their desired outcomes.

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Preliminary Findings: Early Turn Talking is Associated with Later Social-Emotional Development

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Preliminary findings from a follow-up study of 33 children, assessed for their socioemotional development from 18 months of age, are presented. At 77 months, they were evaluated again in a laboratory context, recording on video a situation of discussion of a conflict with the caregiver and then coding these videos using the CIB instrument. Conversation turns assessed with the LENA software at 18 and 30 months of age are associated with socioemotional cognition, emotion regulation, and emotional communication competencies assessed at 77 months of age. The association is stronger at 30 months than at 18 months, suggesting a possible mediation effect to be explored in future analyses. Implications for professional intervention and public policies for children are discussed.

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Foundations for Literacy: A Research-Based Early Reading Program that Improves Outcomes for Children who are Deaf and Hard of Hearing

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One avenue for improving reading outcomes is to ensure children who are deaf or hard of hearing (DHH) enter school with the foundational skills needed to learn to read. Our research team developed an early literacy curriculum specifically for DHH children. Teachers use *Foundations for Literacy* (FFL) in a one-hour literacy block for the school year. Student learning objectives include improving spoken phonological awareness, alphabetic knowledge, word reading, vocabulary, and narrative. FFL is more systematic, and its instruction is more explicit, multi-modal, and intensive than might be used with children who have typical hearing. Much of the instruction is embedded in language-rich activities. Differentiation of instruction to the wide variation of language and phonological processing skills observed for children who are DHH is integral to the design. Results from multiple studies, including a randomized-control trial, indicates that FFL is an effective intervention for young DHH students.

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The Road to Hearing Health Equity

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Of the 1.6 billion people with hearing loss worldwide, over 1.2 billion live in underserved communities with the least access to hearing care. This includes preventable hearing loss in an estimated 42 million children who, without early identification and treatment, are at increased risk of significant detrimental effects that can last a lifetime. These immense hearing health disparities provide a clear and compelling call to action. The new Center for Hearing Health Equity at the University of Arkansas for Medical Sciences is the first of its kind in the world, established to deliver the critical mission of fostering hearing health equity both globally and locally. This article describes the Center's approach, which is built on inclusive, multidisciplinary collaboration guiding a research-driven, public-health oriented agenda to develop evidence that is directly translatable to policy change. The end goal is to generate momentum towards sustained solutions that will create a new future with hearing care accessible to all.

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Caregiver Coaching in Early Childhood Intervention

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Everyday life activities provide development-enhancing learning opportunities for young children. Since parents, teachers, child care providers, and other caregivers are with infants and toddlers more frequently and for longer periods of time than early childhood intervention practitioners, caregivers need to know how they can support their child's learning within the context of their interest-based activities in the home, community, and early childhood classroom. Coaching is an adult learning strategy and interaction style that may be used by early childhood intervention providers to build the competence and confidence of caregivers to use responsive strategies within these development-enhancing activities that will achieve their desired outcomes.

All young children learn new skills and improve existing ones by participating in everyday activities with the important people in their lives. When the development of infants and young children appears delayed or they are diagnosed with a syndrome or condition that may result in a high probability of delay, families may choose to access some support with promoting their children's learning. Part C of the Individuals with Disabilities Education Act (IDEA) helps ensure that children who are eligible and their families receive timely support from a team of individuals representing various disciplines (IDEA, 2004). IDEA also emphasizes that parents and other important people in the child's life are members of the team, are involved in the development of the Individualized Family Service Plan (IFSP), and participate in the intervention process. How services are provided can significantly impact children and their families, thus early childhood intervention practitioners must be certain they are using the most current research-based practices to ensure success. This includes involving caregivers and providing supports within the context of children's and families' typical activities to provide greater opportunities to develop and practice new skills naturally. Caregivers will then know how to maximize the development-enhancing learning opportunities that can occur as part of routine events such as mealtime, dressing, car rides, etc. Coaching is an evidence-based adult learning strategy used by early childhood intervention providers to build the capacity of caregivers to support children's development as part of their daily activities rather than focus on learning only when the provider is present (Rush & Shelden, 2020).

Coaching has become a widely used means of interacting with the important adults in the lives of children enrolled in IDEA Part C early intervention services, and a variety of different coaching approaches are referenced in the early childhood intervention literature (Friedman et al., 2012; Rogers et al., 2021; Rush & Shelden, 2011, 2020; Snyder et al., 2015). The

field of early childhood intervention does not have a universally agreed upon operational definition of coaching, which leads to the variability in how the practice may be applied. A frequently cited (e.g., Kemp & Turnbull, 2014; Movahedazarhouli, 2019; Ward et al., 2019), operational definition of coaching in early childhood intervention is:

“An adult learning strategy in which the coach promotes the learner's (coachee's) ability to reflect on his or her actions as a means to determine the effectiveness of an action or practice and develop a plan for refinement and use of the action in immediate and future situations.”
(Rush & Shelden, 2005, p. 3)

This definition was developed and the characteristics of the practice were identified based on a review of over 30 research studies (Rush & Shelden, 2011). When compared to other coaching paradigms across fields of study, the caregiver coaching process described in this article uses an expert-based approach (Ackland, 1991) and contextual model (Akamoglu & Dinnebeil, 2017; Desimone & Pak, 2016; Friedman et al., 2012) with elements of goal-oriented (Ives, 2017; Megginson, 2014) and adult learning coaching approaches (Cox, 2015).

BACKGROUND & RATIONALE FOR CAREGIVER COACHING IN EARLY CHILDHOOD INTERVENTION

Caregiver Coaching is Expert-Based

The early coaching literature delineates the two basic forms of coaching as either expert-based or peer-to-peer (Ackland, 1991). Expert-based coaching uses an individual with specialized knowledge and skills as the coach whereas peer-to-peer coaching involves two individuals who are both learning a new skill at the same time. Caregiver coaching in early childhood intervention is expert-based rather than peer-to-peer. This does not mean that parents and caregivers do not have

expertise. Parents are the experts on their child and family, and early intervention practitioners must obtain and can build upon the unique knowledge of families and caregivers to effectively promote child learning. Coaching in early childhood intervention is expert-based because IDEA Part C requires those working in early intervention to have expertise in their role by meeting discipline-specific, program, and state standards (IDEA, 2004). Many professional organizations provide guidelines that document the role of and expertise needed by individuals working in early intervention and some, including the American Academy of Pediatrics, refer specifically to the use of coaching when supporting caregivers (Adams et al., 2013; ASHA, 2008; AOTA, 2013; APTA, 2019; DEC, 2014). The “Mission and Key Principles for Providing Early Intervention Services in Natural Environments” indicate that the role of early intervention practitioners is to help family members and other caregivers promote their child’s learning and development as part of their typical daily activities (Workgroup on Principles and Practices in Natural Environment, 2008).

How early intervention practitioners (i.e., therapists, teachers, audiologists, nurses, etc.) provide services is critically important and can determine whether or not early intervention will be successful (Dunst & Trivette, 2009). Coaching is a specific, capacity-building, help-giving strategy found to be effective when used in early childhood intervention. Several syntheses of research studies of caregiver coaching in early intervention have documented positive child and family outcomes (Elek & Page, 2019; Kemp & Turnbull, 2014; Tomeny et al., 2020; Ward et al., 2019). A recent review and meta-analysis found that coaching had positive effects when used to teach caregivers in early intervention as compared to other instructional approaches (Sone et al., 2021), and other authors have referred to the positive impact of coaching caregivers for children with specific diagnoses (Akamoglu & Dinnebeil, 2017; An et al., 2019; Dunn et al., 2012; Graham et al., 2013, 2014; Turner-Brown, 2019).

Caregiver Coaching is Goal-Oriented

Effective help-giving also requires that practitioners are responsive to the priorities of the family and other caregivers. Rather than the practitioner determining the goals and outcomes the child and family will be expected to achieve, IDEA Part C requires the use of an IFSP in which the caregivers identify the outcomes they want for their child and family. Caregiver coaching is goal-oriented. The focus of the coach is on assisting the caregivers to build on their existing strengths and determine how to support the caregivers with achieving the child and family outcomes on the IFSP.

Caregiver Coaching is Contextual

Young children with developmental delays and disabilities as

well as those who are typically-developing learn new skills and practice existing ones by participating in everyday activities with the important people in their lives (Campbell & Sawyer, 2007; Dunn et al., 2012; Dunst et al., 2006; Hwang et al., 2013). IDEA Part C requires that services and supports for eligible children and their families be provided in their natural environments (IDEA, 2004). Natural environments are the locations where children would be if they did not have disabilities (IDEA, 2004). Principle 1 of the “Mission and Key Principles for Providing Early Intervention Services in Natural Environments” states, “Infants and toddlers learn best through everyday experiences and interactions with familiar people in familiar contexts” (Workgroup on Principles and Practices in Natural Environment, 2008, p.2). Early childhood intervention providers use natural learning environment practices to support parents of children with disabilities and others in understanding the critical role of everyday activity settings, child interests, and caregiver responsive interaction strategies as the foundation for children’s learning (Dunst, 2006).

Caregiver Coaching is Consistent with Adult Learning Principles

Principle 3 of the “Mission and Key Principles for Providing Early Intervention Services in Natural Environments” is, “The primary role of a service provider in early intervention is to work with and support family members and caregivers in children’s lives” (Workgroup on Principles and Practices in Natural Environment, 2008, p.2). Most early childhood teachers and pediatric therapists are taught to work directly with young children. In early childhood intervention, however, the principal learners are the adults who are with the child during more of their waking hours than an early intervention provider because development-enhancing learning opportunities happen all day, every day.

The National Research Council (NRC) conducted a research synthesis on human learning to identify teaching practices and environments that promote successful learning (Bransford et al., 2000). Findings of the NRC report indicated that in order for a learner to acquire new knowledge, the individual must develop an understanding of how that knowledge can be used in a specific context and also generalized to other situations (Bransford et al., 2000). The NRC identified three key findings from the research synthesis. First, an individual enters a learning situation with preconceived ideas about a subject matter. As a result, the learner may not develop an understanding of new information and skills being taught if their current understanding is not recognized. Second, to develop a deeper level of understanding in a particular area, the learner must understand the facts as they relate to the particular situation and organize the information for easy recall, use, and generalization to other situations. Third, the learner must develop the ability to self-assess one’s current

level of understanding, determine what additional knowledge and skills might be needed, and measure progress (Bransford et al., 2000). Coaching is defined as an adult learning strategy and the research-based characteristics of coaching are consistent with the NRC findings (Rush & Shelden, 2011, 2020).

Other research syntheses have also focused on adult learning and found coaching to be a proven strategy. A research synthesis from the implementation science literature examined practice implementation research and found that coaching was an effective approach for supporting the implementation of newly learned skills and practices as part of an intervention (Fixsen et al., 2005). Trivette et al. (2009) examined the research related to the characteristics of four adult learning methods. Findings indicated that the more active participation on the part of the learner, the stronger the outcomes. Coaching provides for active participation through the characteristics of action/practice, reflection, and joint planning (Rush & Shelden, 2011, 2020).

