

The Use of Assistive Technology by Early Interventionists in Virginia

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By

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## DEDICATION

This is dedicated to the Feisty 5, my amazing family whose love, support, and patience have given me the strength to pursue and complete this doctoral journey. A special dedication also goes to my parents, who taught me the value of education and to believe in myself and to follow my dreams. Anything is possible...

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Life is good.

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## ABSTRACT

### THE USE OF ASSISTIVE TECHNOLOGY BY EARLY INTERVENTIONISTS IN VIRGINIA

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The Individuals with Disabilities Education Act and subsequent amendments mandate that early intervention (EI) services include provision of assistive technology (AT) devices and services. EI services are provided through an Individualized Family Service Plan (IFSP) through which family members and early interventionists collaborate to develop a family-centered plan to support the child's functional skill development. Although federal laws define EI services to include AT devices and services, data on the inclusion of AT devices and services on the IFSPs of infants and toddlers nationwide in the years 1995 through 2004 found that only 3.07% to 7.41% had AT included on their IFSPs. Furthermore, only 0.7% of children receiving Part C services in Virginia had AT listed as an EI service on their initial IFSP.

These statistics are disconcerting and bring into question, why are such a small percentage of children reported to be receiving AT devices and services through their EI programs, and is this an accurate depiction of AT provision by early interventionists? The

purpose of this study was to investigate the types of AT that early interventionists in Virginia provide to infants and toddlers and their families who receive Part C EI services, the purposes for which they provide AT, the factors that influence their provision of AT, their perceived knowledge of AT, and their perceived need for additional AT education. Identifying these factors can help in developing strategies to support the provision of AT devices and services to infants and toddlers and their families.

Early interventionists who provide Part C services in Virginia completed a web-based survey designed to address these questions. Research findings identified factors which the participants perceived as being barriers to providing AT, areas in which they perceived as having a lack of AT knowledge, and areas in which they perceived needing additional AT education. These areas included AT assessment, types of available AT devices and sources to obtain them, time required for obtaining or providing AT, sources for borrowing AT devices to trial, cost of providing AT, funding sources for AT, care and maintenance of AT devices, and technical support for AT. Limitations of the study and implications for practice and research were identified.

## 1. Introduction

Early intervention programs focus on enhancing the development and functional skills of young children, from infancy to preschool age, who have developmental delays or disabilities in the areas of physical, cognitive, communication, social-emotional, or adaptive development. Assistive technology (AT) devices and services can enhance a child's skills and independence in play, leisure, educational activities, communication, socialization, access to materials, mobility, self-care, and environmental control in their daily activities and routines in their natural environments.

There is a wide range of AT devices from low technology to high technology. Low tech or low technology AT devices refer to “simple devices, supports, systems, and adaptations such as custom-designed hand tools; positioning devices; and other simple, inexpensive easy-to-use adaptations” (Sandal, Hemmeter, Smith, & McLean, 2005, p. 149). Example of low technology devices include adapted seating and positioning equipment, picture communication symbols, voice output communication devices, adaptive switches to operate battery-operated toys, adapted utensils, adapted toys and games. High tech or high technology AT devices refer to “complex electrical and electronic devices, such as computers, voice synthesizers, Braille readers, augmentative communication systems, and environmental control units” (Sandal et al., 2005, p. 149). Examples of high technology AT devices include computer access devices, software

programs, dynamic screen voice output communication devices, powered mobility systems, and environmental control units.

Even early research reflected a consensus on the positive impact of AT to enable young children with developmental delays or disabilities to communicate, socialize, play, learn, participate in activities of daily living, and access and move throughout their daily environments (Behrmann, Jones, & Wilds, 1989; Butler, 1988; Daniels, Sparling, Reilly, & Humphry, 1995; Judge, 2002; Lane & Mistrett, 1996; Langone, Malone, & Kinsley, 1999; Mann & Lane, 1995; Neeley, R. & Neeley, P., 1993; Parette, Hofmann, & Van Biervliet, 1994; Sullivan & Lewis, 1993, 2000; Van Tatenhove, 1987). Federal legislation has been enacted to ensure that infants and toddlers with developmental delays or disabilities, from birth through the age of three years, receive appropriate early intervention services to meet their developmental needs, including AT devices and services.

Through my professional experiences as an early interventionist and a review of the literature on the use of AT by early interventionists, significant concerns have been noted about the underutilization of AT devices and services for children and families receiving early intervention services. My experiences as a pediatric occupational therapist working in early intervention programs and my discussions with colleagues in the early intervention field indicate that the use of AT devices and the provision of AT services are limited for children and families receiving early intervention services.

As an assistive technology specialist working in a public school system, I have also observed that many young children who transition from early intervention programs

to special education preschool programs often do not have necessary AT supports, such as augmentative and alternative communication systems or adapted devices to enable access to play. Thus, many children do not receive needed AT devices and services until they are enrolled in school-based programs. My professional experiences have also noted a consensus among early interventionists that they often do not feel they have the background or training needed for properly assessing AT needs, determining appropriate AT devices, utilizing AT devices, obtaining funding for AT devices, or training families in the use of the AT devices.

In a small pilot study that I did, three early interventionists were interviewed on their use of AT with children and families enrolled in their early intervention program (Feist, 2003). While these early interventionists concurred with the positive value of AT in early intervention, they identified several factors that impacted their provision of AT devices and services to the children and families they served. These factors included the ages and developmental needs of the children enrolled in the program, developmental goals for the children, staff training and experience in AT, program funding for AT, family funding for AT, parent readiness to accept AT as a strategy to use with their child, and concern as to whether providing AT follows the early intervention service model of providing services and equipment that are natural supports in the child's natural environment.

My experiences are paralleled in a review of the research literature on AT in early intervention. Research on the use of AT in early intervention confirms that there are significant concerns regarding the underutilization of AT to support functional outcomes,

the challenges that early interventionists may experience in the evaluation, selection, and integration of appropriate AT to support the needs of the children and families for whom they provide services, the need for family-centered collaboration to integrate AT in the children's daily activities in their natural environments and reduce the chances of abandonment of AT, the early interventionists' lack of confidence and self-efficacy in evaluating and providing AT supports, and the perceived need of early interventionists for additional AT training (Brotherson, Cook, & Parette, 1996; Campbell & Wilcox, 2004; Dugan, Campbell, & Wilcox, 2006; Hanft & Pilkington, 2000; Judge, 2002; Lahm & Sizemore, 2002; Lamorey & Wilcox, 2005; Long, Huang, Woodbridge, Woolverton, & Minkel, 2003; Long & Perry, 2008; Long, Woolverton, Perry, & Thomas, 2007; Mistrett et al., 2001; Moore & Wilcox, 2006; Wilcox, Dugan, Campbell, & Guimond, 2006; Wilcox, Guimond, Campbell, & Moore, 2006).

### **Background of the Problem**

#### **Federal Legislation for the Provision of Early Intervention Services**

Federal legislation for the provision of early intervention services was enacted in 1986 with the Part H amendment to Public Law 94-142, the Education for All Handicapped Children Act originally established in 1975. The amendment included provisions for children with disabilities from birth through three years of age and their families, mandating a statewide system to provide early intervention services. Part H was reauthorized in 1991, becoming the Individuals with Disabilities Education Act (IDEA). Part H mandated that early intervention services be provided in the child's natural environments. In 1998, IDEA was reauthorized and Part H became Part C, the Early



Intervention Program for Infants and Toddlers with Disabilities. This federal grant program assists states in operating statewide early intervention programs for infants and toddlers with disabilities. IDEA was again reauthorized in 2004 becoming Public Law 108–446, the Individuals with Disabilities Education Improvement Act of 2004 (IDEIA 2004).

Early intervention services are provided through an Individualized Family Service Plan (IFSP) through which family members and early intervention providers collaborate to develop a family-centered plan to support the child’s development, including initial and ongoing evaluation, development of functional outcomes, and determination of necessary support services. IDEIA 2004 mandates that, "to the maximum extent appropriate to the needs of the child, early intervention services must be provided in natural environments, including the home and community settings in which children without disabilities participate" (Individuals with Disabilities Education Improvement Act of 2004 [IDEIA 2004], 20 USC § 1432) in their daily activities and routines. IDEIA 2004 specifically defines early intervention services as the following:

- (i) family training, counseling, and home visits;
- (ii) special instruction;
- (iii) speech-language pathology and audiology services, and sign language and cued language services;
- (iv) occupational therapy;
- (v) physical therapy;
- (vi) psychological services;
- (vii) service coordination services;
- (viii) medical services only for diagnostic or evaluation purposes;
- (ix) early identification, screening, and assessment services;
- (x) health services necessary to enable the infant or toddler to benefit from the other early intervention services;
- (xi) social work services;

- (xii) vision services;
- (xiii) assistive technology devices and assistive technology services; and
- (xiv) transportation and related costs that are necessary to enable an infant or toddler and the infant's or toddler's family to receive another service described in this paragraph (IDEIA 2004, 20 USC § 1432).

Trohanis (2008) of the National Early Childhood Technical Assistance Center noted that the reauthorization of IDEA in 2004 (IDEIA 2004) has continued to support significant progress in the provision of early intervention services, encouraging “states and jurisdictions to enhance children’s development, maximize least restrictive practices, and support and collaborate with families as partners throughout the planning and provision of services” (p. 149).

### **Part C Early Intervention Services in Virginia**

The Virginia Interagency Coordinating Council for Early Intervention Services (VICC) implements and coordinates Part C early intervention services for the Commonwealth of Virginia. The lead agency for Part C in Virginia, the Virginia Department of Behavioral Health and Developmental Services, contracts with 39 local lead agencies to provide early intervention services at the local level. The Infant & Toddler Connection of Virginia provides early intervention services throughout Virginia.

In Virginia, children from birth to three years of age are eligible to receive Part C early intervention services if they are “functioning 25% or more below their chronological age or adjusted age in one or more areas of development...and/or show atypical development ...and/or have a diagnosed physical or mental condition that has a high probability of resulting in a developmental delay” (Infant & Toddler Connection of Virginia, 2005). Parents whose children are two years of age have the option to transition

their children to receive Part B special education preschool services through their local school system if their child is age-eligible and becomes two years old by September 30 of that school year, is found eligible through a Part B evaluation, and the parents provide consent to placement under Part B.

The Infant & Toddler Connection of Virginia's current Individualized Family Service Plan (IFSP) form includes a section on "Services Needed to Achieve Early Intervention Outcomes." Section V of the IFSP form specifies the entitled services and the frequency, intensity, group/individual, methods, natural environment/location, payment, projected start/end date, and actual end date for the services. In the methods subsection, there are four options that include (a) coaching, including hands-on as appropriate, (b) consultation, (c) evaluation, and (d) provision of assistive technology devices (Appendix A).

### **Federal Definitions of Assistive Technology Devices and Services**

Early intervention services, under IDEIA 2004, include AT devices and AT services. IDEIA 2004 defines AT devices as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability. The term does not include a medical device that is surgically implanted, or the replacement of such device" (IDEIA 2004, 20 USC § 1401).

IDEIA 2004 defines AT services as "any service that directly assists a child with a disability in the selection, acquisition, or use of an assistive technology device" (IDEIA 2004, 20 USC § 1401). AT services are specifically defined as the following:

- (A) The evaluation of the needs of such child, including a functional evaluation of the child in the child's customary environment;
- (B) purchasing, leasing, or otherwise providing for the acquisition of assistive technology devices by such child;
- (C) selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, or replacing assistive technology devices;
- (D) coordinating and using other therapies, interventions, or services with assistive technology devices, such as those associated with existing education and rehabilitation plans and programs;
- (E) training or technical assistance for such child, or, where appropriate, the family of such child; and
- (F) training or technical assistance for professionals (including individuals providing education and rehabilitation services), employers, or other individuals who provide services to, employ, or are otherwise substantially involved in the major life functions of such child (IDEIA 2004, 20 USC § 1401).

### **Provision of AT Devices and Services to Early Intervention Programs Nationwide**

Campbell and Wilcox (2004) compiled data from the 2002 Office of Special Education Programs (OSEP) congressional report on the implementation of IDEA that indicated that only 4.07% of children enrolled in early intervention programs have AT listed as a service or device on their IFSPs. They also compiled data from the National Early Intervention Longitudinal Study (NEILS), part of a program of longitudinal studies funded by the U.S. Department of Education. NEILS followed more than 3,338 children with disabilities or at risk for disabilities and their families through their experiences in early intervention and into early elementary school. NEILS found that only 4% of the early intervention service records reported AT as a provided service or device.

In the Final Report of the National Early Intervention Longitudinal Study (Hebbeler et al., 2007), the provision of AT devices or services was not even recorded. However, in the section on early intervention services that families reported receiving,

39% of the families reported that they received the service of “Find and/or pay for special equipment, toys, or therapy” (pp. 3-5). Assistive technology devices and services may fall into this category as special equipment or toys.

Goode, Lazara, and Danaher (2008), through the National Early Childhood Technical Assistance Center, produced a Part C update that compiled data on various aspects of Part C of IDEA. One of the aspects on which they compiled data was the inclusion of AT devices and services on the IFSPs of infants and toddlers nationwide who received early intervention services under Part C from 1995 through 2004. Table 1 shows that the percent of infants and toddlers whose IFSPs included AT devices or services ranged from 3.07% to 7.41% over this 10-year span. Furthermore, the lowest percents reported were in the last three years of data collection with 3.07% reported in the years 2002 and 2003 and 3.09% reported in the year 2004.

Table 1

*Percent of Infants and Toddlers Nationwide With AT on their IFSP*

Year	Percent	Year	Percent
1995	5.36	2000	3.77
1996	7.41	2001	3.23
1997	3.77	2002	3.07
1998	3.77	2003	3.07
1999	4.14	2004	3.09

### **Provision of AT Devices and Services to Early Intervention Programs in Virginia**

The Virginia Department of Mental Health, Mental Retardation and Substance Abuse Services, now named the Virginia Department of Behavioral Health and

Developmental Services, submitted an annual report on Virginia's Part C early intervention system to the Virginia governor and chairmen of the House Appropriations and Senate Finance Committees. The report provided information on the revenues and expenses for Virginia Part C services, the number of children served using Part C revenues, and the Part C services that were provided to children and their families in FY-2007, between July 1, 2006 and June 30, 2007 (Reinhard, 2007).

