Background
Young children who have complex communication needs are excluded from full participation in their home, school, and community. Their lack of access to speech may negatively impact all aspects of their development, including cognitive, social, language, and literacy skills. AAC interventions offer the potential to enhance communication and to maximize language development (Romski & Sevcik, 2005). The challenge is to provide children who have complex communication needs with access to the magic and power of communication at the earliest possible age to circumvent the negative effects of communication disabilities (Light & Drager, 2007). Augmentative and alternative communication (AAC) systems offer potential tools to meet this challenge. In order to be optimally effective, AAC systems must be designed to meet the needs and accommodate the skills of very young children and effective evidence-based intervention must be provided to support the children's development of the pragmatic, semantic, and syntactic skills required to achieve communicative competence (Light, 1997).

Goals
This session will report on the results of a longitudinal research project, funded by the National Institute on Disability and Rehabilitation Research as part of the AAC-RERC. The research project is designed to: (1) investigate effective designs for AAC systems to meet the needs and skills of young children, (2) develop effective AAC interventions for young children who have complex communication needs, and (3) evaluate longitudinally the effects on communication and language development, including the frequency of communicative turns, range of communicative functions, modes of communication, rate of vocabulary acquisition, development of semantic-syntactic relations, and phonological awareness /early literacy skills. This presentation will discuss the results of the longitudinal study and will provide guidelines for effective AAC interventions with infants, toddlers, and preschoolers. Videotapes of individual cases will be used to illustrate effective AAC practices and outcomes with children with different disabilities.

Methodology
The studies employ a single subject multiple baseline across subjects design with replication across multiple participants. The children all meet the following selection criteria: (a) have developmental disabilities; (b) require AAC (i.e., their speech is not adequate to meet daily communication needs); (c) recognize photographs of familiar people; and, (d) express fewer than 25 concepts through unaided or aided means at baseline.

The study involves three phases: baseline, intervention, and generalization. During baseline, prior to intervention, the participants are observed / videotaped in naturally occurring interactions during their typical daily routines. During intervention, observations are made each week to track communicative development and language learning. Data are collected via videotape during 15-20 minute interactions within the children's naturally occurring routines. The videotaped interactions are reviewed and coded for the following behaviors: (1) frequency of communicative turns produced by the child; (2) range of functions expressed; (4) vocabulary concepts acquired; (5) number of semantic concepts expressed; (6) mean length of message; and (7) semantic-syntactic relations expressed. Data during the intervention phase are evaluated in comparison to baseline data to determine treatment effects.

Components of the AAC Intervention
Intervention involves two essential components: (1) developing appropriate AAC systems personalized to meet the interests, needs, and skills of the children; and (2) implementing AAC in daily life with parents and other facilitators to maximize communication and language development. To date, the children have been followed longitudinally for between 1-2 years.

Developing Appropriate AAC Systems
Intervention targets multiple modes of communication, depending on the child's needs and skills including speech, gestures and signs, low tech communication books with removable AAC symbols on Velcro, and dynamic display AAC technologies. The AAC technologies (low tech and high tech) are designed to meet three essential criteria (as proposed by Light & Drager, 2007): (a) appeal to young children; (b) are easy to learn and use; and (c) are dynamic.

Specifically the technologies are designed to appeal to young children by integrating play and communication, providing meaningful fun contexts for interaction, using numerous bright colors, including familiar characters, incorporating music and sound effects, and providing options for characterization and personalization. Traditionally, AAC technologies have been designed as speech prostheses that allow the user to speak out linguistic messages; they do not provide engaging contexts for children to support social interaction (Light, Page, Curran, & Pitkin, in press). In contrast, the AAC technologies used in this study are designed to provide engaging contexts to support social interaction between the children and their parents, teachers, and peers.

The AAC technologies are also designed to be easy for young children to learn and use, even infants and toddlers. Current AAC technologies are not transparent to young children; they impose significant motor, cognitive, linguistic, and sensory perceptual demands. As a result, some young children may not be able to understand and use current AAC technologies; others may need many hours of instruction to do so. AAC technologies should be redesigned to minimize the cost of learning while at the same time maximizing the power of communication. For example, the AAC technologies used in this study are designed to be more transparent to young children based on the current research: (a) They use representations of language concepts that better reflect young children's conceptualizations; the representations are grounded in context and involve familiar experiences (e.g., Lund, Millar, Herman, Hinds & Light, 1998); (b) The technologies utilize schematic visual scene displays, that is, digital photos of the scenes of familiar events with concepts embedded under hot spots in the scenes (e.g., Drager, Light, Curran-Speltz, Fallon, & Jeffries, 2003; Light, Drager, McCarthy, et al., 2004); (c) To assist with navigation, they use screenshots of actual pages on the menu page to provide mnemonic cues and make explicit the relationship to the hidden vocabulary pages (e.g., Drager, Light, et al., 2004); and, (d) they provide motivating and engaging output using digitized speech, sound effects, and music (Light, Drager, & Nemser, 2004).