THE CAREGIVER COACHING PROCESS

Because how services are provided can determine the success of the intervention, coaching is the *adult learning* strategy an *expert* in early childhood intervention uses when operationalizing effective help-giving and a capacity-building approach to support caregivers in achieving their desired *goals* for the child by using interest-based everyday activities as the *context* for child learning and development. An early intervention practitioner who uses coaching keeps the caregiver in the lead with the child as much as possible to not only recognize and build their competence and confidence in supporting the child's learning during the visit, but also, most importantly, between visits when they are participating in their usual routines and activities as part of family, community, and early childhood classroom settings. The coach helps caregivers recognize what they are already doing that works to support child development and build on existing or identify new ideas rather than just telling the caregiver what to do or working exclusively with the child while the caregiver watches or carries on with other tasks. Coaching involves asking questions; jointly thinking with the caregiver about what works, does not work, and why; the caregiver trying new strategies with the child; modeling by the coach if necessary; sharing information; and jointly planning next steps (Rush & Shelden, 2020). A coaching interaction occurs during an activity the child and family would typically be doing at the time of the visit and is as hands-on (caregiver and coach) as it needs to be to support the caregiver in knowing how to foster the child's participation in the activity.

Understanding the characteristics or specific activities required to implement a practice is important so a practitioner will

know what to do in order to achieve the desired effect (Fixen et al., 2015). The coaching research synthesis by Rush and Shelden (2011) was guided by a process that focused on the extent to which the specific characteristics of the practices are related to differences in their outcomes or consequences (Dunst et al., 2002). More specifically, the research synthesis examined the characteristics of coaching that were related to variations in the use of newly learned practices or improvement of existing skills. The coaching research studies included as part of the synthesis suggest that coaching has five practice characteristics that lead to the intended outcomes: (1) joint planning, (2) observation, (3) action/practice, (4) reflection, and (5) feedback. The characteristics are used in combination to recognize current knowledge, improve existing abilities, develop new skills, and deepen the understanding of the person being coached. These five characteristics were substantiated by a research synthesis conducted by Artman-Meeker and colleagues (2015), and individual characteristics have also been further examined as related to the coaching process (Elek & Page, 2019; Lorio et al., 2020, 2021; Tomeny et al., 2019; Ward et al. 2019).

Joint Planning

Use of a capacity-building approach requires active participation on the part of the caregiver (Dunst et al., 2014; Dunst & Trivette, 2009; Trivette & Dunst, 2007). Active participation occurs as part of several coaching characteristics, but the characteristic of joint planning is used to ensure the caregiver practices new skills that continue to foster child learning as part of everyday activities until the next scheduled visit. Joint planning is the process of determining what the coach and caregiver will each be responsible for doing between visits and in preparation for the next visit. The joint planning process has four parts: (1) revisitation of the previous between visit plan, (2) plan for the current visit, (3) new between-visit plan, and (4) new next-visit plan.

Revisitation of the Previous Plan

Each coaching conversation typically begins by revisiting the previous between-visit plan to determine what worked and if the caregiver might need some additional support to promote the child's learning in that activity. If that activity is the same as what the caregiver and coach had planned to do during the current visit (e.g., snack time), then the coach, caregiver, and child may move into the activity to build on what worked and/or further analyze what did not work as well as identify new ways to improve the child's participation. If the between-visit plan activity is something that is not time-bound (e.g., throwing a ball for the dog to retrieve in the backyard), then the caregiver might engage the child in the activity while the coach is present to receive further support. If the activity that

was part of the previous between-visit plan would not typically occur at the time of the visit (e.g., getting ready for bedtime), then the caregiver and coach would engage in a discussion to reflect on the child's participation and caregiver responsive strategies used, and then consider a plan for continued implementation. If the caregiver and child are ready to begin the planned activity immediately upon arrival of the coach or are in the midst of the activity when the coach arrives, then the previous joint plan may be reviewed later in the visit or the caregiver might refer to what they had been doing between visits as it relates to the current activity.

Plan for the Current Visit

Every early childhood intervention visit should be based on a joint plan the caregiver and coach outlined at the conclusion of their previous visit. The plan should not be determined at the beginning of the visit and consist of toys or materials the coach brought; focus on a "lesson" or "exercise" the coach and caregiver create at the moment to work on a particular skill (e.g., putting raisins in a cup to work on counting; simply engaging the child in a play routine, putting together a puzzle, or reading a book because those types of activities can occur "anytime;" or based on the caregiver's response to the question, "What do you want to work on today?"). The plan for the visit is a real-life, interest-based activity that the caregiver and child would be doing at this time if the coach was not present, which is the reason why the coach scheduled the visit with the caregiver on this day at this time. The plan also includes what the caregiver wants the child to learn or be able to do in order to fully participate in the activity as well as what the caregiver wants to learn to help the child be able to successfully participate.

New Between-Visit Plan

All coaching conversations end with a new two-part joint plan. The first part is the new between-visit plan. This plan is developed by the caregiver with assistance from the coach as needed and may be a continuation of what occurred during the visit and/or generalization of newly learned skills to other typical activities and routines. The between-visit plan delineates the specific activities in which the caregiver will practice new strategies for promoting the child's participation, thereby providing the child with opportunities to use and further develop targeted skills. The activities selected for the between-visit plan are generally already occurring and happen frequently enough to provide practice for the caregiver and child. They should not be perceived as an extra task, exercise, or homework the caregiver must perform, thereby decreasing the likelihood of happening.

New Next-Visit Plan

The second part of the new two-part joint plan developed at the end of the coaching conversation is the next-visit plan. The purpose of this plan is to identify the family, community, or early childhood program activities that will serve as the context for the following visit based on the IFSP outcomes and caregiver's priorities for the child. Selection of the activities for the next visit helps to determine the day and time the coach should return as it needs to coincide with when the activity would normally happen for the caregiver and child. The caregiver and coach also discuss how the caregiver wants the child to participate in the activity and what the caregiver wants to learn to support the child's participation. The coach asks the caregiver to determine how much time is needed for practice before the coach should return.

Observation

The purpose of observation is for the coach to see the caregiver and child involved in a real-life activity in which the caregiver wants the child to successfully participate (e.g., walk to the kitchen table, tell the caregiver what she wants to eat, or reach for the spoon). The activity may currently be going well, so the caregiver and coach could determine what is happening to cause the success and perhaps how the strategies or actions of the caregiver could be transferred to other settings. The caregiver may want the coach to observe an activity because it is problematic so they can analyze what is causing a particular behavior or lack thereof, then brainstorm strategies for the caregiver to try. Observation provides the coach with content on which the coach and caregiver may reflect to expand the caregiver's and child's learning opportunities in the moment. Conversely, the caregiver might observe the coach model a technique as an option for the caregiver to use to help the child learn a new skill or behavior, if necessary. Modeling by the coach may be helpful with permission when the caregiver (1) is a visual learner, (2) asks to see the coach demonstrate the strategy, or (3) expresses frustration while trying to engage the child or the child becomes agitated and the coach does not want the caregiver and child to miss an important learning opportunity. Observation of the coach by the caregiver should be intentional. That is, the coach should ensure the caregiver knows what the coach is going to do and why, and then the coach provides the caregiver with the opportunity to practice what the coach just demonstrated while the coach observes.

Action/Practice

Another opportunity for active participation as part of the caregiver capacity-building process is the coaching characteristic of action/practice. As part of the visit, the

caregiver immediately practices new ideas for promoting the child's learning during planned and spontaneous real-life activities occurring at that time. Action/practice typically follows observation, reflection, and, if necessary, feedback. The coach may provide modeling, prompts, direct teaching, reflection-in-action, and reflection-on-action as appropriate to support the caregiver's success with promoting the child's learning within the observed daily activity. The caregiver takes action between coaching visits by using what was learned during the visit and included in the joint plan.

Reflection

Reflection is the characteristic that differentiates coaching from other adult learning strategies. Rather than observing, assessing, and then suggesting or telling the caregiver what to do, reflection is consistent with a capacity-building and strengths-based approach by demonstrating respect for what the caregiver already knows and jointly considering how their ideas might work best for the child and family. A key finding of the research synthesis on how people learn was that everyone can be taught to reflect (Bransford et al., 2000). The coach gives the caregiver the opportunity to reflect during the visit to recognize and build upon the caregivers existing knowledge and skills. Reflection increases caregiver competence and confidence so they know what to do when the coach is not present, instead of creating dependence on the coach to solve problems, provide solutions, and work exclusively with the child. The coach prompts reflection by asking open-ended questions that create awareness by the coach and caregiver of what the caregiver already knows to do, is doing, or has tried to do to foster the child's learning and development, and provides opportunities for the caregiver to analyze how previously used strategies have worked in the past or how new approaches are currently working. The use of reflection in a coaching conversation also provides the caregiver with the opportunity to propose new ideas for how to help the child and accomplish the IFSP outcomes.

Reflection occurs on, in, and for action (Schon, 1987). Revisiting the previous between-visit plan at the beginning of the next visit allows the caregiver to reflect on how the targeted interest-based, everyday activity and responsive strategies worked to promote the child's participation in the activity, and determine if more support is needed from the coach related to that activity setting at this time or not. Reflection-on-action can also occur during the visit when the coach asks the caregiver to analyze the child's participation and caregiver's responsiveness *following* an activity observed by the coach. Reflection-in-action involves the coach asking the caregiver to analyze their use of specific responsive strategies while the caregiver and child are participating in a specific activity (e.g.,

caregiver using the "take a turn and wait" strategy for prompting the child's use of a word to request a bite of food at breakfast). If the strategy is not working as planned, the coach may prompt the caregiver to identify ways to modify the activity or strategy. Reflection-in-action may provide the caregiver and child with multiple opportunities to determine what works and practice within the context of an activity while the coach is present to assist (if needed). Reflection-for-action is used by the coach to help the caregiver think through or develop a plan for how to improve the child's learning and development during a targeted family activity (e.g., helping to find specific items while riding in the grocery cart at the store). The coach may be present if this is an activity planned to be the focus of the visit, so the coach and caregiver would spend a few minutes reflecting on the plan for what the caregiver will be doing with the child during the activity. Reflection-for-action also occurs when developing the between-visit and next-visit plans. The coach asks the caregiver to think about the interest-based activity setting(s) in which the caregiver wants to practice specific responsive strategies that will be best to encourage child learning between the current visit and next visit as well as how much time needs to pass between visits to give ample time for the caregiver and child to engage in that activity. The caregiver also reflects on what interest-based activity setting would be most helpful as the context for the next visit as well as what the caregiver wants the child to learn as a result, and when would be the best time to schedule the visit according to when the activity usually occurs.

Feedback

Feedback is provided by the coach based on an observation or at the request of the caregiver, actions shared by the caregiver, or reflections provided by the caregiver related to the past, current, or planned activity. Feedback may follow an observation (coach's or caregiver's), reflection, action, or practice opportunity. The coach should prompt caregiver reflection or sharing of information prior to giving any feedback. Feedback is provided as necessary to build the caregiver's knowledge, skills, and/or confidence, or in response to a direct question from the caregiver. Feedback takes many forms. It can be information provided by the coach to deepen the caregiver's understanding and should be research-informed rather than the coach's personal opinion. Feedback may also be a verbal or nonverbal acknowledgement or affirmation of what the caregiver is saying or doing. Feedback also includes praise, positive reinforcement, and encouragement, although this type of evaluative feedback should be used carefully and intentionally to avoid creating the caregiver's dependence on the coach's approval or coming across as patronizing. Feedback should not be directive in the form of suggestions or recommendations given prior to the

caregiver having the opportunity to share and reflect. Directive feedback creates dependence on the coach and does not ensure the caregiver can or will apply the feedback.