The total expenditures for all Virginia Part C direct early intervention services for FY-2007 were \$12,295,057. Of that total, the expenditures for AT services were \$34,629 (Reinhard, 2007, p. 3). The estimated total number of children who entered the Virginia Part C early intervention system and received early intervention services in FY-2007 was 10,330. From that population, the estimated number of children whose initial Individualized Family Service Plan listed AT as an early intervention service in FY-2007 was 72, a percentage of 0.7% (Reinhard, p. 11). Thus, it appears that a proportionally small amount of expenditures were spent on AT services and a proportionally small number and percentage of children had AT services listed on their IFSPs. Reinhard noted that these numbers were estimates and it was possible that the number of children who received each service was underestimated, as some children whose initial IFSP did not list a service may have had that service added during the one-year time period.

### **Significance of the Problem**

Although federal laws define early intervention services to include AT devices and services, the studies by Campbell and Wilcox (2004), Reinhard (2007), and Goode, Lazara, and Danaher (2008) indicate that a very low percentage of infants and toddlers

who are receiving Part C early intervention services have AT listed as a service on their IFSP. These findings are disconcerting and bring forth several questions. Why are such a proportionally small percentage of infants and toddlers reported to be receiving AT devices and services through their early intervention programs? Do these reported percentages provide an accurate depiction of AT provision by early interventionists? Could early interventionists be providing AT devices and services in their practice, but not defining or reporting them specifically as AT? If so, what types of AT devices and services are they providing and for what purposes? What factors are influencing their provision of AT to children and families receiving Part C services?

The purpose of this study is to obtain a better understanding of these factors by conducting an investigation on the current state of practice by early interventionists in Virginia in providing AT to infants and toddlers and their families who receive Part C services. Identifying these factors can help in developing strategies and education to support early interventionists in providing appropriate AT devices and services to assist infants and toddlers in participating in their daily activities and routines in their natural environments at home and in the community. The following research questions were developed to identify these factors.

### **Research Questions**

1. What types of AT devices do the early interventionists currently provide to infants and toddlers and their families in early intervention programs?
2. What types of AT services do the early interventionists currently provide to infants and toddlers and their families in early intervention programs?

3. For what functional goals and outcomes of infants and toddlers in the early intervention program do the early interventionists currently provide AT devices or services?
4. What factors do the early interventionists consider to be influential, either as a negative barrier or as a positive support, for the provision of AT devices and services to infants and toddlers and their families in early intervention programs?
5. What is the level of perceived knowledge of the early interventionists in areas related to AT for infants and toddlers and their families in early intervention programs?
6. What is the level of perceived need of the early interventionists for additional education or training in areas related to AT for infants and toddlers and their families in early intervention programs?

### **Definition of Terms**

The following are definitions of key terms used in this study:

- *Assistive technology device*: “any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability. The term does not include a medical device that is surgically implanted, or the replacement of such device” (IDEIA 2004, 20 USC § 1401).
- *Assistive technology service*: “any service that directly assists a child with a disability in the selection, acquisition, or use of an assistive technology device” (IDEIA 2004, 20 USC § 1401).



- *Augmentative communication device*: “a physical object or device used to transmit or receive messages (e.g., communication book, board, chart, mechanical or electronic device, computer).” (Beukelman & Mirenda, 1998, p. 4)
- *High tech or high technology AT devices*: “complex electrical and electronic devices, such as computers, voice synthesizers, Braille readers, augmentative communication systems, and environmental control units” (Sandal et. al, 2005, p. 149).
- *Individualized Family Service Plan*: the plan through which family members and early intervention providers collaborate to develop a family-centered plan to support the child’s development, including initial and ongoing evaluation, development of functional outcomes, and determination of necessary support services (IDEIA 2004, 20 USC § 1432).
- *Infant & Toddler Connection of Virginia*: the early intervention system that coordinates and implements all of the Part C early intervention programs in Virginia.
- *Low tech or low technology AT devices*: “simple devices, supports, systems, and adaptations such as custom-designed hand tools; positioning devices; and other simple, inexpensive easy-to-use adaptations” (Sandal et. al, 2005, p. 149).
- *Natural environment*: the provision of early intervention services in the “home and community settings in which children without disabilities participate” in their daily activities and routines (IDEIA 2004, 20 USC § 1432).

- *Part C early intervention services:* services for infants and toddlers ages birth through age three years who are not developing as expected or who have a medical condition that can delay typical development. Services focus on increasing their participation in family and community activities that are important to the family.
- The following acronyms were used:
  - *AT:* assistive technology
  - *EI:* early intervention
  - *IDEA:* Individuals with Disabilities Education Act
  - *IDEIA 2004:* Individuals with Disabilities Improvement Act of 2004
  - *IFSP:* Individualized Family Service Plan

## 2. Literature Review

### **Division of Early Childhood's Recommendations for Provision of AT Services**

The Division for Early Childhood (DEC) of the Council for Exceptional Children developed recommendations for evidence-based best practices for provision of services to early intervention and early childhood programs for children with disabilities. Their recommendations were based on a synthesis of research from peer-reviewed professional journal articles and focus groups consisting of service providers, researchers, families, and administrators (Smith et al., 2002).

State level practices recommended by DEC for provision of AT included that state agencies arrange for leaders and teams to provide early intervention and early childhood program staff members with AT, training in AT, and AT support (Sandall et al., 2005, p. 151). At the local level, DEC recommended that service programs and providers consider the use of AT in the assessment process and provide AT to improve early intervention/early childhood special education services for children with disabilities in order to increase their skills in “communication and language, environmental access, social-adaptive, mobility and orientation, daily life, social interaction, health, and positioning/handling” (Sandall et al., p. 151)

DEC further recommended the provision of developmentally appropriate low technology AT devices and services to increase children's abilities to function and

participate in diverse and less restrictive environments, match the AT to instructional objectives to determine the effectiveness of the AT, and have knowledge of sources for AT funding (Sandall et al., pp. 152-153). In the process of determining the appropriateness of AT for the child, DEC recommended that decisions be based on families' preferences with respect for their cultural and socioeconomic backgrounds, that services be provided to support families in using and maintaining AT, and that access to AT be provided in the various settings where instruction and interactions occur (Sandall et al., pp. 154-155).

### **Family-Centered Provision of AT in Natural Environments**

The Individuals with Disabilities Education Act mandates that early intervention services be provided in the child's natural environments. Hanft and Pilkington (2000) addressed the challenges that occupational therapists, physical therapists, and speech-language pathologists may experience in providing early intervention services when moving from a medical model of service provision to a family-centered model in the child's natural environments. The authors noted that intervention strategies and therapeutic objectives can be incorporated to support the child's functional outcomes that are identified by family members, such as communicating, socializing, playing, dressing, grooming, self-feeding, and moving throughout their daily environments.

In addition to determining the natural environment settings where the child needs to learn and perform these skills, the authors noted that it is just as important to identify strategies to help the family achieve the functional outcomes, which may include modifying the physical environment, adapting toys and other materials, and modifying

daily routines. Collaboration between therapists and family members can identify AT devices and strategies that may be appropriate in supporting the functional outcomes in the child's natural environments.

Through survey data obtained through telephone interviews of parents and family members of children receiving early intervention services, Wilcox, Dugan, Campbell, and Guimond (2006) found that AT devices were being used primarily to support play, communication, and mobility. Lower technology devices were most often introduced to them by other family members or friends, and higher technology devices were most often introduced to them by early intervention providers. Some families were aware of funding sources for AT devices, but most devices were paid for by family funds. Most families were unaware of resources for borrowing AT devices.

Wilcox et al. (2007) noted that, "over 70% of the time they located and tried devices without the assistance of providers" and "their average reported success rate with AT devices was 46.6%", increasing the probability of abandonment of the devices (p. 15). The researchers further noted the importance of collaboration between early interventionists and family members to incorporate the use of AT as a support for the children's functional outcomes and reduce the chance of abandonment of AT devices that were not successful supports.

Judge (2002) discussed the importance of using a family-centered approach in early intervention programs to select and integrate appropriate AT supports and reduce the chances of abandonment of AT. Judge advocated developing parent-professional partnerships to develop an assessment plan, conducting an activity-based assessment in

the child's natural environments, collaborating to develop IFSP goals, identifying resources that are currently in place, exploring AT devices or systems that may be appropriate supports, providing training in the use of the AT supports, and conducting ongoing evaluation in order to be sensitive to potential changes in the child's environments and the strengths and needs of the child and family.

Early interventionists' awareness of cultural diversity and respect for families' ethnic, cultural, and socioeconomic backgrounds, beliefs, and traditions, is critical to using a family-centered approach in early intervention programs. These factors can strongly influence the families' attitudes about having a child with developmental challenges, their perceived need for early intervention services, their desired functional IFSP outcomes, and their perceived need for AT supports (Goode, 2005; Parette & Brotherson, 2004; Turnbull & Turnbull, 2001).

Brotherson, Cook, and Parette (1996) confirmed the importance of using a home-centered approach with collaboration between early interventionists and families in making decisions about AT. They proposed several factors to explore with families to help them identify their need for AT devices, as well as potential barriers and supports, to help them determine how AT be successfully incorporated into their daily home life. These factors include the "influence of family characteristics (culture, values, and needs)...impact on family interactions and relationships...impact on family resources and functions...[and their] dreams and desires for the future" (p. 94).

Long, Huang, Woodbridge, Woolverton, and Minkel (2003) developed an outcome-driven framework to guide early interventionists and families of young children

to collaborate together as a team to determine AT devices and services that may be appropriate to support the needs of the child and family and the child's functional outcomes, and to develop a plan for acquiring, implementing, and integrating the AT strategies in the child's daily activities and environments. The ten decision-making steps in the process include "recognizing a problem, evaluating child and family needs and expectations, assessing barriers and identifying AT devices and services, considering AT menu options, matching AT devices and services to child and family needs, selecting AT and identifying training needs, securing suppliers, securing funding sources for AT devices and services, implementing AT, and providing follow-up" (p. 278).

### **Synthesis Report and Articles Review on Use of AT in Early Intervention**

The "Let's Play!" staff at the State University of New York Buffalo and the American Institutes for Research completed a synthesis report, commissioned by the Office of Special Education Programs, to document the research base supporting the use of AT for infants and toddlers with disabilities (Mistrett et al., 2001). The authors' conceptual framework noted that there are three primary ways in which infants and toddlers participate in their daily activities, including positioning and movement, receptive and expressive communication, and interaction with materials (p. I-12), and that AT can increase their participation in natural learning opportunities in their daily activities.

Mistrett et al. (2001) reviewed the research literature and AT vendor websites and catalogs, and also interviewed early intervention providers, to determine the types of AT devices that were available and their potential applications as AT supports for infants and

toddlers with disabilities. Half of the devices were commercially available items that could be used with or without adaptations, and half were designed specifically for infants and toddlers with disabilities. They found that 33% of the AT devices were used to enhance movement, 56% were used to increase interaction with materials, and 11% were provided to augment communication. The authors found that there is a need for more research, training, and provision of information on the availability, use, and effectiveness of AT provided by early interventionists to support the participation of infants and toddlers with disabilities and their families in their daily activities in their natural environments.

Campbell, Milbourne, Dugan, and Wilcox (2006) reviewed articles on assistive technology that were published between 1980 and 2004, and found 104 articles on the topic of AT in early intervention. Of these articles, 23 of them focused on strategies to teach young children to use AT devices, primarily switches, computers, and power mobility devices. Most of these articles focused on developing specific isolated skills. The authors noted that the earlier studies on using AT with young children primarily focused on the functional areas of mobility, communication, and play, but more recent studies have looked at AT as a tool to enable young children to participate in their daily activities and routines, reflecting recommended practices for providing supports in the child's natural environments. They noted that very few of the articles provided data to support practitioners and families in strategies to teach children with disabilities and their families how to use various AT devices to enable their participation in their daily



activities and natural environments, and the authors further recommended that additional research be conducted to provide this information.

### **Early Interventionists' Perspectives on the Use of AT**

Trachtman and Pierce (1995) conducted an AT needs assessment using a survey questionnaire that was mailed to agencies in North Carolina that provided services to infants, toddlers, and preschoolers with disabilities, ages birth to five years. The types of AT devices that were most frequently reported as being needed by infants and toddlers ages birth to age two years included augmentative communication devices, adapted toys, and learning aids. The types of AT devices that were most frequently recommended and provided included positioning devices, adapted toys, learning aids, computers, and computer access aids. Augmentative communication devices and aids to activities of daily living were reported least frequently as being recommended and provided to infants and toddlers. Thus, there was a discrepancy for augmentative communication devices, which were most frequently reported as being needed, yet reported least frequently as being recommended and provided.

Fifty-five percent of the respondents in the Trachtman and Pierce (1995) study reported that the infants and toddlers on their caseload were receiving the AT that they needed. When needed AT devices were not provided, the most frequently reported reasons were lack of funding, lack of trained providers, or situations when AT devices were ordered but not received. The types of AT services that were most frequently reported as being provided by the respondents included AT assessment, selection of AT devices, and training the child and family in the use of AT.

Tots N Tech, a research institute on AT for infants and toddlers that is a collaboration between Thomas Jefferson University and Arizona State University, funded by the U.S. Department of Education, conducted a five year study to investigate the use of AT services and devices with children receiving Part C early intervention services (Wilcox, Guimond, Campbell, and Moore, 2006). The researchers administered a telephone survey to early intervention providers in twelve states. Early interventionists in the Commonwealth of Virginia were not included in the study. The participants included child development specialists/teachers, speech-language pathologists, occupational therapists, physical therapists, and other disciplines.

The purpose of the Wilcox, Guimond, et al. (2006) study was to determine the early interventionists' perspectives regarding the use of AT (definitions of AT, provision of a formal AT assessment, children's use of AT), their decision-making about AT for children (beliefs about AT, factors influencing their consideration of AT and inclusion of AT on the IFSP, and their perceived access to AT resources, funding supports, and lending programs). They found that 18% of the participants reported having "a lot" of training in the use of AT with infants and toddlers. Fifty-five percent of the participants reported that the children they served received AT if it was needed, but 44% reported that few or no children needing AT were receiving AT (p. 45). Participants who had more training on the use of AT in early intervention reported higher AT use with the children they served.

Furthermore, in the Wilcox, Guimond, et al. (2006) study, when comparing responses across disciplines, occupational therapists reported significantly less frequently

than the other participants that all of the children they served who should be using AT were using it. The factors that most influenced the likelihood of listing AT on the IFSP included assisting the children's achievement of developmental milestones, enhancing their participation in activities that they could not previously take part in, and supporting family interactions. Other factors that were noted, but less frequently, were when the children's IFSP goals were not achieved and when there was a change where the children spent their time during the day in their natural environments.