The AAC systems used in this study are truly dynamic; new vocabulary and language concepts are added on a regular basis to support the children's language learning. Children with complex communication needs who require AAC cannot acquire and use new language concepts unless they are provided with access to these concepts via AAC. They should be exposed to new signs on a daily basis and should have new vocabulary added to their AAC systems regularly to reflect their changing needs and growing language skills.

Working with Parents and Facilitators to Implement AAC
Simply providing access to AAC is not sufficient to support the development of communicative competence; children who require AAC need opportunities to learn the language skills required to be competent communicators. In the present study, parents and other facilitators learn to implement AAC during daily activities and support the children's language learning. Unlike some interventions that primarily target use of AAC to express needs and wants, the AAC intervention in the present study focuses on social interaction during play and other activities (Light, Parsons, & Drager, 2002). Key components of the intervention include: (a) establishing

meaningful and motivating opportunities for communication; (b) ensuring appropriate positioning of the partner and AAC systems to reduce joint attention demands; (c) modeling the use of AAC in conjunction with speech; and (d) responding appropriately to the child's communicative attempts.

Preliminary Results

Preliminary results show very positive language and communication outcomes as a result of the AAC intervention. Specifically, the children have all demonstrated significant gains in their rate of communication in interactions and their expressive vocabularies. Many of the children have also demonstrated significant gains in the complexity of messages communicated and some have shown gains in phonological awareness skills and knowledge of letter-sound correspondences.

This session will present a series of cases illustrating the AAC intervention and demonstrating the effects over time. Specifically, the cases will illustrate the effects of intervention with infants, toddlers, and preschoolers with a range of disabilities (e.g., Down syndrome, cerebral palsy).

Significance

This session will present effective evidence-based AAC intervention techniques to enhance language and communication development with infants, toddlers, and preschoolers with significant disabilities. With early access to appropriate AAC interventions, young children with significant communication disabilities will be able to build the language and communication skills that they require to develop communicative competence and achieve their full potential.

References

Drager, K., Light, J., Carlson, R., D'Silva, K., Larsson, B., Pitkin, L., et al. (2004). Learning of dynamic display AAC technologies by typically developing 3-year-olds: Effect of different layouts and menu approaches. *Journal of Speech Language Hearing Research, 47,* 1133-1148.

Drager, K., Light, J., Curran-Speltz, J., Fallon, K., & Jeffries, L. (2003). The performance of typically developing 2 ½-year-olds on dynamic display AAC technologies with different system layouts and language organizations. *Journal of Speech, Language and Hearing Research, 46,* 298-312.

Light, J. (1997). "Let's go star fishing": Reflections on the contexts of language learning for children who use aided AAC. *Augmentative and Alternative Communication, 13*, 158-171.

Light, J. & Drager, K. (2007). AAC technologies for young children with complex communication needs: State of the science and future research directions. *Augmentative and Alternative Communication, 23,* 204-216.

Light, J., Drager, K., McCarthy, J., Mellott, S., Parrish, C., Parsons, A., et al. (2004). Performance of typically developing four and five year old children with AAC systems using different language organization techniques. *Augmentative and Alternative Communication, 20,* 63-88.

Light, J., Drager, K., & Nemser, J. (2004). Enhancing the appeal of AAC technologies for young children: Lessons from the toy manufacturers. *Augmentative and Alternative Communication, 20,* 137-149.

Light, J., Page, R., Curran, J., & Pitkin, L. (in press). Children's designs of assistive technologies for young children with complex communication needs. *Augmentative and Alternative Communication.*

Light, J., Parsons, A., & Drager, K. (2002). "There's more to life than cookies": Developing interactions for social closeness with beginning communicators who require augmentative and alternative communication. In J. Reichle, D. Beukelman, & J. Light (Eds.), *Exemplary practices for beginning communicators: Implications for AAC* (pp. 187-218). Baltimore, MD: Brookes Publishing Co.

Lund, S., Millar, D., Herman, M., Hinds, A., & Light, J. (November, 1998). *Children's pictorial representations of early emerging concepts: Implications for AAC.* Poster presented at the American Speech Language Hearing Association Annual Convention, San Antonio, TX.

Romski, M.A. & Sevcik, R. A. (2005). Augmentative communication and early intervention: Myths and realities. *Infants and Young Children, 18*, 174-185.