Use of the coaching characteristics is not a linear or step-by-step process, but rather a natural and logical conversation as it transpires within the context of the interaction. Typically, the coach begins and ends with joint planning. Observation and action/practice occur when the caregiver and child are engaged in the real-life activities that are planned as the focus of the visit. Reflection and feedback may be used prior to, during, and/or after the activity as well as part of the re-visitation of the previous between-visit plan and development of the new two-part joint plan at the end of the visit.

CONCLUSION

Caregiver coaching is an expert-based, goal-oriented, and contextualized approach to adult learning that may be implemented by early childhood intervention practitioners to build the competence and confidence of parents, child care providers, and other important people in the child's life and promote child learning and development. Because young children learn by participating in interest-based, everyday activities, the focus of coaching is on the caregiver knowing what to do to promote development as part of their routine interactions, thus providing frequent opportunities for the child to learn and practice new skills. Coaches operationalize the five research-based characteristics of observation, action/practice, reflection, feedback, and joint planning to support caregivers' use of natural, interest-based learning opportunities and responsive strategies. Through the application of these natural learning environment practices and a coaching interaction style, early intervention practitioners empower caregivers to achieve their desired priorities for themselves and the children.

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Preliminary Findings: Early Turn Talking is Associated with Later Social-Emotional Development

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Preliminary findings from a follow-up study of 33 children, assessed for their socioemotional development from 18 months of age, are presented. At 77 months, they were evaluated again in a laboratory context, recording on video a situation of discussion of a conflict with the caregiver and then coding these videos using the CIB instrument. Conversation turns assessed with the LENA software at 18 and 30 months of age are associated with socioemotional cognition, emotion regulation, and emotional communication competencies assessed at 77 months of age. The association is stronger at 30 months than at 18 months, suggesting a possible mediation effect to be explored in future analyses. Implications for professional intervention and public policies for children are discussed.

BACKGROUND

In 1995, Hart and Risley's groundbreaking study showed the world that the number of words adults direct at children predicts the development of their language skills. Subsequent research confirmed the importance of talking to infants and toddlers from an early age to promote their cognitive and linguistic development (Chapman, 2000; Hart & Risley, 1995; Gilkerson et al., 2018; Hirsh-Pasek et al., 2015; Hoff, 2006; Romeo et al., 2017; Rowe, 2008).

Based on these and other pieces of evidence, we conducted a study between 2016 and 2019 that explored the longitudinal relationships between the number of conversational turns (assessed using the LENA software; Weisleder & Fernald, 2013) at 18 months of age and socioemotional development at 30 months. The results of this study were published in *Developmental Science* (Gómez & Strasser, 2021) and received significant attention from the international scientific community as they provided evidence regarding how conversational turns also influence socioemotional development.

In that study, we measured 43 infants' language environment and socioemotional competencies at 18 months and again at 30 months of age. Using hierarchical multiple regressions, we found that turn-taking at 18 months contributed significantly to the development of all socioemotional competencies assessed at 30 months (attachment, emotion regulation, and emotional communication). This relationship held even after controlling for baseline levels of each assessed socioemotional competency, as well as for infant vocalizations, maternal warmth, infant temperament, and cumulative social risk (an index that combined poverty, overcrowding, maternal depression, maternal adolescent, low educational level of the mother, and alcohol abuse or domestic violence in the family)

at 18 months of age. Additionally, we performed cross-lagged analyzes that revealed that the direction of the longitudinal relationship between conversational turns and emotional competencies went more strongly from conversational turns to socioemotional development (but not the other way around), providing evidence of a possible causal relationship and initiating a promising line of research in the field.

The initial findings of our work (Gómez & Strasser, 2021) left a set of relevant questions to be considered in further studies: (a) although infants' early vocalizations were used as a control variable, it is important to explore the degree to which children's language skills are associated with turn-taking and to what extent the development of their socio-emotional skills is associated with, for example, language and vocabulary development at later ages; (b) socioemotional competencies were evaluated using a play situation, free of induced stress, making it more difficult to observe their performance under situations of greater emotional and interpersonal demand, such as, for example, in a conflict situation associated with unpleasant or painful emotions or thoughts; and perhaps the most relevant question of all, (c) whether conversational turns in early childhood continue to be significant predictors of social-emotional development in school and beyond.

METHOD

In 2021, the Relational Neuroscience Laboratory of Fundación América por la Infancia in Santiago, Chile, conducted a follow-up study of the children from the original study by Gómez and Strasser (2021), who were now in school and ages 6 to 7 years old.

To do this, a trained research assistant made telephone contact with each family of the original sample to explain the nature

of the study, following a written protocol. With those families that were available to participate, they were offered transportation to go from their homes to the laboratory and back, respecting a series of care protocols for reasons of the COVID-19 pandemic. The boy or girl identified as a participant in the original study, plus the mother or primary caregiver, attended the laboratory. The Informed Consent form for adults and the Informed Assent form for children were read and explained in detail. All procedures and instruments were approved by the Scientific Ethics Committee of Fundación América por la Infancia.

Instruments

The following instruments were applied: (a) a sociodemographic characterization sheet, (b) the Peabody test to evaluate vocabulary, (c) the protocol recorded on video for coding with the CIB instrument, (d) the Dp-3 questionnaire, (e) the BarON, (f) the Hearts and Flowers test, and (g) the Gaze Test. In this article, correlational findings are reported and centered on the CIB–Coding Interactive Behavior, an instrument that has been widely used in research due to its precision and versatility in addition to having adequate psychometric properties of validity and reliability (Feldman, 1998; Halevi et al., 2017; Ulmer-Yaniv et al., 2017).

The CIB protocol was designed in the Laboratory of Dr. Ruth Feldman in Israel and consists of videotaping a discussion of a *mother-child conflict situation*. The advantage of this protocol is that, by confronting the child with a discussion about a conflict with their attachment figure, emotional stress is induced, and a cognitive, regulatory, and communicational challenge is generated that summons socio-emotional skills for its resolution. This situation was evaluated by combining specific codes from the CIB instrument according to theoretical relevance so that we could assess the three socio-emotional competencies proposed by Gómez and Strasser (2022): (a) socio-emotional cognition, (b) emotion regulation, and (c) emotional communication.

Socioemotional cognition is defined as the ability to pay attention to social and emotional cues and understand them in a referential framework of meaning. It includes socio-emotional attention, which focuses the organism on social cues and emotional indicators, as well as socio-emotional interpretation, which allows understanding the meaning of social cues and the emotions, intentions, and mental states of oneself and others, combining mentalization and empathy.

To assess socioemotional cognition, the following CIB codes were used: (a) *child's gaze*: the child's gaze is constantly focused on the parent or on the joint activity and maintains eye contact throughout the interaction; (b) *motivation*: the child tries to explain his/her point of view to the parent and

makes an effort to understand the parent's perspective during the discussion of the conflict; (c) *initiative/creativity*: the child contributes ideas and solutions to the conflict and develops these ideas, such as being proactive, suggesting what to talk about, contributing ideas and perspectives, to try to resolve the relational conflict with the parent figure. The internal consistency of these three items was very good, obtaining a Cronbach's alpha of $\alpha = .83$.

Emotion regulation is defined as "the process of initiating, avoiding, inhibiting, maintaining, or modulating the occurrence, form, intensity, or duration of emotional states, emotion-related physiological or attentional processes, motivational states, and/or the behavioral concomitants of emotion, in the service of achieving biological or social adaptation linked to affects" (Eisenberg & Spinrad, 2004). In our model, emotion regulation is made up of inhibitory control and emotional modulation capacities.

To assess emotion regulation, the following codes were used: (a) *affective lability*: the child's affect is labile and shows sudden changes in mood and emotional expression; the child switches from engagement to disengagement or from positive to negative emotionality for no obvious reason or in response to situational events; the reaction is disproportionate to the situation and the affect is unpredictable; (b) *acceptance of limits*: the child respects and accepts the limits that the parent sets regarding ways of talking (e.g., yelling, humiliating the parent, cursing) or other limits set by the parent. The child can accept parental requests during the interaction (e.g., "I want you to sit down and stop walking around the room until we are finished"); (c) *cooperation*: the extent to which the child cooperates with the parent in the task, showing willingness to hold a conversation about a relational conflict in search of a solution or agreement. The internal consistency of these three items was acceptable, obtaining a Cronbach's alpha of $\alpha = .63$.

Finally, *emotional communication* refers to the use of various communication mechanisms to share the emotional world by connecting, linking, coordinating, and interacting successfully with others, including verbal communication and gestural, corporal, and non-verbal communication skills.

To assess emotional communication, the following CIB codes were used: (a) *conversational involvement*: the child engages in conversation, collaborates, exhibits positive affect, shows interest, and shows that the interaction is important to him or her; (b) *child vocalization*: refers to the child's vocalizations that are part of social interaction with the caregiver and how the child talks to the caregiver (including laughter); it is not about how much you talk, but how you express yourself verbally in the interaction when discussing a conflict; (c) *self-confidence*: the degree to which the child dares to

TABLE 1: Correlations between language variables at 18, 30, and 77 months (N=33)

		Child vocalizations 18m	Vocabulary 77m	Conversational Turns 18m	Conversational Turns 30m
Child vocalizations 18m	<i>R</i>	1	.326	.597**	.290
	<i>Sig.</i>		.064	.000	.101
Vocabulary 77m	<i>r</i>	.326	1	.209	.428*
	<i>Sig.</i>	.064		.243	.013
Conversational Turns 18m	<i>R</i>	.597**	.209	1	.660**
	<i>Sig.</i>	.000	.243		.000
Conversational Turns 30m	<i>R</i>	.290	.428*	.660**	1
	<i>Sig.</i>	.101	.013	.000	

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

express his/her point of view clearly and assertively in the presence of the caregiver; confidence is reflected not only by presenting a safe position, but also when the caregiver and the child are expressing different points of view or opinions and when the child disagrees with something the caregiver said. The internal consistency of these three items was good, obtaining a Cronbach's alpha of $\alpha = .79$

RESULTS

First, the data was explored descriptively, to then perform correlational analyzes between the variables. The children were distributed in 54% men and 46% women, with an average age of 6.4 years ($SD = 0.5$), equivalent to 77 months of age on average. The caregivers were 94% women (mainly mothers) and 6% men (grandparents), and their average age was 36.7 years old ($SD = 8.7$).

Language Variables

The vocalizations of the boys and girls at 18 months averaged 161.5 ($SD = 66.2$), with a minimum of 20 and a maximum of 345 vocalizations per hour. Regarding the conversation turns, at 18 months of age they averaged 43.6 ($SD = 20.7$) with a minimum of 7 and a maximum of 105; and an average of 60.9 ($SD = 26.0$) with a minimum of 19 and a maximum of 132 at 30 months, showing a clear upward trend in the number of conversational shifts between 18 and 30 months of age. Regarding the vocabulary evaluated at 77 months, an average of 97.3 ($SD = 22.6$) was observed, with a minimum of 4 and a maximum of 123. The associations between these variables can be seen in Table 1.

Vocalizations at 18 months are only concurrently associated with conversational turns, but do not predict turns at 30 months or vocabulary at 77 months, although the strength of the correlation in the latter case was $r = .326$, with $p = .064$ being marginally significant. In contrast, conversational turns at 30 months do show a significant association with vocabulary at 77 months with $r = .428$ and $p = .013$.

Variables of the Family System and Socio-Emotional Competencies

The cumulative risk averaged 1.6 ($SD = 1.4$), with 30.3% registering zero risk factors, 18.2% one factor, 24.2% two factors, 12.1% three factors, and 15.2% four risk factors accumulated in the family system. The correlations between the variables of the family system (accumulated risk, the child's temperament, and the mother's emotional warmth) at 18 months, and the children's socio-emotional competencies at 77 months are shown in Table 2.