The factors that the participants' in the Wilcox, Guimond, et al. (2006) study considered most important for AT provision included their knowledge of AT, the parents' attitudes towards AT, the opportunities to trial or borrow AT devices, the environments in which the children would use the devices, and the availability of AT devices, technical support, and funding sources. Participants who had little or no AT training were more likely to report AT availability, red tape, and support from colleagues or supervisors as being more important in their consideration for AT provision than participants who reported having more AT training (p.41). The researchers recommended further research on the use of AT in early intervention to promote children's participation in their daily activities in their natural environments.

Follow-up telephone interviews of 424 of the 967 early intervention providers in the Wilcox, Guimond, et al. study (2006) were conducted by Dugan, Campbell, and Wilcox (2006) to determine the decisions that they would make for interventions, including the choices of providing low technology, providing high technology, working on skill development, or having no concerns when presented with specific scenarios with

infants and toddlers in the functional areas of communication, playing, dressing, mobility, bathing, and eating/drinking. The researchers found that the most frequently selected option for all ages and for most functional areas was building skill development. For children under the age of 12 months, providers selected skill development as the option for most of the scenarios, with the exception of dressing and bathing. Providers indicated having no concerns if a child under the age of 12 months could not participate in dressing. For bathing, use of a low technology device was selected by 83.3% of the providers for children less than 12 months of age.

For children between 12 to 24 months of age, 20.9% of the providers selected low technology options for communication challenges, 33.3% for children who are able to hold but not manipulate a toy to play with it, 41.2% for children who are able to swallow without difficulty, but cannot eat or drink without assistance, and by 48.4% for bathing supports (p.29). A high technology custom bath seat was selected by 29.9% of the providers for bathing.

For children over the age of 24 months, 55.2% of the providers selected low technology options for communication challenges, 56.4% for children who are able to hold but not manipulate a toy to play with it, 57.2% for children with dressing challenges, 69.5% for children with mobility challenges, and 76.5% for children who are able to swallow without difficulty, but cannot eat or drink without assistance (p. 29). High technology options were selected by 8.4% of the providers for communication challenges, and by 63.7% of the providers for bathing. Dugan et al. (2006) determined that AT is an underutilized intervention with infants and toddlers, and the factors that

may influence and support the use of AT by early interventionists should be further explored.

In a doctoral dissertation study, Galyon Keramidas (2006) explored the factors related to the use of different categories of AT by early interventionists working with infants and toddlers in West Virginia. Data was collected through the use of a survey questionnaire that was mailed to all early interventionists listed in a database of practitioners who contract with the state to provide early intervention services and through follow-up phone interviews with survey respondents who agreed to participate. Results from the study determined that the respondents' occupation, perception of their level of AT experience, number of AT inservice trainings taken, and number of college-level courses that included information on AT were significantly related to the number of AT categories that they reported using with infants and toddlers. Physical therapists and occupational therapists reported the highest use of AT, followed by developmental specialists and speech-language pathologists. The respondents most frequently reported using low tech and sensory integration AT.

Milbourne and Campbell (2008) surveyed coordinators of Part C early intervention programs from 29 states, including the Commonwealth of Virginia, to determine how AT services and devices are provided. The majority of the Part C coordinators, including Virginia, reported that AT is listed as a service option on the IFSP, and almost half reported that AT is specifically linked to IFSP outcomes. They reported that the top barriers to provision of AT included funding for AT, availability of early intervention providers who are knowledgeable and experienced in AT, access to AT

lending libraries or loan programs, and access to convenient AT training, demonstrations, and professional development.

### **Early Interventionists' Self-Efficacy and Confidence in Using AT and Their Perceived Needs for Additional AT Training**

Gallagher, Malone, Cleghorne, and Helms (1997) surveyed early intervention providers from 11 disciplines in one southeastern state to determine their perceived needs for current and future inservice training in seven competency areas, including typical/atypical development, family systems and family involvement, assessment, program implementation and evaluation, administrative and team process, professional development, and technology. The majority of the providers reported having six or more years of early intervention experience. The most frequently reported needs for current inservice training were in the competency areas of technology and assessment.

Professionals in the counseling group (psychology, family training/counseling, and social work) and the medical group (physician and nursing) reporting the greatest need for training in technology. Furthermore, the area of technology was ranked most highly as a need for inservice competency training in the future, defined as three or more years from the time of the survey, by professionals in the counseling group, medical group, and early intervention group (early intervention service coordination and early intervention coordination).

Lesar (1998) administered a survey to early childhood special education professionals to explore their preparation in AT, knowledge, usage, and concerns related to using AT with their preschool students. The participants included early childhood

special educators, speech-language pathologists, child development general educators, administrators, and other disciplines. Forty percent or more of the participants rated their AT knowledge as being “nonexistent” or “novice” in several areas, including mobility aids (64%), communication devices (59%), agencies that provide services or access to AT (55%), switch-activated devices (51%), software (50%), low technology devices (48%), and computers (47%) (p. 150). Although 83% of the participants indicated that they used some types of AT devices with their students, 57% indicated that they seldom or never used communication devices, 40% seldom or never used switch-activated toys or devices, and 28% seldom or never used computers (p. 151).

The respondents in the Lesar (1998) study noted having concerns and needs for additional training in the areas of using appropriate AT devices, instructing students, families, and teachers in the use of AT devices, types of available AT devices, determination of appropriate AT devices to provide in the child’s natural environments to meet the needs of the child and family, sources to obtain AT devices, length of time to acquire AT devices, sources to obtain funding for AT devices, services, and training, and maintaining or updating the AT devices when needed. Lesar emphasized that these are barriers to the provision of AT, and that it is important to provide preservice and inservice AT training in these areas to support teachers in integrating AT in their students’ daily activities.

Approximately 68% of the Lesar (1998) respondents reported that their educational background had not adequately prepared them to use AT with their students (p. 150). The most frequently reported sources of AT preparation were through personal

experiences and printed materials. Significant relationships were found between the participants' ratings of their knowledge of AT devices and the participants' hands-on experiences with those AT devices, including low technology devices, switch-activated devices, communication devices, mobility aids, computers, and computer software. Significant relationships were also found between the participants' ratings of their computer knowledge and their utilization of computers with students, their knowledge of communication devices and their usage of electronic communication devices with students, and their knowledge of switch-activated devices and their use of switch-activated devices with students.

Lahm and Sizemore (2002) administered a telephone survey to professionals from different disciplines that provided AT services to early intervention programs, in order to explore their beliefs and approaches when making decisions about AT provision. The participants included educators, speech-language pathologists, assistive technology suppliers, assistive technology practitioners, and an occupational therapist. The participants rated client goals and environmental demands as the most important factors in their decision-making, followed by family/client demands and client diagnosis. When asked about the functional areas for which AT provided support, the participants most frequently noted providing supports in the areas of play, learning, work, communication, and achievement of goals.

Although all of the participants in the Lahm and Sizemore (2002) study noted the importance of using a team approach in making decisions about AT, none of the participants mentioned including parents and family members on the decision-making



team. Furthermore, most of the participants, regardless of educational level, reported that their education did not prepare them adequately to work in the AT field, as very few reported having taken any coursework in AT. However, the speech-language pathologists who had most recently graduated reported feeling better prepared. Most of the participants agreed that additional AT training would be beneficial. The researchers recommended further research to define the factors that influence early interventionists' decisions on AT provision.

Lamorey and Wilcox (2005) developed the Early Interventionist Self-Efficacy Scale (EISES) to determine the self-efficacy of early interventionists in standards for early intervention and to explore the relationship between specific characteristics of the practitioners and their reported self-efficacy, defined as their perception of themselves as being “capable of making a difference in the lives of the children and families that they serve” (p. 79). The researchers distributed the EISES to early interventionists from various disciplines, including occupational therapists, physical therapists, early interventionists, speech-language pathologists, family educators, developmental specialists, and other disciplines. They found that overall, the participants reported having at least a moderate level of self-efficacy. A positive relationship was found between their reported self-efficacy and their years of experience working in the early intervention field, but not with their years of overall professional experience. No significant relationship was found between their level of reported self-efficacy and the level of education of the participants.

Moore and Wilcox (2006) developed the Assistive Technology Confidence Scale (ATCS) to explore the relationship between early interventionists' confidence in early intervention and their confidence in using and applying AT. The researchers distributed the ATCS, along with the EISES, to early interventionists from various disciplines. AT confidence scores on the ATCS were positively related to early intervention self-efficacy scores on the EISES. Overall on the ATCS, the participants reported having fair to good confidence in AT, with service coordinators reporting less confidence than the other disciplines. The participants rated themselves as being most confident in the area of AT assessment, which included participating in an AT assessment, collaborating with families and professionals during the assessment process, evaluating a child's need for AT related to their functional skills, and determining whether an AT device will support the child's functional skill development.

Overall, the participants indicated being less confident in the area of use and application of AT devices and services, which included using AT equipment in the assessment process, determining which AT devices are most effective for a child, making provisions for AT devices and services on the IFSP, assisting families in using and maintaining AT, ensuring that children have access to AT devices in their daily settings, helping families incorporate the use of AT in their daily routines, collaborating with professionals about using AT with children and families, and coordinating AT support for families transitioning to preschool. The participants indicated being least confident in the area of accessing and using information pertaining to AT, which includes utilizing state and local AT resources, finding funding sources for AT, obtaining training in AT

assessment and intervention, gathering information for families on maintenance of AT devices, and making low technology devices and adaptations. Although no significant difference was found in confidence ratings based on educational level, significant differences were found based on years of experience in early intervention, with participants who had more than 10 years of experience reporting having more confidence in using and applying AT than those with less experience.

Long, Woolverton, Perry, and Thomas (2007) surveyed the AT training needs of pediatric occupational therapists through the use of a mailed questionnaire that asked respondents to rate the adequacy of their AT training, their confidence in providing AT, the types of AT training topics that they would find to be most beneficial to their practice, and the effectiveness of different methods of professional AT training. The majority of the participants provided services to school systems, but 13% of the participants indicated that their primary work setting was an early intervention program.

Long et al. (2007) found that more than half of the respondents indicated having adequate training in collaborating with colleagues and in working with clients with disabilities for AT devices and services. The respondents reported having the least adequacy in knowledge of AT legislation and policies related to AT devices and services. There was a wide variation in the level of AT confidence reported by the respondents, but the majority of respondents reported having the most confidence in recognizing that individuals with disabilities may benefit from AT and in using low tech AT devices. They reported having markedly less confidence in identifying AT funding sources, using high tech AT devices, doing AT evaluations, developing a menu of AT devices and

services, providing AT training for children, working with culturally diverse families who need AT, determining the outcome of providing AT devices and services, and identifying qualified AT suppliers (p. 349). They further found that respondents who had more than 11 years of occupational therapy experience and respondents whose professional responsibilities included a higher percentage of AT related responsibilities reported having the highest confidence levels.

Furthermore, in the Long et al. (2007) study, the respondents also indicated their AT training needs, usefulness of AT training topics, and preferences for types of AT training methods (p. 351). They rated their most critical needs for AT training as keeping current with advancements in AT, funding for AT devices and services, and collaboration with families and AT professionals. When asked to rate the usefulness of AT training topics to provide more information on AT, the topics that were most highly rated included receiving information on specific types of AT devices, AT assessment for client use, AT funding sources, fabrication of AT devices, and skills to train others in the use of AT. The respondents indicated a preference for hands-on training or lab experiences, group instruction provided through continuing education or inservices, and person-to-person mentoring. The researchers concluded that additional preservice and inservice AT training is needed for pediatric occupational therapists, using hands-on and group instructional methods, particularly in the areas of AT funding sources and use of high tech AT devices (p. 353).

Long and Perry (2008) did a similar survey study with pediatric physical therapists to explore their perceptions of their previous AT training, confidence level in

providing AT, and their AT training needs and preferences for methods of AT training. Seventy-eight percent of the therapists reported working with children ages birth to three years. Their findings were strikingly similar to the Long et al. (2007) survey with pediatric occupational therapists. The areas in which they reported having high and low levels of confidence in AT were the same as reported by the occupational therapists. A relationship was again found between the respondents' years of experience and the amount of their job responsibilities related to AT, as respondents who had more than eleven years of physical therapy experience and a higher percentage of job responsibilities related to AT reported higher levels of confidence in AT. The respondents rated the usefulness of having additional AT training most highly in the areas of specific types of AT devices, assessing the client for use of AT devices, clinical decision-making skills, AT funding sources, and training others in the use of AT (p. 635).

Furthermore, in the Long and Perry (2008) study, the physical therapists reported that their most crucial training needs were in the areas of AT evaluation, AT funding, and keeping current with AT advancements, and that they preferred receiving training in the forms of hands-on or lab experiences through group instruction provided through continuing education or inservices, and person-to-person mentoring. Barriers to receiving additional AT training included the lack of available AT courses, inconvenience of times and locations offered for training, concerns about the quality of training, and lack of funding to pay for additional training or coursework. The conclusions reached by the researchers for this study confirmed the conclusions for the Long et al. (2007) study that additional training is needed at the preservice and inservice levels for physical therapists,

particularly in the use of high tech AT devices, AT funding sources, and that their preferred training methods included hands-on experiences and group instructional methods.

### **Pilot Study**

As part of the requirements for a graduate research course, I conducted a pilot study that explored the use of AT in an early intervention program from the perspectives of three early interventionists (Feist, 2003). This topic was selected because my professional experiences as an early interventionist, consultations with other early interventionists, and review of literature determined that there was a need for further research on the use of AT with infants and toddlers with developmental delays or disabilities who receive early intervention services, including determining the types of AT services and devices that were being provided, the purposes for which AT was being used, and the factors that supported and hampered the use of AT in early intervention programs.

The purpose of the pilot study was to determine the types of AT services and devices that were being provided to infants and toddlers and their families in an early intervention program and to determine the factors that influence their use. For this study, three staff members from Virginia's Loudoun County Parent-Infant Education Program were interviewed, including the program coordinator, speech-language pathologist, and infant educator. Three very different perspectives on the use of AT by these early interventionists were obtained in the interviews.