As can be seen, neither the cumulative risk nor the baby's temperament at 18 months are longitudinally associated with socioemotional competencies five years later. In contrast, the emotional warmth of the mother at 18 months does show a significant association with socio-emotional cognition ($r = .463$), emotion regulation ($r = .392$), and emotional communication ($r = .398$).

Socioemotional Competencies

Regarding the longitudinal measures of socio-emotional development, an association was observed between the variables evaluated within each age considered (at 18 months, 30 months, and 77 months) but not between the ages evaluated (see Table 3). In other words, trajectories of wide variability are observed in the socio-emotional development of boys and girls as time goes by whereas, for example, emotion regulation at 18 months is not associated with emotion regulation at 30 or at the 77 months.

Conversational Turns and Social-Emotional Development

Table 4 shows that children's vocalizations at 18 months are not longitudinally associated nor are their vocabulary at 77 months concurrently associated with socioemotional competencies at 77 months. Additionally, conversational turns at 18 months do not show a relationship with socioemotional cognition or emotional communication at 77 months, but they do with emotion regulation ($r = .393$). On the other hand, the conversational turns at 30 months do show a relevant

TABLE 2: Correlations between family system variables at 18 months and socioemotional competencies at 77 months (N=33)

		Cumulative Risk 18m	Temperament 18m	Emotional Warmth 18m	Socioemotional Cognition 77m	Emotion Regulation 77m	Emotional Communication 77m
Cumulative Risk 18m	<i>r</i>	1	.153	-.023	-.287	-.138	-.244
	Sig.		.395	.899	.105	.445	.170
Temperament 18m	<i>r</i>	.153	1	.039	.129	.042	.142
	Sig.	.395		.831	.475	.817	.432
Emotional Warmth 18m	<i>r</i>	-.023	.039	1	.463**	.392*	.398*
	Sig.	.899	.831		.007	.024	.022
Socioemotional Cognition 77m	<i>r</i>	-.287	.129	.463**	1	.742**	.856**
	Sig.	.105	.475	.007		.000	.000
Emotion Regulation 77m	<i>r</i>	-.138	.042	.392*	.742**	1	.695**
	Sig.	.445	.817	.024	.000		.000
Emotional Communication 77m	<i>r</i>	-.244	.142	.398*	.856**	.695**	1
	Sig.	.170	.432	.022	.000	.000	

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

TABLE 3: Correlations between socio-emotional development variables at 18, 30, and 77 months (N=33)

		CS 18m	RE18m	CE 18m	CS 30m	RE 30m	CE 30m	CS 77m	RE 77m	CE 77m
CS 18m	<i>r</i>	1	.768**	.746**	.235	-.051	.318	.292	.151	.216
	Sig.		.000	.000	.219	.791	.093	.099	.402	.228
RE 18m	<i>r</i>	.768**	1	.703**	.305	.121	.307	.246	.141	.070
	Sig.	.000		.000	.107	.533	.105	.167	.435	.698
CS 18m	<i>r</i>	.746**	.703**	1	.276	.069	.469*	.218	.184	.199
	Sig.	.000	.000		.148	.722	.010	.223	.305	.266
CS 30m	<i>r</i>	.235	.305	.276	1	.696**	.537**	.228	.351	.001
	Sig.	.219	.107	.148		.000	.003	.234	.062	.994
RE 30m	<i>r</i>	-.051	.121	.069	.696**	1	.517**	-.023	.125	-.168
	Sig.	.791	.533	.722	.000		.004	.905	.517	.384
CE 30m	<i>r</i>	.318	.307	.469*	.537**	.517**	1	.318	.347	.186
	Sig.	.093	.105	.010	.003	.004		.093	.065	.334
CS 77m	<i>r</i>	.292	.246	.218	.228	-.023	.318	1	.742**	.856**
	Sig.	.099	.167	.223	.234	.905	.093		.000	.000
RE 77m	<i>r</i>	.151	.141	.184	.351	.125	.347	.742**	1	.695**
	Sig.	.402	.435	.305	.062	.517	.065	.000		.000
CE 77m	<i>r</i>	.216	.070	.199	.001	-.168	.186	.856**	.695**	1
	Sig.	.228	.698	.266	.994	.384	.334	.000	.000	

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

CS = socioemotional cognition; ER = emotion regulation; CE = emotional communication

predictive association of socioemotional competencies at 77 months, both for socioemotional cognition ($r = .558$), emotion regulation ($r = .558$), and for emotional communication ($r = .561$).

DISCUSSION

The relationship found between conversational turns at 30 months and vocabulary at 77 months could account for how everyday conversations that occur between the ages of

2 and 3 years old in boys and girls play a relevant role in the development of their later language and vocabulary, which is in line with findings previously reported in the literature (Chapman, 2000; Gilkerson et al., 2018; Hart & Risley, 1995; Hirsh-Pasek et al., 2015; Hoff, 2006; Romeo et al., 2017; Rowe, 2008).

The study did not find an association between the initial temperament of infants and their socioemotional development at school, which shows that temperament

TABLE 4: Correlations between language variables and socioemotional development at 77 months (N=33)

		VN 18m	VB 77m	TC 18m	TC 30m	CS 77m	RE 77m	CE 77m
VN 18m	<i>R</i>	1	.326	.597**	.290	.054	-.123	-.030
	<i>Sig.</i>		.064	.000	.101	.767	.496	.867
VB 77m	<i>R</i>	.326	1	.209	.428*	.158	-.122	.164
	<i>Sig.</i>	.064		.243	.013	.379	.498	.362
TC 18m	<i>R</i>	.597**	.209	1	.660**	.274	.393*	.198
	<i>Sig.</i>	.000	.243		.000	.123	.024	.269
TC 30m	<i>R</i>	.290	.428*	.660**	1	.558**	.558**	.561**
	<i>Sig.</i>	.101	.013	.000		.001	.001	.001
CS 77m	<i>R</i>	.054	.158	.274	.558**	1	.742**	.856**
	<i>Sig.</i>	.767	.379	.123	.001		.000	.000
RE 77m	<i>R</i>	-.123	-.122	.393*	.558**	.742**	1	.695**
	<i>Sig.</i>	.496	.498	.024	.001	.000		.000
CE 77m	<i>R</i>	-.030	.164	.198	.561**	.856**	.695**	1
	<i>Sig.</i>	.867	.362	.269	.001	.000	.000	

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

VN = child vocalizations; VB = child's vocabulary; TC = conversation turns; CS = socioemotional cognition; ER = emotion regulation; CE = emotional communication

and socioemotional development are different theoretical constructs that refer to different aspects of the person (Mangelsdorf & Frosch, 1999; Gross, 2014). Nor was a relationship found between the risk accumulated in family systems at 18 months and subsequent socio-emotional skills, which on one hand could be explained by the dynamism of family systems over the years, and on the other could show that there are proximal processes of greater direct influence than social and family risk in the development of children's socio-emotional skills, such as the emotional warmth of the attachment figure, parenting practices, daily interactions of good or maltreatment, and conversational turns, among other possibilities (Halevi et al., 2017; Gómez & Strasser, 2021, 2022; Gómez, 2022).

The relationship between the emotional warmth of the mother in early childhood and the socio-emotional competencies of children five years later is another interesting finding, which is consistent with research on the importance of positive parenting, sensitivity, and emotional availability of the caregiver in parenting for positive development over time (Gómez, 2022). The association was slightly stronger for socioemotional cognition (attention, mentalization, and empathy), while it was similar for both emotion regulation and emotional communication.

The finding of a stronger association of conversational turns at 30 months with socioemotional competencies at 77 months could be suggesting a mediation effect, in which part of the effect of conversational turns at 18 months passes through conversational turns at 30 months, a possibility that should be explored through mediation analysis in future publications.

The fact that neither vocalizations at 18 months nor vocabulary at 77 months showed a relationship with socioemotional competencies at 77 months reinforces the finding by Gómez and Strasser (2021) that the effect of conversational turns it was sustained even after controlling for the child's individual language skills. Conversational turns at 30 months predict vocabulary and socioemotional competencies of boys and girls at 77 months, but vocabulary is not concurrently associated with socioemotional competencies at that age. This underlines the specific importance of turn-taking as a possible central mechanism in explaining developmental trajectories of socio-emotional competencies. The present study adds to the preliminary longitudinal evidence of Gómez and Strasser (2021) regarding what happens with this relationship beyond early childhood to the school stage.

Combining the study by Gómez and Strasser (2021) (regarding the effect of turn-taking at 18 months on socioemotional development at 30 months) with these preliminary findings from a follow-up study at school (showing an effect of conversational turns at 30 months on socio-emotional development at 77 months), a possible causal mechanism of socio-emotional development throughout the life course is outlined, based on turns and on the exchange of back and forth that would act as a training ground, a laboratory for experimentation and daily discoveries that shape the skills of socio-emotional cognition, emotion regulation, and emotional communication at each age (Gómez & Strasser, 2022).

Future studies should determine the real scope of these preliminary conclusions, expanding the sample and improving the statistical power of the studies, diversifying the

characteristics of the participating subjects, making the data analysis models more complex, longitudinally extending the ages studied, diversifying the type of indicators of socio-emotional development considered (to include, for example, psychophysiological indicators, among other possibilities), and including measures not only of the number of turns of conversation but also of the content and quality of the narratives exchanged in those turns.

The implications of these findings, both for professional intervention and for public policies for children, are promising, although much more scientific evidence is still needed to support them. In its current embryonic state, the data suggest that informing and sensitizing the general population about the critical importance of talking to babies—especially of learning to hold dialogues (back and forth conversations with pause and a delicate wait for the intention of the child); training the ability to listen to the baby's vocalizations, paying attention to their signals to exchange sounds in the language, words, and expressions; waiting for the words and expressions of the child, to weave a shared narrative, that is conversational turns, shifts that give a space to the child's internal world as it expresses itself but that also offer the child the possibility of knowing the adult's own world—is key to teaching and professional intervention. If these findings are correct, working on this focus is a key piece to protect and promote positive trajectories of socio-emotional development not only in early childhood, but also in the school stage of boys and girls.

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Foundations for Literacy: A Research-Based Early Reading Program that Improves Outcomes for Children who are Deaf and Hard of Hearing

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One avenue for improving reading outcomes is to ensure children who are deaf or hard of hearing (DHH) enter school with the foundational skills needed to learn to read. Our research team developed an early literacy curriculum specifically for DHH children. Teachers use Foundations for Literacy (FFL) in a one-hour literacy block for the school year. Student learning objectives include improving spoken phonological awareness, alphabetic knowledge, word reading, vocabulary, and narrative. FFL is more systematic, and its instruction is more explicit, multi-modal, and intensive than might be used with children who have typical hearing. Much of the instruction is embedded in language-rich activities. Differentiation of instruction to the wide variation of language and phonological processing skills observed for children who are DHH is integral to the design. Results from multiple studies, including a randomized-control trial, indicates that FFL is an effective intervention for young DHH students.

Children who deaf or hard of hearing (DHH) and are acquiring spoken language need the same foundational skills to learn to read as children with typical hearing (TH). Researchers have found that phonological awareness, alphabetic knowledge, and vocabulary predict reading abilities in young deaf children with cochlear implants and hard-of-hearing children with hearing aids (Ambrose et al., 2012; Cupples et al., 2014; Easterbrooks et al., 2008; Lederberg et al., 2013; Nitttrouer et al., 2012; Webb & Lederberg, 2014; Webb et al., 2015). These studies showed that the majority of DHH children are delayed in these skills compared to TH children, with wide individual differences. There is a strong need for intervention in the early childhood years (3-5 years old) and beginning school years (5-6 years old) that focuses on these skills. Our interdisciplinary team developed and assessed the efficacy of an early literacy curriculum for DHH prekindergarten children, called *Foundations for Literacy* (FFL). This paper describes our research and the curriculum used.

BACKGROUND

Our team began the process of developing FFL with a systematic review of research that exists about effective early childhood education programs for TH preschoolers/prekindergartners (National Early Literacy Panel, 2008). Primarily based on the Simple View of Reading (Gough & Tumber, 1986) and Scarborough's Reading Rope (Scarborough, 2001), effective early childhood education programs focus on improving the fundamentals for learning to read by emphasizing

both the skills necessary to learn to decode or read individual words (referred to as code-based) and the skills necessary to understand what is read (referred to as meaning-based).

Code-based skills acquired during early childhood include both phonological awareness and alphabetic knowledge (i.e., knowledge of the relations between letter names, sounds, and shapes). Phonological awareness refers to the ability to identify and manipulate the sound units of spoken language. Phonological awareness skills typically taught during preschool include syllable segmentation (e.g., how many word parts are there in *popcorn*?), rhyming (do *cat* and *bat* rhyme?), initial sound identification (what is the first sound in *man*?), and blending sounds (Listen, *c-a-t*, what word do you hear?). Alphabetic knowledge includes letter-name (the name of this letter is m) and letter-sound knowledge (this letter says mmmm). In the United States, early childhood education programs have historically targeted teaching letter-name knowledge. However, evidence suggests that, for TH and DHH children who are acquiring spoken language, letter-sound knowledge has a stronger relation to learning to read because it is foundational to sounding out or decoding written words (National Early Literacy Panel, 2008; Webb, et al., 2015). In a meta-analysis of 78 studies with TH children, Shanahan and Lonigan (2010) found that code-based interventions improved phonological awareness and alphabetic knowledge in TH preschoolers. Interventions with the greatest impact on learning were those that taught phonological awareness and alphabetic knowledge together.

Early childhood programs also build meaning-based skills such as vocabulary and more complex language, which are foundational for reading comprehension (i.e., for understanding the words decoded.) Research suggests structured book-reading (such as dialogic reading) and language enrichment activities are effective in improving language. A meta-analysis of 37 early childhood programs found large to moderate effect sizes for increasing TH children's oral language skills, particularly vocabulary (Shanahan & Lonigan, 2010).

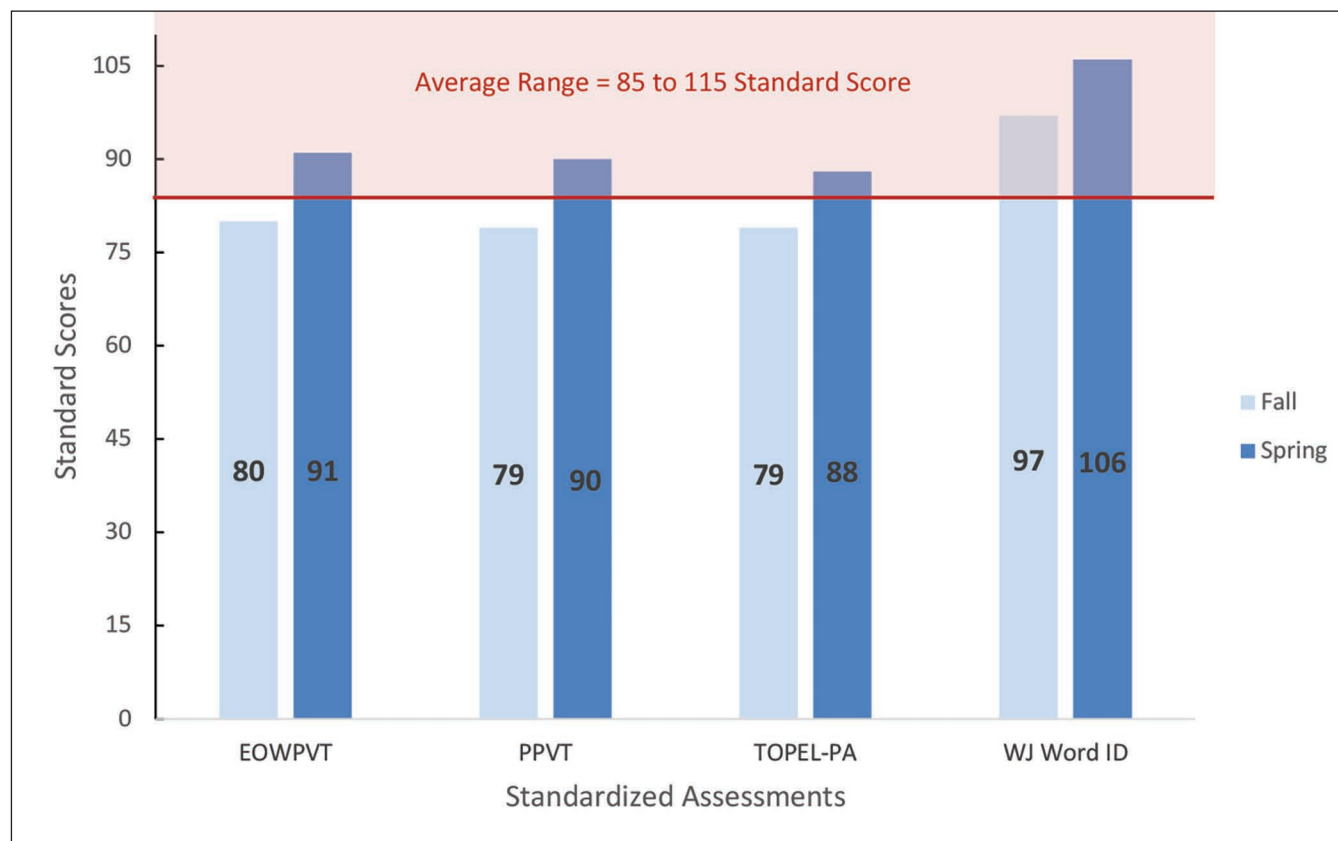
After examining available curricula developed for TH preschool children, our team decided they were not ideal for the majority of DHH children. Commonly used preschool curricula relied too heavily on incidental learning, delivered instruction too quickly, and used instructional language that was too difficult for many DHH children. Our team adopted the literacy objectives of effective, integrated, code- and meaning-based early childhood programs for TH children, but adapted instruction to the unique learning needs of DHH children. FFL is a year-long curriculum designed to be used daily with 3- to 6-year-old DHH children. Hearing loss results in decreased access to spoken language that may cause incomplete phonological representation of words and phonemes, as well as delayed language. Therefore, FFL targets these foundational skills more explicitly and with greater intensity than interventions developed for TH children. Cognitive theories (e.g., Dual-Code theory; Sadoski & Paivio, 2001) and theories of early word reading (Ehri, 2014) suggest that these targeted foundational skills would be acquired best in the context of instruction designed to build multi-modal (visual, auditory, kinesthetic) and semantic (i.e., meaning-based) representations. One novel instructional strategy used in FFL is to build strong semantic associations for the sounds of language. For example, children listen to a story that includes a snake saying ssss. The children then make playdoh snakes and pretend their snakes are saying ssss. These experiences give children a meaningful connection for the /s/ sound that is reinforced with a picture. During these experiences, the teacher also makes an explicit connection between the letter s and the sound /s/ by saying, "the letter s makes the ssss sound, too". Ehri (2014) has shown that TH children remember letters better when they are made more meaningful by pairing a picture with the letter shape. Because DHH children experience greater difficulties remembering sounds than letter shapes, we applied Ehri's semantic association strategy to learning sounds rather than learning to recognize letters. FFL instruction also includes visual and kinesthetic support when teaching phonological awareness, alphabetic knowledge, vocabulary, and narrative elements (i.e., character and setting identification, sequencing of events, and story retell). In order to address most DHH children's language delays, literacy instruction is embedded in language-rich activities that provide a context to

teach vocabulary and more complex language while developing code-based skills. Finally, DHH children show large individual differences in early language and literacy skill development. Therefore, each lesson in FFL includes strategies for differentiating instruction based on children's speech perception, developmental language abilities, and language usage. For those children who primarily use sign language and do not have access to sound, we include alternatives to sound-based phonological skills, including fingerspelling and bilingual instructional strategies.

DEVELOPMENT OF FFL

FFL was developed in three phases. During the first phase, research teachers implemented lessons that followed a basic framework developed by an interdisciplinary team of teachers and researchers. Research teachers were certified teachers of the deaf who were part of the development team. They taught children in small groups—four days per week, one hour per day—for the full school year. They gave immediate feedback to the team on child engagement and instructional effectiveness, and lessons were adapted on an ongoing basis. A series of studies indicated that children taught with FFL by research teachers made educationally meaningful gains in phonological awareness, alphabetic knowledge, and vocabulary (Beal-Alvarez et al., 2012; Bergeron et al., 2009; Lederberg et al., 2014; Miller et al., 2013; Tucci & Easterbrooks, 2014). Children who received FFL made significantly more gains in phonological awareness and alphabetic knowledge than children in the comparison group who received business-as-usual instruction.

During the second phase, the research team moved FFL into classrooms where instruction was delivered by the teacher of record (Lederberg, 2016). The team developed a detailed teacher's manual and a two-day professional learning workshop. Eight classroom teachers attended the workshop and received ongoing coaching by members of the research team. These classrooms teachers implemented FFL as their literacy curriculum. The research team used observations of classroom teachers and weekly teacher feedback to improve lesson content and professional development. As is displayed in Figure 1, the 32 DHH children who received FFL from these eight classroom teachers began the year with delays on standardized measures of phonological awareness, alphabetic knowledge, and vocabulary. By the end of the school year, they gained, on average, 10 standard points and ended the year within a standard deviation of the normative average for TH children. In other words, DHH children who received FFL from their classroom teachers showed accelerated learning and achieved end-of-year scores that placed them within the typical range for TH children for phonological awareness, alphabetic knowledge, and vocabulary.