The following information was obtained from the interviews. The speech-language pathologist was very concerned about parent readiness to accept the use of AT for their children. She noted that at this young age, many parents are working through the process of accepting their child's disability, and are hopeful that their child will resolve their developmental issues without needing AT. As the speech-language pathologist noted, some families feel that using AT makes their child look different. AT often involves equipment that must be taken along with the child when they go into the community, and for many parents this can be cumbersome. She commented that she tended to not push parents into using AT.

The program coordinator focused on the early intervention model of providing services in the child's natural environment, which is usually in their home, and working with the equipment and toys that are in the child's natural environment. She questioned whether bringing AT devices into the child's home was providing a natural support. She felt that most of the AT services that are provided should involve low technology devices and adaptations to equipment in the child's home.

The infant educator felt that since most of the families in the early intervention program have computers and other technology in their home, providing AT to help a child be more successful in communicating and more independent in playing did fit into the natural environment early intervention model. She noted that the benefits of AT encompassed all developmental areas, and felt that development of children's self-esteem was one of the most important benefits. She commented that when children are able to communicate their needs, socialize with family and friends, or independently activate a

toy, it reduces their frustration. She also noted the positive impact on the families when they are able to see their child be more independent and more like their peers when using AT. She supported the speech-language pathologist's assertion of the importance of parent readiness for their child to use AT as being a significant factor influencing when AT is introduced.

This pilot study highlighted the differences in perspectives of three early interventionists from different disciplines, and found that they had differing perspectives about using AT as a support for infants and toddlers and their families, including parent readiness to use AT with their child and how AT fits into the model of providing supports in the child's natural environment. These results corroborate the findings of the Wilcox, Guimond, et al. study (2006) that parent attitudes are an important factor that early interventionists take into consideration for AT provision. The discomfort that the speech-language pathologist expressed in providing AT illustrated the challenges identified by Hanft and Pilkington (2000) that some therapists may experience in providing AT through a collaborative family-centered model in the children's natural environments. Among the three participants, the infant educator was the practitioner who was the most optimistic about providing AT to support the children's functional skills in their natural environments, including communicating their needs, socializing with family and friends, and independently activating a toy, and the positive impact on the self-esteem of the children and their families.



## **Summary**

The findings from this review of literature on assistive technology in early intervention, my pilot study, my professional experiences as an early interventionist and assistive technology specialist, and my discussions with professional colleagues determined the following:

- There is a consensus that young children with disabilities may benefit from AT as supports for building skill development and achieving functional outcomes, particularly in the areas of play, learning, communication, and achievement of goals.
- There is a consensus on the importance of collaboration between early interventionists and family members to incorporate the use of AT as a support for the children's functional outcomes.
- The early interventionists have concerns about the underutilization of AT and provision of AT to children who are perceived as needing it.
- The factors that early interventionists most consider for AT provision include parents' attitudes towards AT, the opportunities to trial or borrow AT devices, the environments in which the children would use the devices, the age of the child, availability of AT devices, technical support, and funding sources.
- There is a relationship between the provision of AT and the early interventionists education and training in AT, years of experience in early intervention, and professional discipline.

- The types of AT services that were most frequently reported as being provided by the early interventionists included AT assessment, selection of AT devices, and training the child and family in the use of AT.
- The types of AT devices that were most frequently reported as being provided by the early interventionists were primarily low tech.
- The early interventionists' perceived confidence level was highest in using low tech AT devices, with less confidence in identifying AT funding sources, using high tech AT devices, doing AT evaluations, providing AT training for children, working with culturally diverse families who need AT, determining the outcome of providing AT devices and services, and identifying qualified AT suppliers
- The early interventionists' perceived need for additional training was primarily in the use of AT with infants and toddlers, including AT evaluation, collaboration with families and professionals, AT funding, and keeping current with AT advancements.
- The researchers confirmed the need for further research on the provision of AT devices and services by early interventionists to the infants and toddlers and their families receiving early intervention services, identification of factors related to their provision of AT, and identification of needs for additional education and training in AT.

### 3. Method

This research study explored the types of AT that early interventionists in Virginia were providing to infants and toddlers and their families receiving Part C early intervention services, the purposes for which they were providing the AT, the factors that influenced their provision of AT, their perceived knowledge of AT, and their perceived need for additional education or training in AT. Research studies have shown that these factors can impact the provision of AT in early intervention programs. Identifying these factors can, as noted by the Infant & Toddler Connection of Virginia Part C coordinator, one of their Part C consultants, and several Part C local system managers in Virginia, help the Infant & Toddler Connection of Virginia to identify the needs of early interventionists for AT education, training, and technical assistance.

For this cross-sectional study, data were obtained from the participants using a self-administered, web-based survey questionnaire designed to address the six research questions. As defined by Fink (2003), a survey is “a system for collecting information from or about people in order to describe, compare, or explain their knowledge, attitudes, and behavior” (p. 138). Survey research is appropriate for this study since the purpose is to collect information from early interventionists throughout the Commonwealth of Virginia to obtain a snapshot of their current practice and perceptions and then analyze the data to obtain descriptive statistics to describe and compare their responses.

## **Participants**

The Commonwealth of Virginia currently has 39 local systems, or early intervention programs, that provide Part C early intervention services to their localities. Each locality in Virginia has a central point of entry. The Infant & Toddler Connection of Virginia, the early intervention system that coordinates and implements all of the Part C early intervention programs in Virginia, maintains a central directory that provides information on the central point of entry for each locality, including the names and contact information for the 39 local system managers who coordinate early intervention services for their locality. A Part C consultant with the Infant & Toddler Connection of Virginia who provided the updated contact information for the local system managers estimated that there are approximately 1,000 early intervention providers currently providing services to infants and toddlers and their families in Virginia's Part C local systems (K. Patterson, personal communication, January 5, 2009).

The participants who were recruited to participate in this study were from a sample that is representative of early interventionists in the general population who provide Part C services, consisting of program coordinators, service coordinators, special instructors, occupational therapists, physical therapists, speech and language pathologists, occupational therapy assistants, physical therapy assistants, instructional assistants, and other early intervention practitioners from rural, suburban, and urban areas across the state. As reported in the Virginia Department of Behavioral Health and Developmental Services' report on Virginia's Part C early intervention system (Reinhard, 2007), the majority of services provided to children who entered the Virginia Part C early

intervention system and received early intervention services in FY-2007 were service coordination (100%), speech-language pathology (47%), special instruction (23.3%), physical therapy (28.7%), occupational therapy (14.5%), and other disciplines (7.1%) including assistive technology, audiology, vision services, psychological services, social work services, nutrition, nursing and health (p. 11).

### **Data Sources and Instrumentation**

The survey utilized a web-based, self-administered questionnaire that was completed by the participants (Appendix B). I designed this questionnaire and included components of the surveys used by Wilcox, Guimond, et al. (2006), Dugan et al. (2006) and Moore and Wilcox (2006).

The questionnaire was divided into the following seven sections:

1. The early interventionists' professional discipline, highest level of formal education completed, years of experience working in early intervention programs, years of experience providing AT in their professional practice, sources used to learn about AT, area where their early intervention program provided services, number of families on their early intervention caseload and number of families on their caseload who have AT listed on their IFSP
2. The types of AT devices that the early interventionists were providing to infants and toddlers and their families in the early intervention program
3. The types of AT services that the early interventionists were providing to infants and toddlers and their families in the early intervention program

4. The functional goals and outcomes for which the early interventionists were providing AT supports to infants and toddlers and their families in the early intervention program
5. The level of perceived importance of various factors that influenced early interventionists, either as a negative barrier or a positive support, in providing AT to infants and toddlers and their families in the early intervention program
6. The level of perceived current knowledge of the early interventionists in areas related to AT for infants and toddlers and their families in the early intervention program
7. The level of perceived need of the early interventionists for additional AT education or training in areas related to AT for infants and toddlers and their families in the early intervention program

Eight of the questionnaire items consisted of closed-ended questions to obtain the following data:

1. Professional discipline that best described their primary area of practice in the early intervention program
  - a. In this section, there was an option, under the category of “Other”, to specify any other professional discipline not listed that best described their area of practice in the early intervention program, thus this was also an open-ended question.
2. Highest level of formal education completed

3. Years of experience working in early intervention programs
4. Years of experience providing AT in their professional practice
5. Sources used for learning about AT
6. Area where their early intervention program provided services
7. Number of families on their early intervention caseload
8. Number of families on their early intervention caseload who had specific AT devices or services listed on their IFSP

A Likert scale was used for the participants to rate their responses on six of the questionnaire items, to obtain the following data:

1. The types of AT devices provided to infants and toddlers and their families, and how often they were provided
  - a. There were 14 factors on this item with a rating range on each factor from “Never”, “Occasionally”, “Frequently”, to “Always”. The rating scale was coded for data analysis with a “1” representing “Never”, “2” representing “Occasionally”, “3” representing “Frequently”, and “4” representing “Always.”
2. The types of AT services provided to infants and toddlers and their families, and how often they are provided
  - a. There were 12 factors on this item with a rating range on each factor from “Never”, “Occasionally”, “Frequently”, to “Always”. The rating scale was coded for data analysis with a “1” representing “Never”, “2”

representing “Occasionally”, “3” representing “Frequently”, and “4” representing “Always.”

3. The functional goals and outcomes for which AT supports were provided to infants and toddlers and their families
  - a. There were 13 factors on this item with a rating range on each factor from “Never”, “Occasionally”, “Frequently”, to “Always”. The rating scale was coded for data analysis with a “1” representing “Never”, “2” representing “Occasionally”, “3” representing “Frequently”, and “4” representing “Always.”
4. The factors that were influential, either as a negative barrier or a positive support, in providing AT to infants and toddlers and their families
  - a. There were 15 factors on this item with a rating range from “Significant barrier”, “Mild to moderate barrier”, “Mild to moderate support”, and “Significant support”. The rating scale was coded for data analysis with a “1” representing “Significant barrier”, “2” representing “Mild to moderate barrier”, “3” representing “Mild to moderate support”, and “4” representing “Significant support.”
5. The level of perceived knowledge of the early interventionists in areas related to AT for infants and toddlers and their families in the early intervention program
  - a. There were 15 factors on this item with a rating range on each factor from “Not at all knowledgeable”, “Fairly knowledgeable”, “Very



knowledgeable”, to “Extremely knowledgeable.” The rating scale was coded for data analysis with a “1” representing “Not at all knowledgeable”, “2” representing “Fairly knowledgeable”, “3” representing “Very knowledgeable”, and “4” representing “Extremely knowledgeable.”

6. The level of perceived need of the early interventionists for additional AT education or training in areas related to AT for infants and toddlers and their families
  - a. There were 15 factors on this item with a rating range on each factor from “Not at all important”, “Fairly important”, “Very important”, to “Extremely important.” The rating scale was coded for data analysis with a “1” representing “Not at all important”, “2” representing “Fairly important”, “3” representing “Very important”, and “4” representing “Extremely important.”

The final questionnaire item was an optional open-ended question asking if there were any additional comments that the participants would like to share regarding their use of AT with infants and toddlers and their families in early intervention programs.

Prior to this study, feedback from colleagues and mentors who were experienced researchers were solicited to identify potential validity threats or weaknesses in this research design. To determine content validity, defined by Litwin (2003) as “a measure of survey accuracy that involves formal review by individuals who are experts in the subject matter of the survey” (p. 84), a paper-based draft of the questionnaire was

provided to assistive technology specialists and early interventionists to formally review in order to identify potential bias of questions or potential misinterpretation of the instructions or the questions due to lack of clarity. The questionnaire was revised based on their feedback.

After the revision, the questionnaire was pilot tested with 22 assistive technology specialists and early interventionists to identify any errors in form or presentation that needed further revision. Litwin (2003) asserts that pilot testing “is a critical step in assessing the practical application of your survey instrument” in order to see how it “actually plays in the field” (p. 66). Since the questionnaire is a web-based survey, it was provided in the electronic format to be pilot tested by the reviewers in order to determine clarity and ease of use for reading the items online, understanding the questions and response choices, entering their responses, and submitting the questionnaire. After receiving the reviewers’ feedback the questionnaire was revised a final time based on their feedback.

### **Procedures for Data Collection**

The Part C coordinator for the Infant & Toddler Connection of Virginia sent an email to each of the local system managers informing them that I would be contacting them by phone. In her email, she expressed her support for the study, stating it would help the Infant & Toddler Connection of Virginia identify needs for AT education and technical assistance. She encouraged the local system managers to forward my email with the survey link to the early interventionists who provide services for their program.

After that email was sent, I contacted the local system manager of each early intervention program by phone. A total of 35 of the 39 local system managers were eventually reached by phone. The other four local system managers did not respond to attempts to contact them. Using a phone script, the purposes and procedures of the research study were explained to the local system managers, confidentiality was assured, and they were asked to forward an email with the web survey link to each early intervention provider on their team (Appendix C). All 35 of the 39 local system managers who had been reached by phone agreed to forward the email to their early intervention providers.

Upon their agreement, an email with the survey link was sent to the local system managers. The email explained the purpose of the study, the reasons why participation in the study was important, and assurance of confidentiality in their responses (Appendix D). A web link was provided to the Informed Consent Form (Appendix E). If the early intervention providers selected the "I have read this form and agree to participate" button, they were electronically directed to the survey questionnaire. If the early intervention providers chose not to participate by selecting the "I have read this form and do not agree to participate" button, they were directed to a "Thank you for your time" screen. After submitting the questionnaire, a message appeared thanking the participants for taking the time to complete the survey and asking them if they would be willing to be contacted to follow-up on some survey responses for clarification, if necessary. The information that they had already submitted would remain confidential.

Approximately six weeks after the mail with the survey link was sent to the local system managers, out of a potential pool of approximately 1000 early interventionists, only 69 early interventionists had completed the survey questionnaire. This was not enough participants for a valid study. In an attempt to recruit more participants, I sent a follow-up email to the Part C local system managers expressing appreciation for their support and asking if they would be willing to forward a follow-up email to their early intervention providers in which I thanked those who had completed the survey questionnaire and asked those providers who had not yet responded to consider completing it (Appendix F). Several Part C local system managers responded that they would be willing to forward the follow-up email to their providers. The follow-up email with the survey link was sent to those Part C local system managers (Appendix G). As a result of the follow-up emails, an additional 52 participants completed the survey questionnaire.

A total of 121 early intervention providers participated in the survey and submitted the questionnaire. Forty-two of the participants provided their email addresses for follow-up contact if needed. However, five of the response sets were eliminated from inclusion in data analysis because their responses were incomplete, with a range of 45% to 66% of the items left blank. Thus, data from 116 participants were included in the data analysis to address the research questions.

### **Limitations of the Study**

A Part C consultant estimated that there are approximately 1000 early interventionists providing Part C services in Virginia. These services could be provided

by full-time or part-time staff members or by providers who are contracted on an hourly basis. It is not known whether the participants in this study provided services as a staff member or a contract provider. This factor could influence the size of their caseloads, their time to collaborate with colleagues and families, and their opportunities to participate in staff development inservices.

There were technology related challenges to the survey that appear to have potentially impacted the number of respondents who submitted the survey. I was not permitted to directly email the potential participants and relied on the Part C local system managers to forward the emails with links to the survey. Four of the local system managers did not respond to recruitment phone calls or emails, thus their early intervention providers did not have the opportunity to consider participating in the study. There were varying levels of technology competency among the local system managers and some of them had difficulty forwarding the email with the active survey link. Instead of forwarding the email, some local system managers copied and pasted the email text into a new email which sometimes resulted in broken links to the survey. I learned of this problem when a few of the early intervention providers sent emails notifying me that the links did not work. A follow-up email was sent to the Part C local system managers which many of them forwarded to their early intervention providers to clarify that if the survey link did not work they could copy and paste it into their browser window. It is not known how many of the potential participants encountered a broken survey link. Therefore, technology related challenges very likely resulted in fewer survey questionnaire submissions.

#### 4. Data Analysis and Results

This chapter summarizes the findings based on analyzing data gathered from 116 early interventionists providing Part C services to early intervention programs in Virginia. The data were obtained from the participants' responses submitted on a survey questionnaire designed to address the six research questions on their use of AT with infants and toddlers and their families. The web-based survey stored data from the participants' responses in a Microsoft Excel database that were later converted to a Statistical Package for the Social Sciences (SPSS) database. Descriptive statistics and data tables were generated for each of the following variables:

- Professional discipline/Primary area of practice in early intervention program
- Highest level of formal education completed
- Years of experience working in early intervention programs
- Years of experience using AT in professional practice
- Sources used to learn about AT
- Area where their early intervention program provides services
- Approximate number of families on their early intervention caseload
- Approximate number of families on their early intervention caseload who have specific AT devices or services listed on their IFSP

### **Professional Discipline / Primary Area of Practice in EI Program**

Participants were asked to identify the professional discipline that best described their primary area of practice in the early intervention program. As shown in Table 2, service coordinators comprised 23.3% ( $n = 27$ ) of the respondents and represented the largest group. There was some overlapping of disciplines in this category since the service coordinator is the early intervention provider assigned to the child and family to support them through the early intervention process and coordinate their early intervention services. Thus, the service coordinator could be an occupational therapist, physical therapist, speech-language pathologist, special instructor, or another discipline.

The next two largest groups, speech-language pathologists and special instructors, each comprised 18.1% ( $n = 21$ ) of the respondents. Physical therapists comprised 14.7% ( $n = 17$ ) and program coordinators comprised 12.9% ( $n = 15$ ) of the respondents. In the “Other” discipline category, 1.7% ( $n = 2$ ) of the respondents indicated having a different primary area of practice in the early intervention program, including an assistive technology specialist and an infant educator/teacher of the hearing impaired. None of the respondents were occupational therapy assistants, physical therapy assistants, or instructional assistants.

Table 2

*Professional Discipline/Primary Area of Practice in EI Program*

Professional Discipline	Frequency	Percent
Program coordinator	15	12.9
Service coordinator	27	23.3
Occupational therapist	13	11.2
Physical therapist	17	14.7
Speech-language pathologist	21	18.1
Special instructor	21	18.1
Assistant (PT, OT, Instructional)	0	0
Other	2	1.7
Total	116	100

*Note.* “Other” professional disciplines were AT Coordinator and Infant Educator/Teacher of the Hearing Impaired

### **Highest Level of Formal Education Completed**

Participants were asked to indicate the highest level of formal education they have completed. As shown in Table 3, 62.1% ( $n = 72$ ) of the respondents indicated a masters degree as their highest level of formal education and represented the largest group. The next largest group of respondents, 34.5% ( $n = 40$ ), had a bachelors degree. The two smallest groups, each comprising 1.7% ( $n = 2$ ) of the respondents, had an associates degree or a doctorate as their highest level of formal education completed. None of the respondents identified having a high school degree or GED as their highest level of formal education completed



Table 3

*Highest Level of Formal Education Completed*

Education Level	Frequency	Percent
High school/GED	0	0
Associates degree	2	1.7
Bachelors degree	40	34.5
Masters degree	72	62.1
Doctorate	2	1.7
Total	116	100

**Years of Experience Working in Early Intervention Programs**

Participants were asked to indicate the number of years they have worked in early intervention programs. As shown in Table 4, 37% ( $n = 43$ ) of the participants had worked in early intervention programs for five years or less, 25.9% ( $n = 30$ ) of the participants had worked in early intervention programs from 6-10 years, and 36.2% ( $n = 42$ ) had worked in early intervention programs for more than 11 years.

Table 4

*Years of Experience Working in Early Intervention Programs*

Years of Experience	Frequency	Percent
5 years or less	43	37.0
6-10 years	30	25.9
11 years or more	42	36.2
No response	1	0.9
Total	116	100.0

### **Years of Experience Providing Assistive Technology in Professional Practice**

Participants were asked to indicate the number of years they have provided AT in their professional practice. As shown in Table 5, 21.6% ( $n = 25$ ) of the participants had used AT in their professional practice for five years or less, and 26.7% ( $n = 31$ ) had used AT for 6-10 years in their practice. The largest group, at 44.8% ( $n = 32$ ), had used AT in their professional practice for more than 11 years.

Table 5

#### *Years of Experience Providing AT in Professional Practice*

Years of Experience	Frequency	Percent
5 years or less	25	21.6
6-10 years	31	26.7
11 years or more	52	44.8
No response	8	6.89
Total	116	100.0

### **Sources Used to Learn About Assistive Technology**

Participants were asked to identify the sources they have used to learn about AT devices, strategies, or services. A list of 10 sources was provided, and participants were asked to select all of the sources that applied, thus multiple selections could be made. As shown in Table 6, the participants have used many different sources to obtain information about AT. The most frequently identified source was collaboration with colleagues with 91.4% ( $n = 106$ ) of the participants reporting this as a source. The next most frequently reported source, by 76.7% ( $n = 89$ ) of the participants, was attending professional

conferences or workshops. Print sources, including books, vendor catalogs, and professional journals, magazines, and newsletters, were selected by 68.1% ( $n = 79$ ) of the participants, and staff development inservices were cited as a source for 65.5% ( $n = 76$ ). Internet resources, such as tutorials, research articles, webinars, listservs, podcasts, or other website resources were identified by 53.4% ( $n = 62$ ) of the participants, and 51.7% ( $n = 60$ ) noted collaboration with families as sources to learn about AT. AT vendor demonstrations were reported as sources by 45.7% ( $n = 53$ ) of the participants, and 40.5% ( $n = 47$ ) reported AT specialists as sources. Taking face-to-face college courses as a source to learn about AT was cited by 37.9% ( $n = 44$ ) of the participants and 8.6% ( $n = 10$ ) of the participants indicated taking online college courses to learn about AT. “None of the above” was selected by 1.7% ( $n = 2$ ) of the participants indicating that they did not use any of the 10 sources to learn about AT. Figure 1 illustrates the continuum of the percents of sources, from lowest to highest, that the participants used to learn about AT.

Table 6

*Sources Used to Learn About Assistive Technology*

AT Source	Frequency	Percent
College courses, face-to-face	44	37.9
College courses, online	10	8.6
Professional conferences	89	76.7
Staff development inservices	76	65.5
AT vendor demonstrations	53	45.7
Print sources	79	68.1
Internet resources	62	53.4
Collaboration with colleagues	106	91.4
Collaboration with families	60	51.7
AT specialists	47	40.5
None of the above	2	1.7

*Note.* Total number of respondents = 116

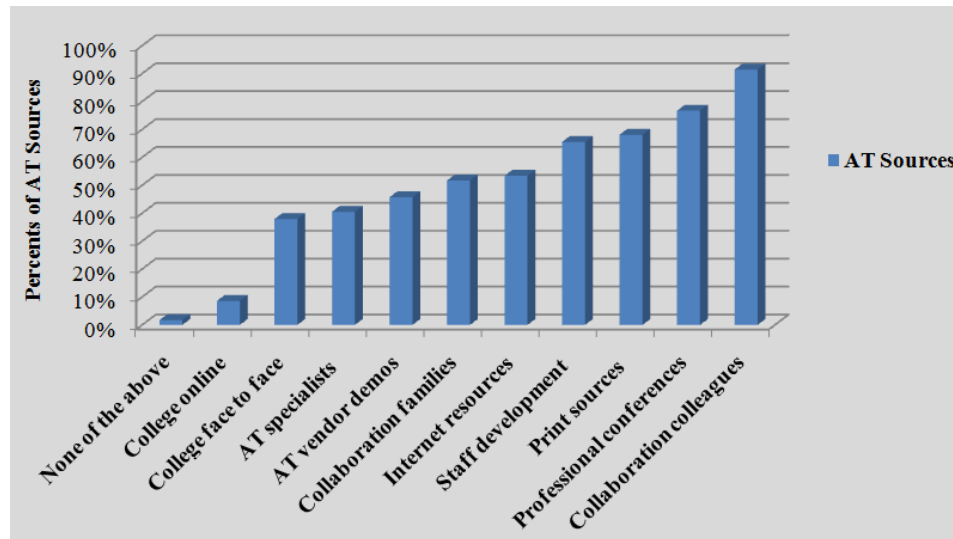


Figure 1. Percent of Sources Participants Used To Learn About AT.

### **Area Where Participants' Early Intervention Program Provides Services**

Participants were asked, "Which of the following best describes the area where your early intervention program provides services?" There were three options to select from, including rural, urban, and suburban. As shown in Table 7, the largest number of participants, 52.6% ( $n = 61$ ), indicated providing early intervention services in an urban area. The next largest group of respondents, 32.8% ( $n = 38$ ), indicated providing services in a rural area, followed by 13.8% ( $n = 16$ ) of the participants who indicated providing services in a suburban area.

Table 7

*Area Where Participants' Early Intervention Program Provides Services*

Area	Frequency	Percent
Rural	38	32.8
Urban	61	52.6
Suburban	16	13.8
No response	1	0.9
Total	116	100.0

### **Number of Families on EI Caseload and Number of Families on EI Caseload Who Have Specific AT Devices or Services Listed on Their IFSP**

Participants were asked to identify the approximate number of families on their early intervention (EI) caseload. They were also asked to identify the approximate number of families on their early intervention caseload who have specific AT devices or services listed on their Individualized Family Service Plan. Overall, the average number

of families on their early intervention caseload, represented by the mean score, was 17.75. Overall, the average number of families on their early intervention caseload who had AT devices or services listed on their IFSP, represented by the mean score, was 4.78. Therefore, the participants reported overall that 26.31% of the children on their caseload had AT listed as a device or service on their IFSP.

Descriptive statistics were generated to compare the number of families on their EI caseloads and number of families on their caseloads who had AT listed on the IFSP based on the participants' primary area where their early intervention program provided services. As shown in Table 8, participants who provided early intervention services in rural areas reported the largest number of families on their EI caseload ( $M = 19.55$ ), yet the smallest number of families on their caseload who had specific AT devices or services listed on their IFSP ( $M = 3.86$ ). The percent of families on their caseload who had AT listed on their IFSP was 19.74%. In comparison, more than 30% of the families served by participants who provided EI services in suburban and urban areas were reported to have AT listed on their IFSP.

Table 8

*Number of Families on EI Caseload and Number of Families on EI Caseload with AT Listed on Their IFSP*

	Mean Number of Families on EI Caseload	Mean Number of Families with AT on IFSP	Percent of Families on Caseload with AT on IFSP
Overall (All Programs)	17.75	4.78	27.31
Rural EI Programs	19.55	3.86	19.74
Suburban EI Programs	16.28	4.91	30.16
Urban EI Programs	17.42	5.58	32.03

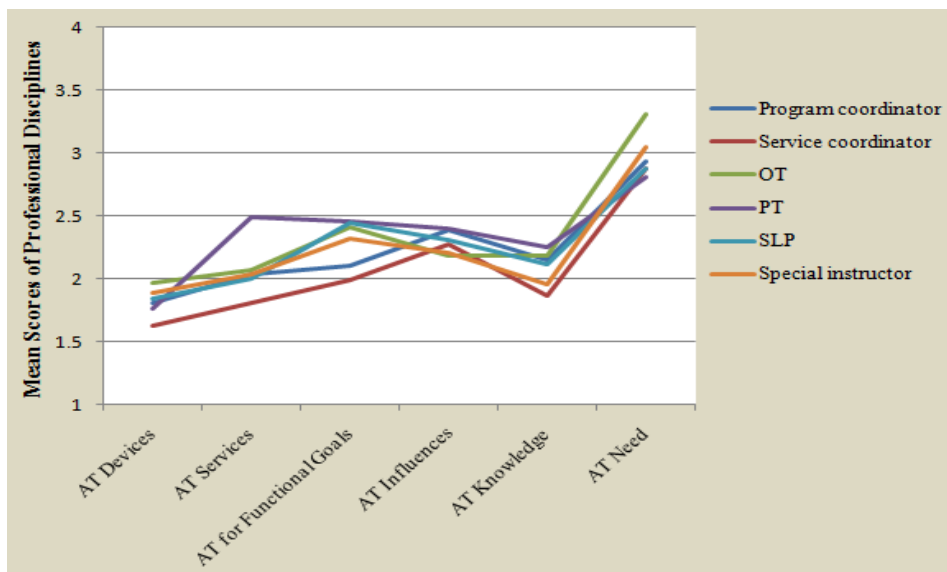
### **Results by Demographics for Research Questions**

Descriptive statistics were generated to obtain information about the participants' demographics to address the following six research questions:

1. What types of AT devices do the early interventionists currently provide to infants and toddlers and their families in early intervention programs?
2. What types of AT services do the early interventionists currently provide to infants and toddlers and their families in early intervention programs?
3. For what functional goals and outcomes of infants and toddlers in the early intervention program do the early interventionists currently provide AT devices or services?
4. What factors do the early interventionists consider to be influential, either as a negative barrier or as a positive support, for the provision of AT devices and services to infants and toddlers and their families in early intervention programs?