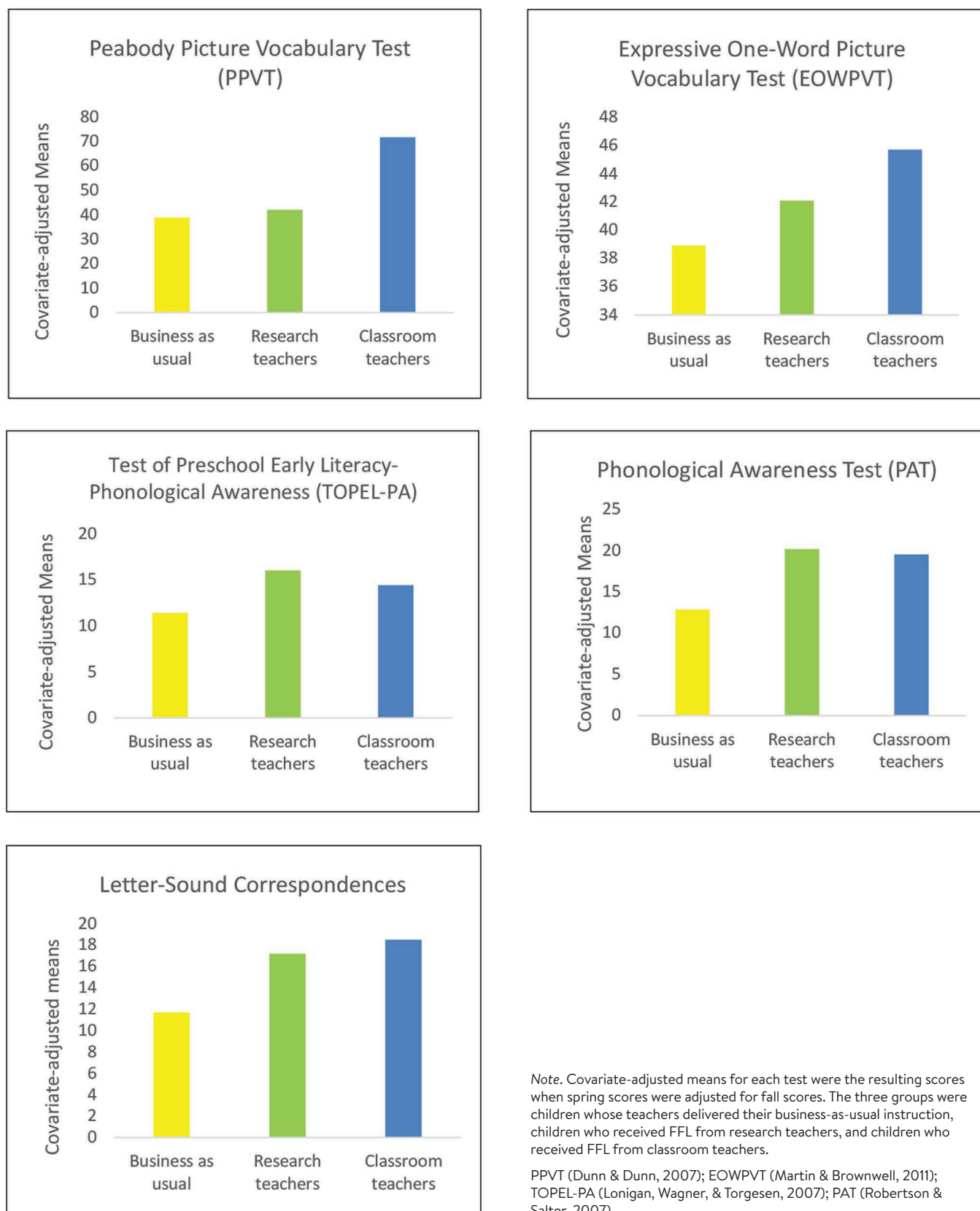
FIGURE 1. Fall and Spring Vocabulary Standard Scores for Children Taught FFL by their Classroom Teachers

Note. Expressive One Word Picture Vocabulary Test (EOWPVT; Martin & Brownwell, 2011); Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 2007); The Test of Preschool Early Literacy-Phonological Awareness (TOPEL-PA; Lonigan, Wagner, & Torgesen, 2007); Woodcock-Johnson Tests of Achievement-III-NU Letter-Word Identification. (WJ-WordID; Woodcock, McGrew, & Mather, 2007). All tests have a mean standard score of 100 with a standard deviation of 15, with 85 representing the lower limit of typical development.

Next, we compared these children's fall-to-spring gains with the gains made by DHH children who were in the business-as-usual group enrolled in phase 1 (see Figure 2). DHH children receiving FFL from their classroom teachers improved their early literacy skills more than the DHH children in the business-as-usual group. Specifically, DHH children who received FFL from classroom teachers made greater statistically significant gains on measures of phonological awareness, alphabetic knowledge, and vocabulary than did DHH children taught by classroom teachers who used their typical instruction. In a second comparison, DHH children who received FFL from their classroom teachers made equivalent or greater gains on these measures than DHH children who received FFL from research teachers (Figure 2).

During the third and final phase of our research, the research team conducted a national randomized-control trial (RCT) of FFL (Lederberg et al., 2018). Forty-eight classroom teachers were randomly assigned to either intervention (teachers used FFL as their literacy curriculum) or control (teachers continued

their business-as-usual instruction) conditions. Children were enrolled in the condition assigned to their teacher. Classrooms were in rural, urban, or suburban schools located in 14 states. Seventy percent of the teachers used only spoken language with their students, while 30% used both signed and spoken language. The FFL intervention group included 118 DHH children and the control group included 110 DHH children. Children's ages ranged from 3 to 6 years old (Mean age = 4 years, 3 months). Teachers in the intervention group used FFL for one hour a day throughout the school year. Teachers in the control group implemented their typical instruction. DHH children in the intervention group showed greater statistically significant gains on tests of phonological awareness, alphabetic knowledge, and word reading than children in the control group. Effect sizes were moderate to large. Children in both groups showed accelerated gains in vocabulary learning. At the end of the school year, the research team gave each intervention teacher a summative feedback survey. Eighty-four percent of the teachers returned the survey. Of those who replied, 95% of teachers said they enjoyed teaching FFL, felt their children

FIGURE 2. Fall to Spring Gain Scores across Three Instructional Contexts

benefitted from FFL instruction, would recommend it to other teachers, and planned to continue using FFL the following year. Additionally, 62% taught classes with both DHH and TH children (some typically developing, others with disabilities) where all children received FFL instruction and 100% of those teachers agreed that their TH children in their classes benefitted from the FFL curriculum as well.

These studies provide strong evidence that FFL promotes the language and early reading skills of DHH children. Teachers reported enjoying implementing FFL. Teachers also indicated it is appropriate for TH children, so whole class implementation in inclusion classrooms is appropriate. These results also show that early literacy skills, including phonological awareness, letter-sound knowledge, and early decoding, are malleable skills in DHH children, despite their decreased access to sound and spoken language.

DESCRIPTION OF PUBLISHED VERSION OF FFL

Our team released FFL for commercial sale in the summer of 2017 (selling materials at cost). To ensure that FFL is implemented with fidelity, teachers must complete a 16-hour professional learning workshop to purchase it (Lederberg & Tucci, 2022). Hundreds of teachers from across the country have attended the FFL professional learning workshops offered in a variety of delivery models including virtual national trainings, in-person training at local schools, and state-wide trainings. Our trainers have worked with teachers in almost every state and many provinces in Canada. Virtual workshops allow our training team to reach teachers in historically underserved areas. Although only classroom-based teachers were included in our research, FFL is being adapted for use by itinerant teachers and speech pathologists.

We also have created alternative instruction for DHH children enrolled in bilingual (ASL-English) programs. This approach uses fingerspelling phonology and ASL-to-English bilingual strategies to support visual language and early reading skills. These strategies are embedded within the Teacher's Manual. Supplemental materials may be purchased separately.

Teachers purchase a 398-page manual, along with all the instructional materials necessary to implement FFL (Lederberg et al., 2020). Figure 3 displays sample material used in FFL. The manual contains detailed lesson plans for 28 instructional units. Each unit consists of four one-hour lessons to be implemented within a week. During the first four weeks, teachers explicitly teach the instructional language needed to understand activities for the rest of the year. For example, students are taught the meaning of *same* versus *different* by sorting pairs of familiar objects into same and different categories. In another activity, students are taught the meanings for *sound* versus *name* through a farm animal activity

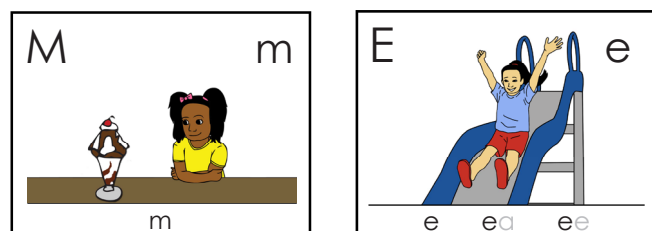
where students learn the names of different farm animals (e.g., cow, pig, horse) and the sound the animals make (e.g., moo, oink, neigh). Children then identify what sounds are the same. These activities are foundational for later instruction in applying the concepts of same and different to letters and sounds.

The other 24 instructional units have a common structure where each unit is organized around a sound or phoneme (e.g., /m/, /ō/, /ē/, /b/). The target sound is embedded in a unique language experience story that anchors the unit. In the stories, Miss Giggie, an after-school teacher, and her three students, Pete, Kate, and Sue, experience a fun activity in which the target sound occurs. For example, in Unit 5, Pete, Kate, Sue, and Miss Giggie make and eat ice cream sundaes. They are so delicious that the children rub their tummies and say mmmm when they take a bite. Then Miss Giggie says, "Guess what? The letter m makes the same sound mmmm." Miss Giggie draws the letter m and Pete, Kate, and Sue takes turns pointing to the letter and making the /m/ sound.

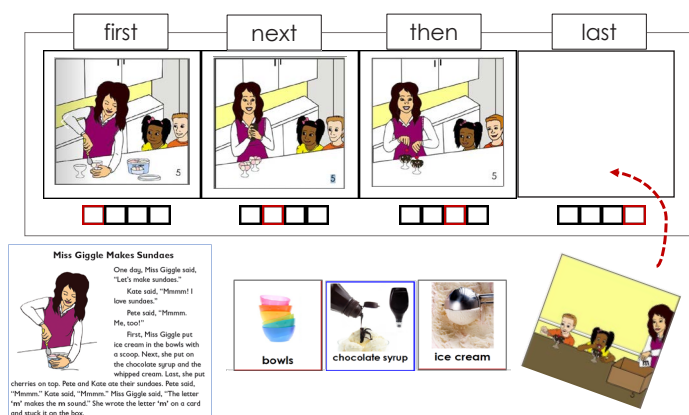
Teachers begin the week by telling the language experience story using illustrative sequence cards and vocabulary picture cards. During the week, teachers and students retell the Miss Giggie story and participate in a three-day language activity sequence where the teacher and the students plan, do, and recall the same experience in the Miss Giggie story. The Miss Giggie story and related language activity sequence create a personally meaningful semantic association for the target sound (e.g., making sundaes and saying, "mmm that's good!"; going down a slide and saying, "eee that's fun!"). The activities also provide a fun context for children to engage in repeated practice in perceiving and producing individual sounds. Each story is accompanied by a large sound card that displays the associated letters and a picture representing the sound concept in the story (e.g., sundae for /m/, slide for /ē/; see Figure 3.) The picture serves as a visual mnemonic to support student recall of the target sound. Children learn to associate the multiple spellings for long vowels (e.g., e, ee, ea for /ē/). The picture is also used on small sound cards to represent the sound in subsequent reading activities (e.g., blending, decoding, encoding). The small sound card helps to make code-based instruction more transparent as there is a one-to-one correspondence between the sound and the picture on small sound cards (unlike using letters if there are multiple spellings for a sound). Using the small sound cards allows teachers to simplify the task of identifying and blending sounds in a word. Over time, children transition from small sound cards to letter cards in reading activities.

To support story understanding and story retell, teachers target 6-10 vocabulary words, which they embed in the Miss Giggie story and the three-day language experience.

FIGURE 3. Instructional Materials from FFL



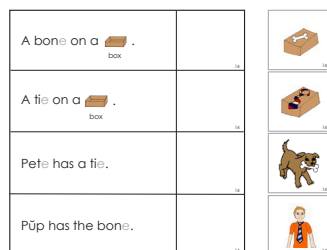
Large Letter-Sound Cards



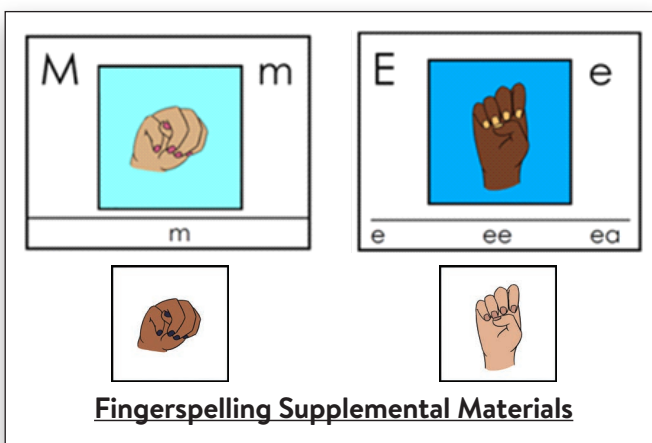
Miss Giggles Story and Vocabulary Picture Cards



Reading Booklet



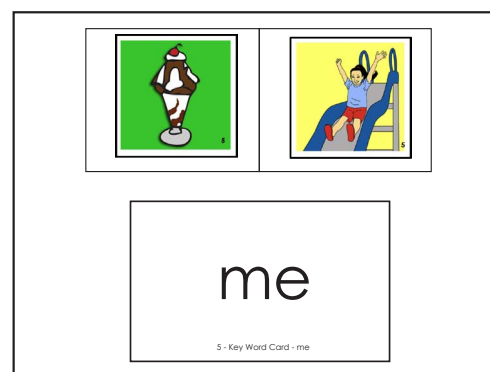
Reading Practice



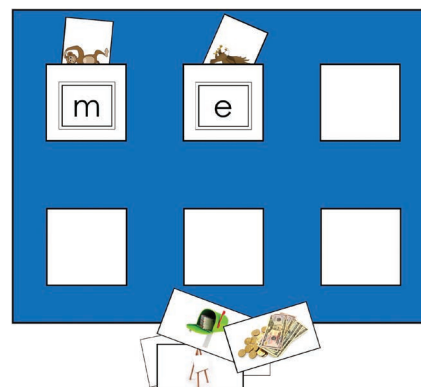
Fingerspelling Supplemental Materials



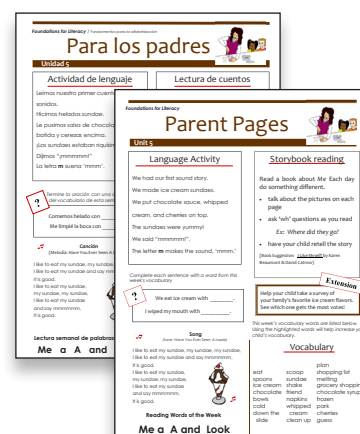
Small Sound Cards



Key Word Blending (Make-a-Word Card)



Initial Sound Identification



Parent Pages

Teachers select vocabulary appropriate for their students' language levels from unit-specific vocabulary lists, which include four levels of difficulty: core, target, challenge, and extension. Vocabulary picture cards are provided for the first three levels (see Figure 3). Teachers use evidence-based practices for receptive and expressive vocabulary learning such as using child-friendly definitions, picture support, and repeated opportunities to learn and use new words in meaningful contexts (e.g., Miss Giggle stories and three-day language experience activities) (Duncan & Lederberg, 2018; Schwanenflugel et al., 2010).

Each week teachers engage in activities centered around a decodable word or words that use taught sounds and their associated spellings. New words are introduced with a language activity that provides repeated opportunities to hear, see, and produce the decodable word. For example, after learning /m/ and /ē/, children play a question-and-answer game where the right answer is *me* (e.g., "Who has these eyes?" when shown a picture of the children's eyes). The activities ensure children have strong semantic (meaning-based) and phonological (sound-based) representation of the decodable word (Ehri, 2014) and prime them for the subsequent blending activities. Following the new word activity, teachers model identifying and blending the sounds of the new word using small sound cards (e.g., saying "me, /m/ /ē/, me").

After decodable words are introduced and practiced several times using picture support, children spend time reading printed words in isolation and in connected text. These activities target phonological awareness, word reading, and reading comprehension. Reading decodable words in isolation and in connected text provides repeated opportunities to segment and blend the sounds of a word. Research suggests that children learn sound-level phonological awareness skills better when instruction includes letters (Shanahan & Lonigan, 2010), likely because letters serve as visual support for hard-to-discriminate sounds. In addition to reading words in isolation, children read connected text composed of explicitly-taught decodable words and rebuses (i.e., pictures that take the place of words that children cannot recognize through sight or through decoding; see Figure 3). Teachers use reading materials to support their students' reading comprehension by probing children's understanding through pictures and questions.

Teachers also explicitly teach syllable segmentation, initial sound identification, and rhyming. These activities frequently use the vocabulary from previous units to ease the language burden so that students can focus their attention on phonological awareness. Daily practice activities of previously taught skills include reviewing letter-sound correspondences, letter(s)-sound correspondences fluency charts, reading connected text, and phonological awareness activities. These are incorporated into every lesson to ensure students have

enough opportunities to build skill mastery.

Teachers further reinforce complex language and vocabulary through daily storybook reading using dialogic reading techniques (Fung et al., 2005; Shanahan & Lonigan, 2010). Teachers select a book that connects to the unit theme and identify 6 to 10 novel vocabulary words contained in the storybook based on their students' language knowledge. They read the story and then revisit the story three or four times throughout the week. Each day the teacher emphasizes targeted vocabulary and increases students' active engagement by asking questions, expanding children's answers, and prompting students to provide more detailed answers and discussions.

FINAL TIPS FOR IMPROVING PHONOLOGICAL AWARENESS, ALPHABETICAL KNOWLEDGE, AND VOCABULARY

Phonological Awareness

- Provide intensive, explicit, and extensive instruction to support phonological awareness skills which takes months to develop.
- Use familiar vocabulary in phonological awareness instruction so the children can focus their attention on the structure of words, rather than their meaning.
- Use letters to facilitate learning to isolate initial sounds of words. For example, once children know the sounds of two letters (e.g., /m/ and /p/) have children sort words (mop, papa) into two categories using the letters m and p as visual support for the two sounds (see Figure 3).
- Teach rhyming through the identification of pairs of familiar words that rhyme and pairs that do not. It is critical to include examples of words that do not rhyme for contrast. Make this a listening activity because pictures tend to distract DHH children in this activity. Exposure to rhyming books is insufficient to teach children to rhyme.

Alphabetic Knowledge and Early Reading

- Teach children to associate sounds with letters by focusing on those sounds in isolation. Sounds are typically taught through reviewing what words start with that letter (e.g., It is M week. What words start with the letter M?--milk, mama). This requires children to isolate the letter from these words. Instead, we suggest focusing on the sound (e.g., This is /m/ week). Embed individual sounds in stories that allow children to hear and say a sound in isolation and then associate it with a letter. Those letter-sound correspondences can then be used to identify initial sounds in familiar words.

- Include opportunities to read simple words during reading instruction. Follow learning letter-sound correspondences with sounding out and blending those sounds in decodable words. This shows children why they are learning the sounds of letters and gives them practice in the important phonological awareness skills of segmenting and blending sounds. Because this is an advanced skill, teachers should model sounding out the letters and blending them into a word. Children should practice reading the same words throughout the year. Preschool children may need continuous teacher modeling to begin to read decodable words.

Vocabulary

- Teach five to 10 words a week explicitly. Instruction should include child-friendly definitions and visual or kinesthetic support to clarify meaning (e.g., pictures, objects, and acting out).
- Expand on children's utterances by repeating them with the addition of at least one or two words or correcting syntactic mistakes.
- Read language-appropriate stories using dialogic reading techniques. Books create a meaningful context for children to acquire and practice using new words. Prior to reading the story, identify targeted vocabulary and create child-friendly definitions and picture cards. Embed these definitions and picture supports while reading the story. Revisit the same book three to four times, encouraging the students to engage in more dialogue with each reading.

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The Road to Hearing Health Equity

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Of the 1.6 billion people with hearing loss worldwide, over 1.2 billion live in underserved communities with the least access to hearing care. This includes preventable hearing loss in an estimated 42 million children who, without early identification and treatment, are at increased risk of significant detrimental effects that can last a lifetime. These immense hearing health disparities provide a clear and compelling call to action. The new Center for Hearing Health Equity at the University of Arkansas for Medical Sciences is the first of its kind in the world, established to deliver the critical mission of fostering hearing health equity both globally and locally. This article describes the Center's approach, which is built on inclusive, multidisciplinary collaboration guiding a research-driven, public-health oriented agenda to develop evidence that is directly translatable to policy change. The end goal is to generate momentum towards sustained solutions that will create a new future with hearing care accessible to all.

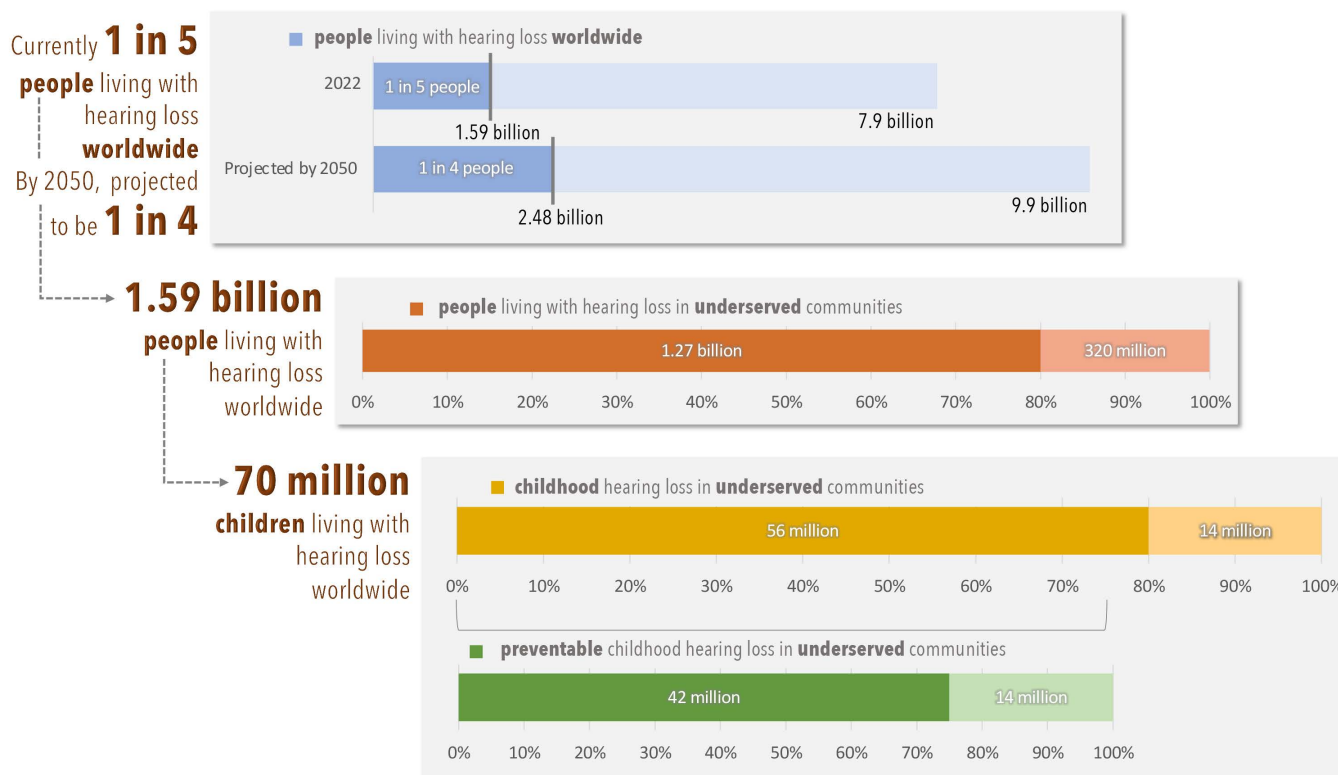
There are an estimated 1.6 billion people living with hearing loss worldwide. This means that out of the entire global population, a staggering one in five people experience hearing loss. The numbers of people affected are expected to continue to grow, and by 2050 one in four people are projected to have hearing loss (World Health Organization, 2021). Not only is the scale of hearing loss one of the globe's major health challenges, the burden is also inequitably distributed. Eighty percent of affected individuals live in underserved communities, specifically in low- and middle-income countries, or within underserved communities in high-income countries (Figure 1) (World Health Organization, 2021). As a result, the populations most likely to be affected by hearing loss are also the least likely to have easy access to hearing care.