5. What is the level of perceived knowledge of the early interventionists in areas related to AT for infants and toddlers and their families in early intervention programs?
6. What is the level of perceived need of the early interventionists for additional education or training in areas related to AT for infants and toddlers and their families in early intervention programs?

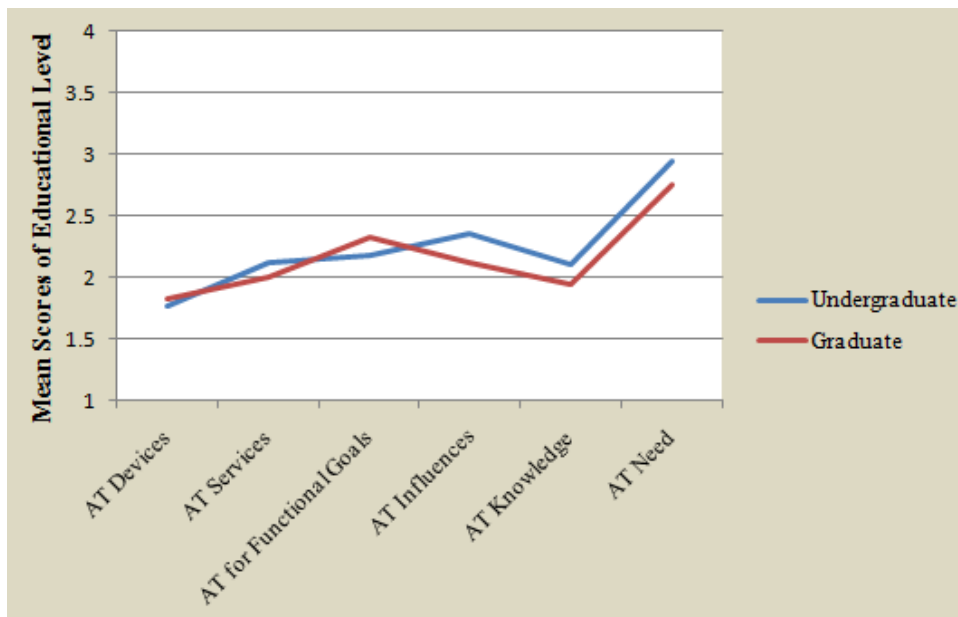
Figure 2 depicts the overall mean scores of the participants' professional disciplines in relation to their responses on the factors of AT devices, AT services, functional goals and outcomes supported by AT, influential factors in providing AT, perceived AT knowledge, and perceived need for additional AT education or training.



*Figure 2.* Mean Scores of Professional Discipline in Relation to AT Devices, AT Services, Functional Goals Supported by AT, Influential Factors in Providing AT Perceived AT Knowledge, and Perceived Need for Additional AT Education.

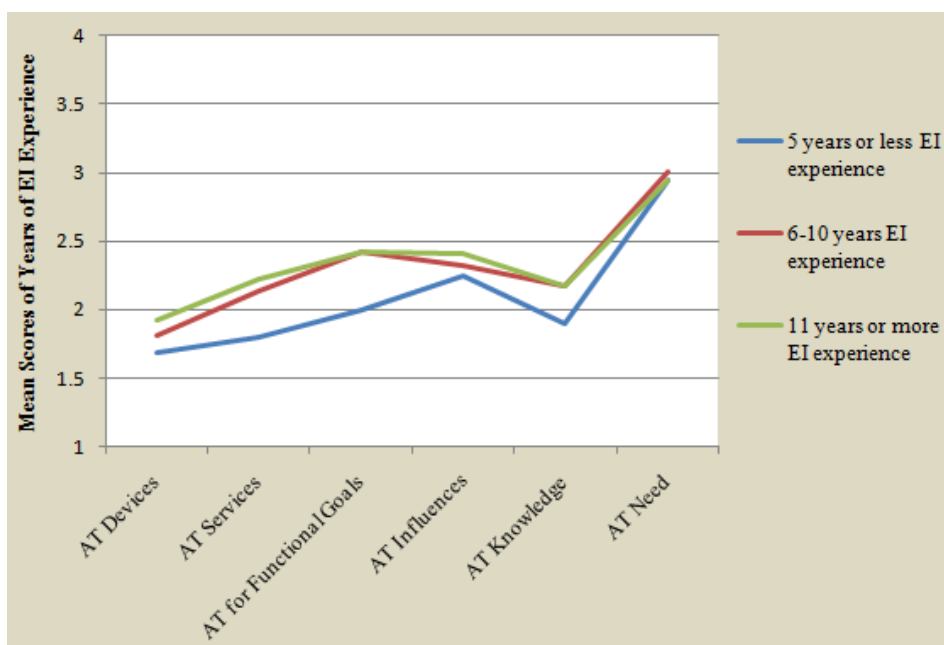


Figure 3 depicts the overall mean scores of the participants' highest level of formal education in relation to their responses on the factors of AT devices, AT services, functional goals supported by AT, influential factors in providing AT, perceived AT knowledge, and perceived need for additional AT education.



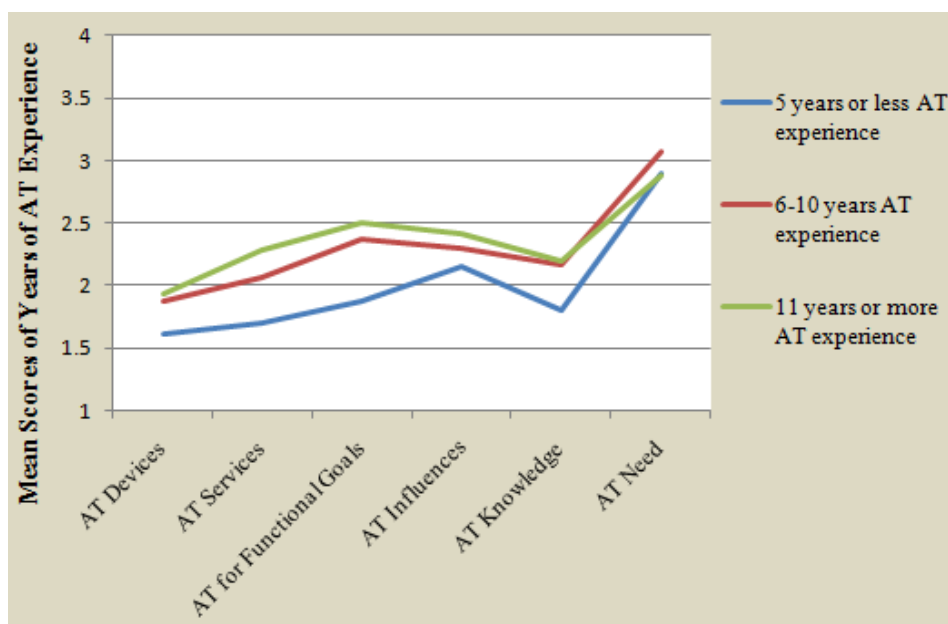
*Figure 3. Mean Scores of Formal Educational Level in Relation to AT Devices, AT Services, Functional Goals Supported by AT, Influential Factors in Providing AT, Perceived AT Knowledge, and Perceived Need for Additional AT Education or Training.*

Figure 4 depicts the overall mean scores of the participants' number of years of working in early intervention programs in relation to their responses on the factors of AT devices, AT services, functional goals supported by AT, influential factors in providing AT, perceived AT knowledge and perceived need for additional AT education.



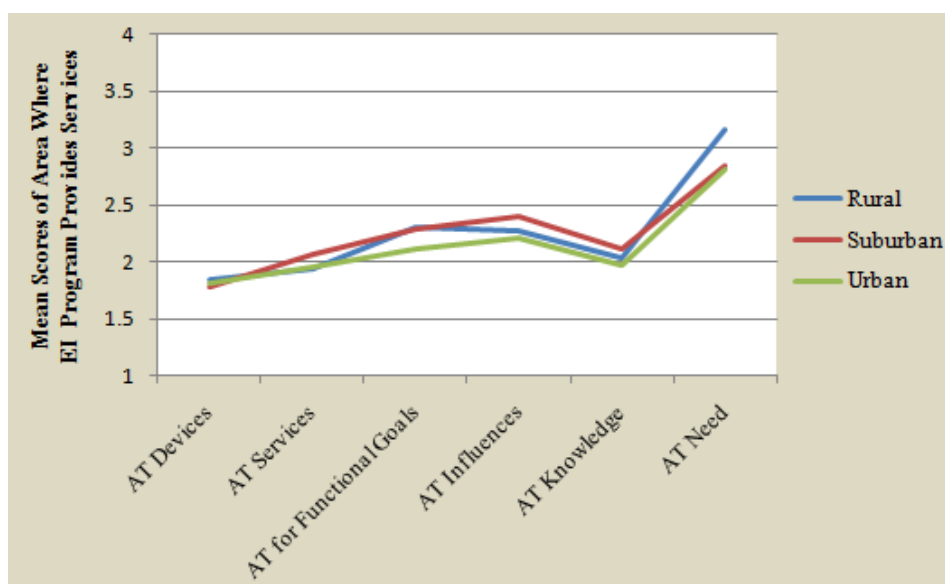
*Figure 4.* Mean Scores of Years of Experience Working in Early Intervention Programs in Relation to AT Devices, AT Services, Functional Goals Supported by AT, Influential Factors in Providing AT, Perceived AT Knowledge, and Perceived Need for Additional AT Education or Training.

Figure 5 depicts the overall mean scores of the participants' number of years of providing AT in their professional practice in relation to their responses on the factors of AT devices, AT services, functional goals supported by AT, influential factors in providing AT, perceived AT knowledge, and perceived need for additional AT education.



*Figure 5. Mean Scores of Years of Experience Providing AT in Professional Practice in Relation to AT Devices, AT Services, Functional Goals Supported by AT, Influential Factors in Providing AT, Perceived AT Knowledge, and Perceived Need for Additional AT Education or Training.*

Figure 6 depicts the overall mean scores of the area where the participants' early intervention program provides services in relation to their responses on the factors of AT devices, AT services, functional goals supported by AT, influential factors in providing AT, perceived AT knowledge, and perceived need for additional AT education.



*Figure 6. Mean scores of Area Where Participants' Early Intervention Program Provides Services in Relation to AT Devices, AT Services, Functional Goals Supported by AT, Influential Factors in Providing AT, Perceived AT Knowledge, and Perceived Need for Additional AT Education or Training.*

### **Research Question 1**

To analyze data for research question 1, “What types of AT devices do the early interventionists provide to infants and toddlers and their families in early intervention programs?” descriptive statistics were generated to provide data on the variable of AT devices, including frequency, percentage, mean, and standard deviation. Data was obtained from the participants’ responses to the survey question, “Please rate how often you provide the following types of assistive technology devices to infants and toddlers and their families in the early intervention program.”

As shown in Table 9, 50% or more of the participants indicated “Never” providing AT devices to infants and toddlers and their families in the areas of assistive

listening devices such as hearing aids and FM systems (58.6%), environmental control units (73.3%), voice output communication devices (53.4%), computer software programs (69.8%), and computer access devices (74.1%). Mobility devices such as braces, orthotics, walkers, or wheelchairs were reported to “Never” be provided by 49.1% of the participants. Fifty percent or more of the participants indicated “Occasionally” providing battery-operated or adapted toys (50.0%) and adaptive switches to infants and toddlers and their families (56.0%).

Table 9

*Provision of Assistive Technology Devices to Infants and Toddlers and Their Families*

AT Devices	Never %	Occasionally %	Frequently %	Always %	<i>M</i>	<i>SD</i>
Positioning devices	25	46.6	25.0	3.4	2.07	.799
Mobility devices	49.1	26.7	21.6	2.6	1.78	.876
Visual aids	34.5	49.1	14.7	1.7	1.84	.734
Assistive listening devices	58.6	31.9	7.8	1.7	1.53	.716
Aids for bathing, eating, dressing, or hygiene	31.9	47.4	17.2	3.4	1.92	.793
Battery-operated or adapted toys	17.2	50.0	29.3	3.4	2.19	.757
Adapted books	36.2	41.4	19.0	3.4	1.90	.828
Sensory items	13.8	43.1	33.6	9.5	2.39	.842

Adaptive switches	25.9	56.0	15.5	2.6	1.95	.720
Environmental control units	73.3	25.0	1.7	0	1.28	.490
Picture communication symbols / boards	25.0	35.3	30.2	9.5	2.24	.938
Voice output communication devices	53.4	36.2	6.9	1.7	1.56	.704
Computer software programs	69.8	23.3	4.3	0.9	1.35	.609
Computer access devices	74.1	22.4	2.6	0.9	1.30	.563

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*Note.* Never = 1, Occasionally = 2, Frequently = 3, Always = 4.

Figure 7 illustrates the mean scores of the AT devices that the early interventionists indicated providing to infants and toddlers and their families. Overall, the participants indicated providing AT devices in the “Never” to “Occasionally” range in 10 of the 14 areas with mean scores ranging from 1.28 to 1.95. These areas included environmental control units ( $M = 1.28$ ), computer access devices ( $M = 1.30$ ), computer software programs ( $M = 1.35$ ), assistive listening devices ( $M = 1.53$ ), voice output communication devices ( $M = 1.56$ ), mobility devices ( $M = 1.78$ ), visual aids ( $M = 1.84$ ), adapted books ( $M = 1.90$ ), aids for bathing, eating, dressing, or hygiene ( $M = 1.92$ ) and adaptive switches ( $M = 1.95$ ). The participants indicated most often providing AT devices, with the highest mean scores ranging between 2-3 and indicating the range of

“Occasionally” to “Frequently” providing AT devices, in the areas of positioning devices such as standers, adapted chairs, adapted tables, side-lyers, wedges, and rolls ( $M = 2.07$ ), battery-operated or adapted toys ( $M = 2.19$ ), sensory items with touch or movement input ( $M = 2.39$ ), and picture communication symbols or communication boards ( $M = 2.24$ ).

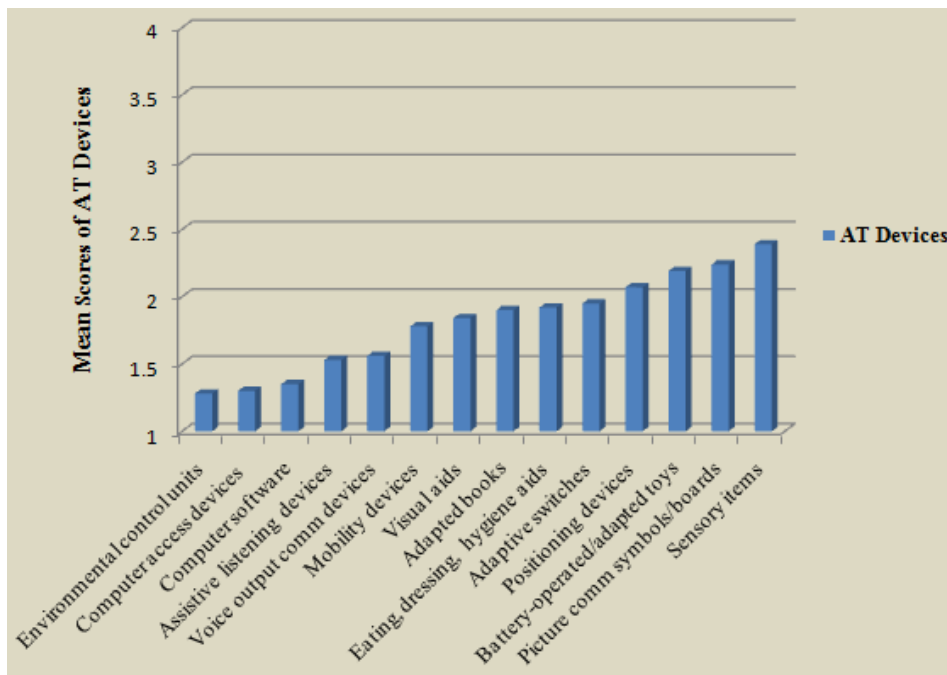


Figure 7. Mean Scores of AT Devices Provided by Participants.

Figures 8, 9, 10, 11 and 12 depict the mean scores of the participants’ provision of AT devices in relation to their professional discipline (Figure 8), highest level of formal education completed (Figure 9), years of experience providing AT in their professional practice (Figure 10), years of early intervention experience (Figure 11), and area where their early intervention program provides services (Figure 12).

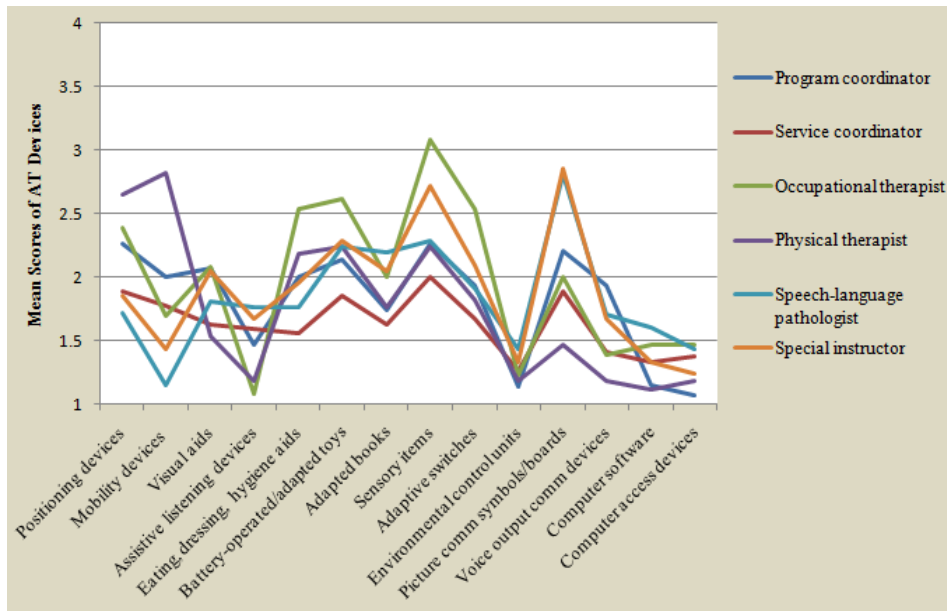


Figure 8. Mean Scores of AT Devices in Relation to Participants' Professional Discipline.

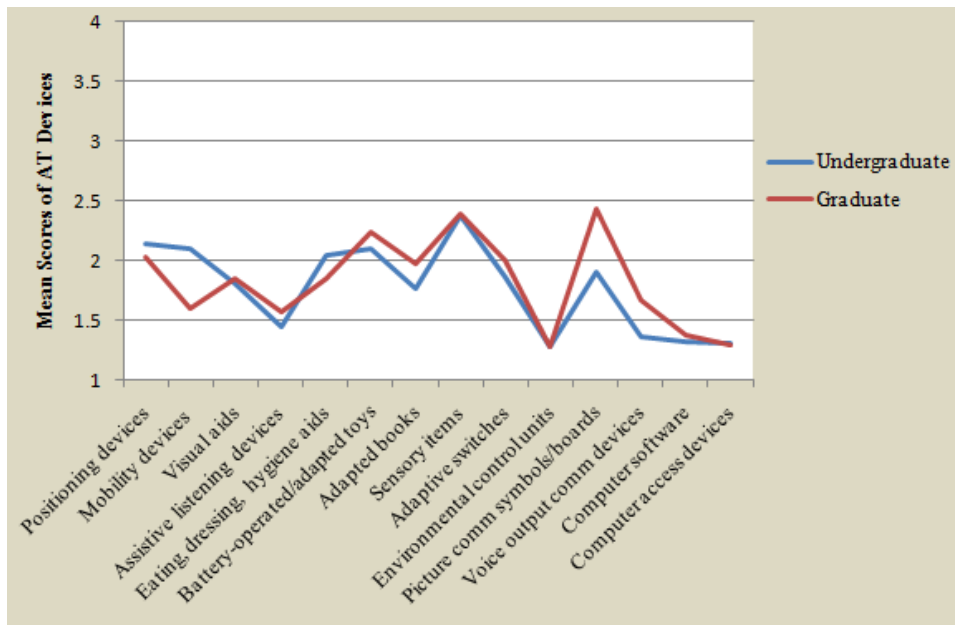


Figure 9. Mean Scores of AT Devices in Relation to Participants' Formal Educational Level.



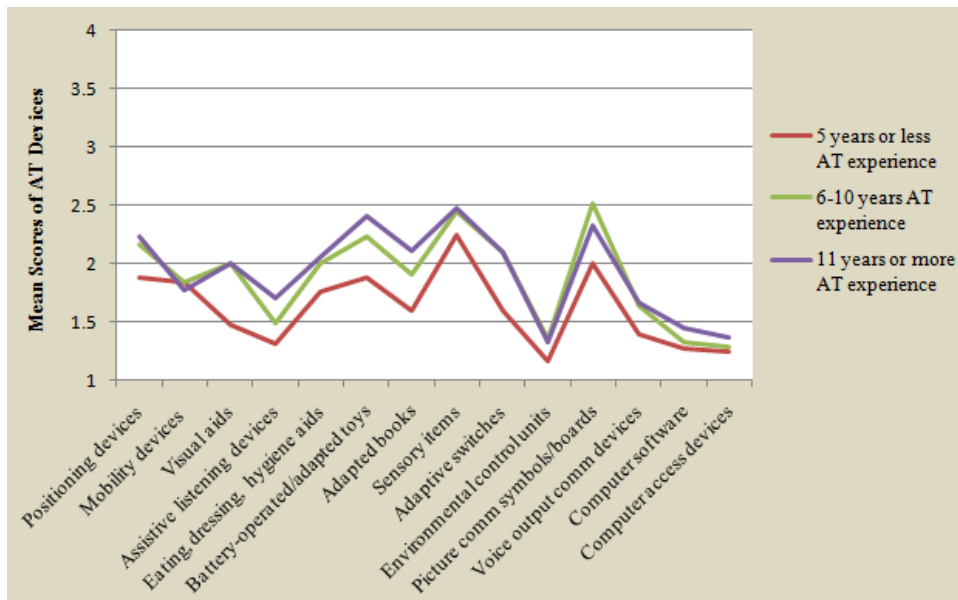


Figure 10. Mean Scores of AT Devices in Relation to Participants' Years of Experience Providing AT in Professional Practice.

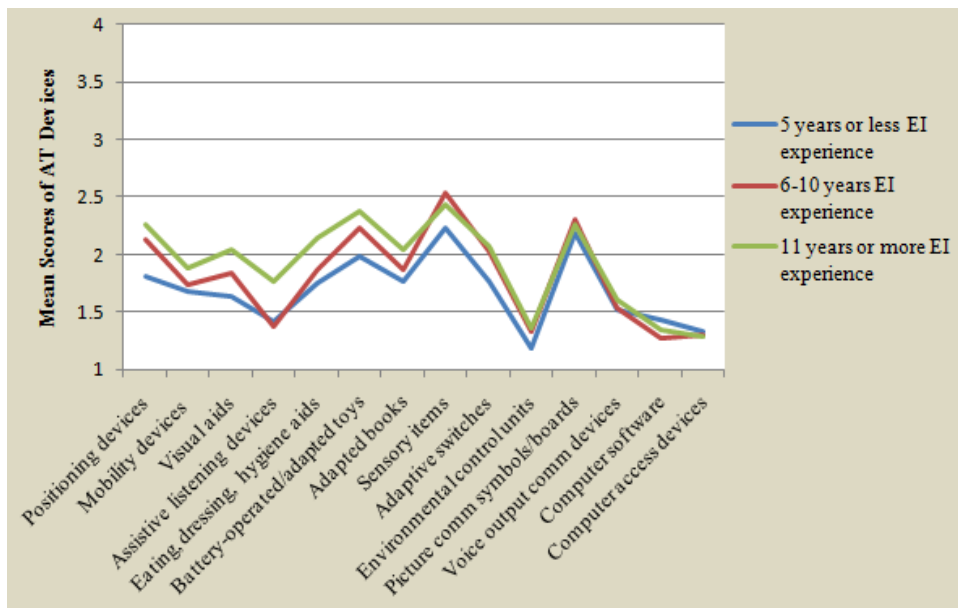
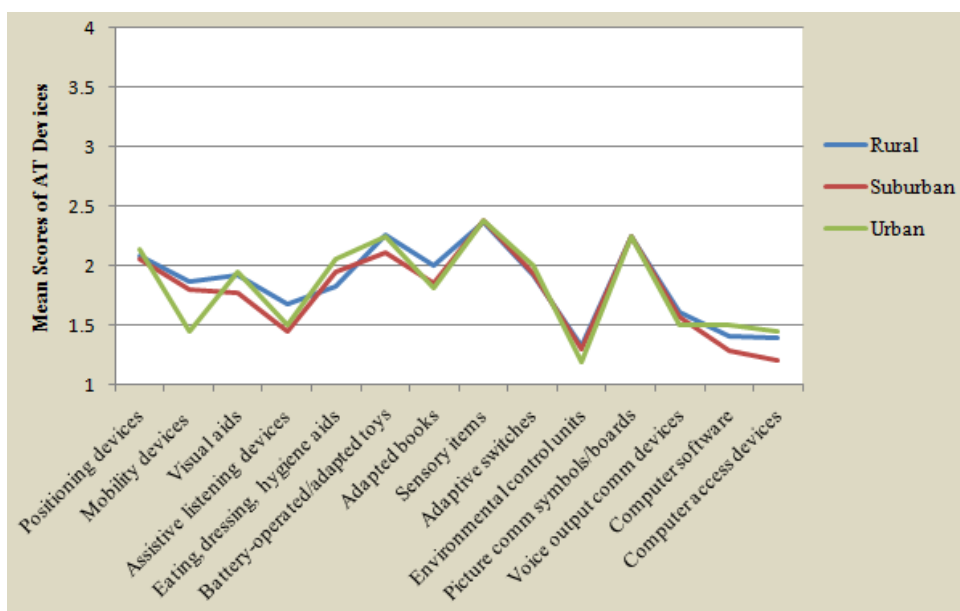


Figure 11. Mean Scores of AT Devices in Relation to Participants' Years of Experience Working in Early Intervention Programs.



*Figure 12. Mean Scores of AT Devices in Relation to Area Where Participants' Early Intervention Program Provides Services.*

## Research Question 2

To analyze data for research question 2, “What types of AT services do the early interventionists provide to infants and toddlers and their families in early intervention programs?” descriptive statistics were generated to provide data on the variable of AT services including frequency, percentage, mean, and standard deviation. Data were obtained from the participants’ responses to the survey question, “Please rate how often you provide the following types of assistive technology services to infants and toddlers and their families in the early intervention program.”

As shown in Table10, 50% or more of the participants indicated “Never” providing AT services to infants and toddlers and their families in the area of maintaining and repairing AT devices (54.3%) and “Occasionally” providing AT services in the areas

of evaluating the AT needs of infants and toddlers and their families (53.4%), collaborating with families to determine appropriate AT devices and strategies (58.6%), collaborating with early intervention providers to determine appropriate AT devices and strategies (52.6%), providing AT to support Individualized Family Service Plan goals and outcomes (54.3%), providing information to families on AT funding sources for AT devices (50.0%), and providing information to families on sources for borrowing AT devices to trial (54.3%).

Table 10

*Provision of Assistive Technology Services to Infants and Toddlers and Their Families*

AT Services	Never %	Occasionally %	Frequently %	Always %	<i>M</i>	<i>SD</i>
Evaluating the AT needs of infants and toddlers and families	17.2	53.4	20.7	8.6	2.21	.829
Collaborating with families to determine appropriate AT	9.5	58.6	24.1	6.9	2.29	.735
Collaborating with EI providers to determine appropriate AT	11.2	52.6	29.3	6.9	2.32	.764
Providing AT to support IFSP goals	12.1	54.3	27.6	4.3	2.25	.723
Providing AT to support daily activities and routines in natural environments	14.7	47.4	31.0	6.0	2.29	.792

Selecting and customizing AT devices	31.9	48.3	17.2	2.6	1.91	.769
Maintaining and repairing AT devices	54.3	35.3	5.2	3.4	1.57	.753
Providing information to families on AT funding sources	38.8	50.0	7.8	3.4	1.76	.742
Providing information to families on sources for borrowing AT devices to trial	31.0	54.3	10.3	4.3	1.88	.759
Teaching infants and toddlers to use AT devices	23.3	44.8	25.0	6.0	2.14	.847
Teaching families to use AT devices and strategies	21.6	44.0	25.0	6.9	2.18	.858
Teaching EI providers to use AT devices and strategies	41.4	44.8	8.6	4.3	1.76	.790

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*Note.* Never = 1, Occasionally = 2, Frequently = 3, Always = 4.