Hearing loss in children is of particular concern given the lifelong consequences. Children with hearing loss frequently experience speech and language delays, poor academic performance, and limited vocational opportunities (Emmett & Francis, 2015; Järvelin et al., 1997; Khairi Md Daud et al., 2010; Tomblin et al., 2015; Woodcock & Pole, 2008). Hearing loss is also associated with lower quality of life and worse behavioral outcomes (Rolland et al., 2016; Wang et al., 2019). Importantly, the World Health Organization estimates that up to 60% of childhood hearing loss is preventable. This estimate rises to 75% in underserved communities, such as in low- and middle-income countries, where the majority of childhood hearing loss is related to ear infections (World Health Organization, 2021).

The scope of hearing health disparities is immense, with more than 1.2 billion people living with hearing loss from underserved communities with the least access to hearing care. This includes preventable hearing loss in an estimated 42 million children, who, without early identification and treatment, are at increased risk of significant detrimental effects that can last a lifetime (see Figure 1).

CENTER FOR HEARING HEALTH EQUITY AT THE UNIVERSITY OF ARKANSAS FOR MEDICAL SCIENCES

As members of the hearing health community, we have a clear and compelling call to action to address these disparities. The new Center for Hearing Health Equity at the University of Arkansas for Medical Sciences is the first of its kind in the world, established to deliver the critical mission of fostering hearing health equity both globally and locally. The philosophy driving our new Center's approach is grounded in several key attributes that work collectively to overcome inequities. First, our approach is multidisciplinary and all-embracing, encompassing collaboration across disciplines, backgrounds, countries, and cultures. This is a global problem that requires global solutions. We believe it is critical to adopt an inclusive mindset that values the input not only of healthcare professionals but also educators, parents, community members, and individuals living with hearing loss themselves. Our approach is research-driven with a specific focus on developing evidence that is directly translatable to policy change. A public health perspective is necessary given the scale of the problem, which

FIGURE 1. Scope of hearing health disparities globally. Estimates derived from the World Health Organization World Report on Hearing.

will not be solved with a traditional clinical mindset of caring for one patient at a time. Finally, our approach is multifaceted and addresses hearing loss from multiple angles.

COMPONENTS OF THE APPROACH

Collaborative

Collaboration is first and foremost for achieving hearing health equity. Our approach at the Center for Hearing Health Equity is rooted in team science, recognizing that accelerated scientific advancement is possible when we invest the time and energy to work in large collaborative teams (Committee on the Science of Team et al., 2015). In 2018, we launched the Global HEAR (Hearing Loss Evaluation, Advocacy, and Research) Collaborative, the only international research network dedicated to reducing disparities in hearing loss worldwide. The Global HEAR Collaborative has grown to now include collaborators from 28 countries (Figure 2). Collaborators' backgrounds include otolaryngology-head and neck surgery, audiology, and speech pathology. In 2021, HEAR-USA began as the United States branch of the HEAR Collaborative focused on addressing hearing loss disparities in underserved rural and minority populations across the United States. We now have three grant-funded initiatives running through these collaboratives, including two randomized trials of school-based

telehealth to improve access to hearing care for rural children and a device development project to improve screening for infection-related hearing loss. Our scientific teams also involve experts from multiple other disciplines beyond the hearing fields, such as implementation science and education research. Collaborative initiatives such as HEAR represent the future of hearing health equity, providing an opportunity for individuals across disciplines and countries to partner on large international and domestic multi-site projects that would otherwise not be possible.

Equally vital to the collaborative effort to address disparities is partnership with community stakeholders. At the UAMS Center for Hearing Health Equity, we ground our research in community partnership and feel these relationships are indispensable for generating truly implementable and sustainable policy change. Examples of community engagement include developing stakeholder teams and community advisory boards to inform and guide community-based research. Using mixed methods to incorporate qualitative investigation alongside quantitative randomized controlled trials is another technique we frequently employ to facilitate integration of community input into the research process (Patterson et al., 2022; Robler et al., 2020).

FIGURE 2. Global HEAR Collaborative sites.

**Research-Driven**

Maintaining a research-driven approach is also critical for achieving hearing health equity. There are many questions in hearing loss to which we do not yet know the answers, and filling these gaps in the evidence can provide actionable solutions to enact policy change. Our Center for Hearing Health Equity focuses on the big picture questions that could ultimately move the needle to address disparities. By working together in large collaborative teams, we will be able to answer these pressing questions and develop the evidence needed to influence policy change. This approach provides an avenue for community partners and healthcare professionals who provide patient care full-time to participate in large-scale initiatives that that will ultimately lead to elimination of inequities in hearing care.

Public Health-Oriented

In addition to being research-driven, we believe a public health lens is essential to successfully address hearing health disparities. The sheer numbers of people affected—20% of the entire global population—dictate that we develop innovative ways to provide hearing care that focus on population-level innovations. Technology can also undergird these efforts, such as supporting task sharing with community health workers by applying artificial intelligence and machine learning techniques for diagnostic support.

Multi-Faceted*New Solutions for Prevention*

A multifaceted perspective spanning prevention, identification, and treatment is an essential component of this research-driven,

public health approach to hearing health equity. Particularly in children, prevention is critical to addressing disparities because of the vast numbers affected with preventable hearing loss: currently estimated at 42 million children. To be able to prevent hearing loss from developing in the first place, we need to understand why it is so common in underserved communities. Specifically, what are the etiologies that are unique to low resource settings, and what can be done about them?

Two examples, one from Nepal and another from Alaska, illustrate this concept. It is well known that the majority of childhood hearing loss in underserved populations is related to ear infections. What is less understood is why these infections happen, and what the modifiable risk factors are that can be altered to reduce the risk of infection and therefore reduce the risk of developing hearing loss. In the Gangetic flood plain of South Asia where micronutrient deficiencies and undernutrition are common, children with a history of ear infections who received vitamin A supplementation as preschool children were 54% less likely to have hearing loss as young adults than those with ear infections who did not receive supplementation. This evidence from a follow-up study of a large randomized trial cohort has very practical implications: supplementation with a 2-cent vitamin A tablet every six months in early childhood resulted in a 7% absolute reduction in hearing loss among individuals who had a history of ear infections (Schmitz et al., 2012). In Alaska, our analysis from a randomized trial cohort revealed that middle ear disease is more common in children who live in homes without running water (Hicks, 2022). Addressing water availability exemplifies another public health measure that could be used to reduce the burden of ear infections and may ultimately reduce childhood hearing loss in underserved communities.

Improving Identification

In addition to prevention, improving identification is also an essential element of a multifaceted, research-driven strategy to address disparities in hearing loss. For example, school screening is an important public health measure to identify children with previously undiagnosed hearing loss. However, evidence-based guidelines for the optimal protocols to conduct screening are scarce, and loss to follow-up after screening programs is a universal problem. During a recent randomized trial in Alaska, we addressed two key unanswered questions about identification: 1) how do we best identify children with infection-related hearing loss, and 2) how do we address the longstanding problem of loss to follow-up (Emmett, Robler, Gallo, et al., 2019; Emmett, Robler, Wang, et al., 2019)? This trial, which tested mobile health screening and telemedicine referral for rural schools, found that the most accurate screening protocol in an environment with frequent ear infections included not only pure-tone screening, which is commonly used for screening programs, but also

tympanometry, which assesses the health of the middle ear. For the perennial challenge of loss to follow-up, the trial found that children randomized to telehealth specialty referral were more than twice as likely to receive follow-up after school screening, and follow-up occurred more than 17 times faster with telemedicine specialty referral than with standard primary care referral (Emmett et al., 2022). These results have important policy implications for improving access to care for rural children, providing clear evidence for the most accurate screening protocol in environments where ear infections are common and a potential solution using telemedicine to improve entry to the healthcare system after screening.

Expanding Access to Treatment

Lastly, a multifaceted perspective would not be complete without addressing treatment. Despite the many unanswered questions around hearing loss, there are nevertheless known treatments that are highly effective. For example, cochlear implantation (CI) has been clearly shown to improve speech and language development as well as improve academic and vocational outcomes in children with severe to profound hearing loss, yet this proven technology is not accessible to the majority of the world's population. In fact, it is estimated that less than 1% of CI candidates globally currently have implants (Bodington et al., 2021). Through the Global HEAR Collaborative, we questioned this gap and sought to address one of the key questions holding up access: the high cost. For many years, a common assumption around cochlear implantation was that the technology would only be available in high resource settings because of cost constraints. Cost-effectiveness in underserved settings had not been evaluated, and filling this gap in the evidence was a critical first step to support policy change for expanding access to CIs. Through a series of analyses spanning 21 countries in Sub-Saharan Africa, Latin America, and Asia, we determined that pediatric cochlear implantation can be cost-effective in underserved settings (Emmett, Sudoko, et al., 2019; Emmett et al., 2016; Emmett et al., 2015). This type of evidence provides ministries of health with essential information to support incorporating cochlear implantation into national health plans.

Mentorship-Focused

Returning to the importance of inclusivity, learners and trainees at all levels of education are vital contributors to achieving hearing health equity. Mentorship of the next generation and fostering long-lasting commitment to addressing disparities are key elements of our approach at the UAMS Center for Hearing Health Equity. From undergraduates to medical students and surgical residents, trainees are involved in all of our projects and bring appreciated energy and perspective to the team.

Advocacy-Centered

Finally, advocacy ties all aspects of our approach together, serving as the connector between new evidence generated and the achievement of hearing health equity. Policy change is needed for the work that we do collectively to have impact, and engaging in advocacy is how the hearing health community can best facilitate policy change. This can happen at multiple levels, from local to global. For instance, many of our local stakeholders serve in state leadership and hold significant influence on the direction of public policy. Involving government leadership from inception of a project provides valuable perspective on the questions that most urgently need to be answered, as well support for scaling and sustainability after the scientific work is complete. On the international level, an example of advocacy is the World Health Organization World Report on Hearing, which involved significant investment by many members of the hearing health community and can serve as an invaluable tool for advocacy at the individual country level.

GOAL OF GENERATING SUSTAINABLE CHANGE

Despite the immense disparities facing us in hearing health globally, achieving hearing health equity is possible. Each of the components of our approach contribute to the ultimate goal of generating sustainable change in the landscape of hearing health disparities. At the UAMS Center for Hearing Health Equity, we are excited to partner with multidisciplinary and community collaborators, leading innovative research initiatives designed to generate momentum towards sustained solutions that will create a new future with hearing care accessible to all.

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