Figure 13 illustrates the mean scores of the AT services that the early interventionists indicated providing to infants and toddlers and their families. Overall, the participants indicated providing AT services in the “Never” to “Occasionally” range in 5 of the 12 areas with mean scores ranging from 1.28 to 1.95. These areas include selecting and customizing AT devices ( $M = 1.91$ ), maintaining and repairing AT devices ( $M = 1.57$ ), providing information to families on AT funding sources ( $M = 1.76$ ), providing

information to families on sources for borrowing AT devices to trial ( $M = 1.88$ ), and teaching early intervention providers in the use of AT devices and strategies ( $M = 1.76$ ).

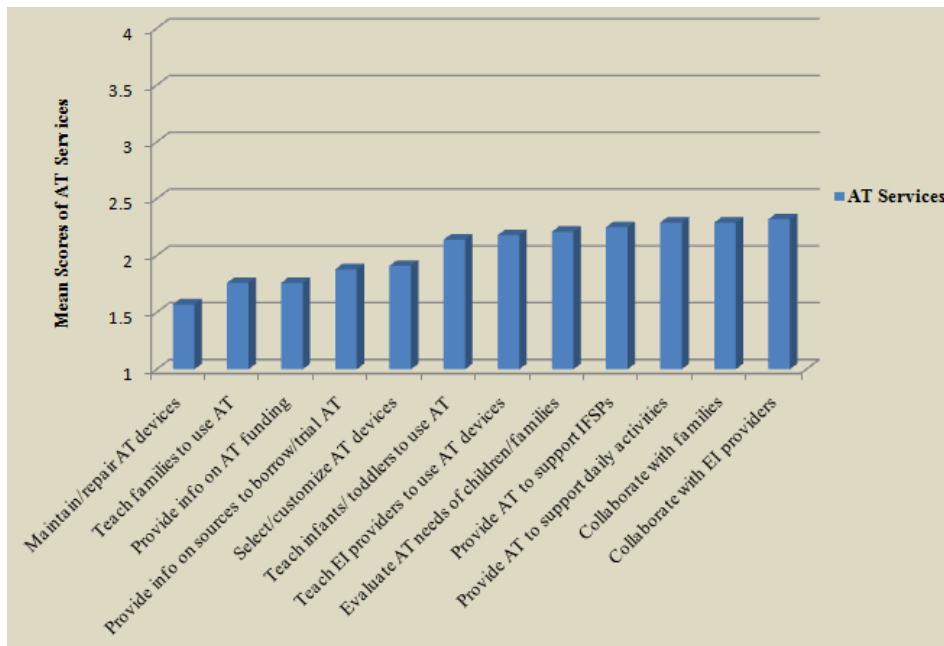


Figure 13. Mean Scores of AT Services Provided by Early Participants.

Figures 14, 15, 16, 17 and 18 depict the mean scores of the participants' provision of AT services in relation to their professional discipline (Figure 14), highest level of formal education completed (Figure 15), years of experience providing AT in their professional practice (Figure 16), years of experience working in early intervention programs (Figure 17), and area where their early intervention program provides services (Figure 18).

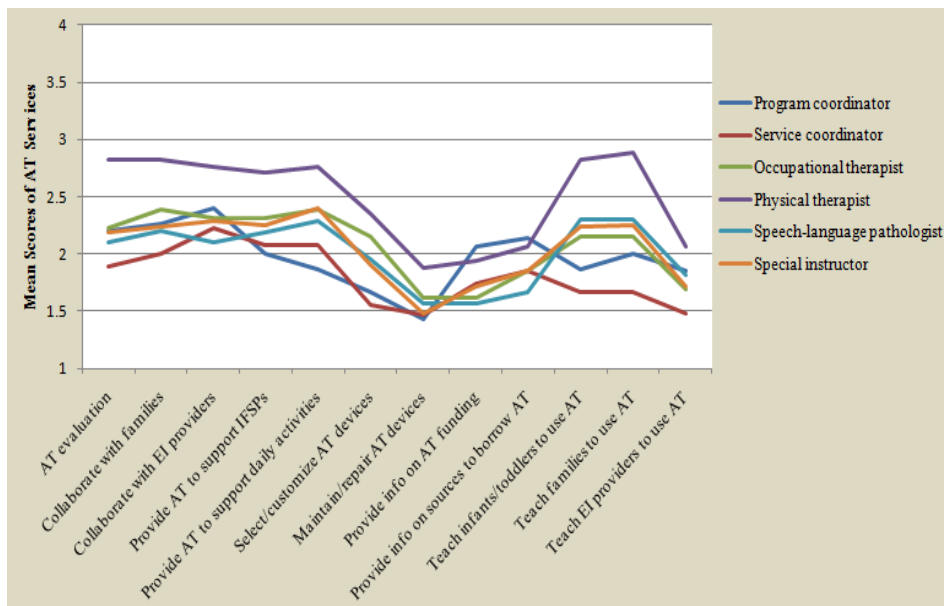


Figure 14. Mean Scores of AT Services in Relation to Participants' Professional Discipline.



Figure 15. Mean Scores of AT Services in Relation to Participants' Formal Educational Level.

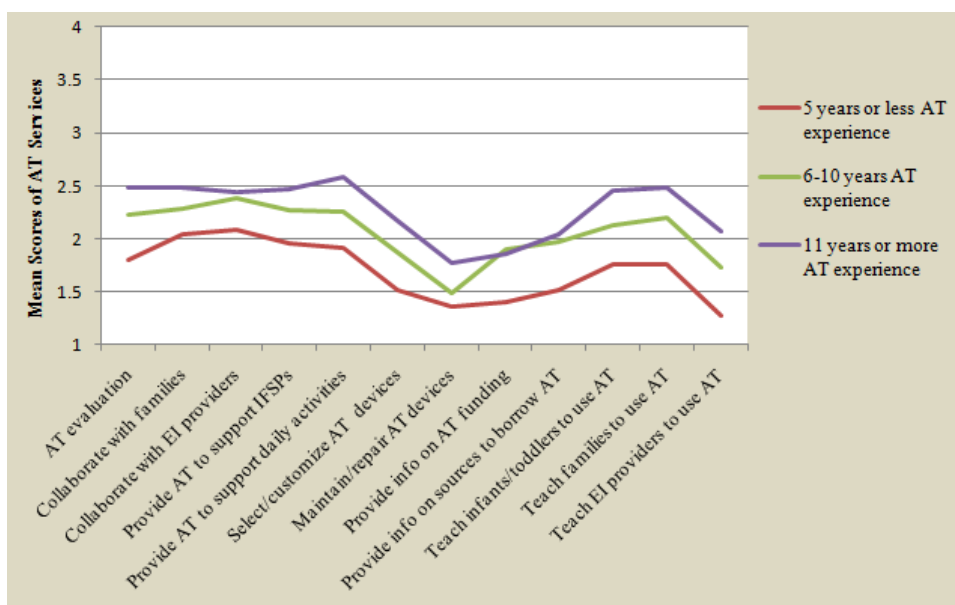
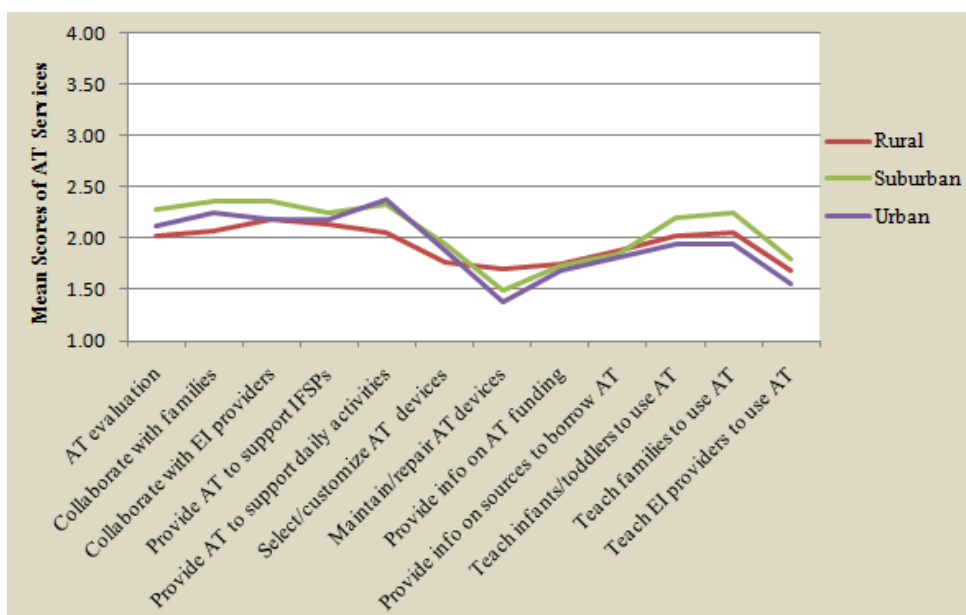


Figure 16. Mean Scores of AT Services in Relation to Participants' Years of Experience Providing AT in Professional Practice.



Figure 17. Mean Scores of AT Services in Relation to Participants' Years of Experience Working in Early Intervention Programs.



*Figure 18. Mean Scores of AT Services in Relation to Area Where Participants' Early Intervention Program Provides Services.*

### Research Question 3

To analyze data for research question 3, “For what functional goals and outcomes of infants and toddlers in the early intervention programs do the early interventionists currently provide assistive technology devices or services?” descriptive statistics were generated to provide data on the variable of functional goals and outcomes including frequency, percentage, mean, and standard deviation. Data were obtained from the participants’ responses to the survey question, “Please rate how often you provide assistive technology services to support the functional goals and outcomes of infants and toddlers in the early intervention program in the following areas.”

As shown in Table 11, 40% or more of the participants indicated “Occasionally” providing AT to support infants’ and toddlers’ functional goals and outcomes in the areas



of moving throughout their daily environments (41.4%), maintaining body positions for engaging in activities (43.1%), visually locating items in their daily environments (46.6%), going on community outings (45.7%), interacting with peers (41.4%), engaging in self-care activities ( 43.1%), making choices for preferred items or activities (42.2%), and participating in activities that are part of family routines (40.5%).

Table 11

*Functional Goals and Outcomes of Infants and Toddlers Supported by AT*

Functional Goals and Outcomes	Never %	Occasionally %	Frequently %	Always %	<i>M</i>	<i>SD</i>
Moving throughout daily environments	25.9	41.4	24.1	8.6	2.16	.910
Maintaining body positions for engaging in activities	19.0	43.1	31.9	6.0	2.25	.833
Visually locating items in daily environments	30.2	46.6	19.0	4.3	1.97	.818
Physically accessing items in daily environments	25.0	38.8	28.4	6.9	2.17	.891
Manipulating items in daily environments	22.4	32.8	33.6	9.5	2.31	.932
Playing with toys	11.2	36.2	39.7	12.9	2.54	.859
Going on community outings	27.6	45.7	20.7	5.2	2.03	.837

Interacting with family members	14.7	37.9	32.8	13.8	2.46	.991
Interacting with peers	22.4	41.4	26.7	9.5	2.23	.908
Engaging in self-care activities	25.9	43.1	24.1	6.0	2.10	.862
Making choices for preferred items or activities	16.4	42.2	28.4	12.9	2.38	.910
Participating in family routines	13.8	40.5	36.2	9.5	2.41	.845
Communicating wants or needs	14.7	33.6	35.3	15.5	2.52	.930

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*Note.* Never = 1, Occasionally = 2, Frequently = 3, Always = 4.

Figure 19 illustrates the participants' mean scores of the functional goals and outcomes for which they provide AT supports. Overall, the participants indicated providing AT to support the functional goals and outcomes of infants and toddlers in the "Occasionally" to "Frequently" range in 12 of the 13 areas with mean scores ranging from 2.03 to 2.54. These areas include moving throughout their daily environments ( $M = 2.16$ ), maintaining body positions for engaging in activities such as sitting for feeding, bathing, or play ( $M = 2.25$ ), going on community outings ( $M = 2.03$ ), interacting with peers ( $M = 2.23$ ), engaging in self-care activities, such as dressing, feeding, or hygiene ( $M = 2.10$ ), making choices for preferred items or activities ( $M = 2.38$ ), and participating in activities that are part of family routines ( $M = 2.52$ ). The one area in which the

participants reported providing AT in the “Never” to “Occasionally” range ( $M = 1.97$ ) was visually locating items in the infants’ and toddlers’ daily environments.

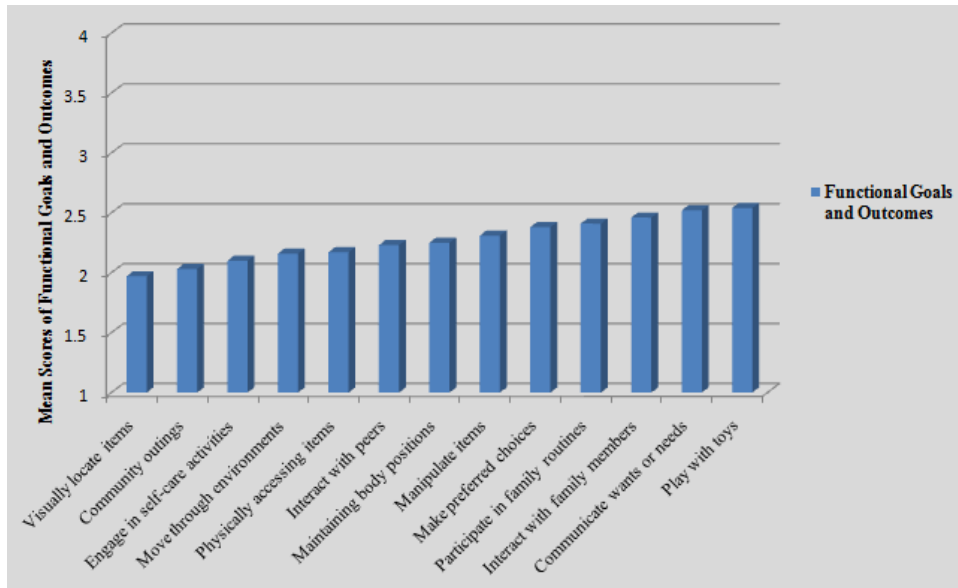


Figure 19. Mean Scores of Functional Goals and Outcomes Supported by AT.

Figures 20, 21, 22, 23 and 24 depict the mean scores of the participants’ provision of AT to support functional goals and outcomes in relation to their professional discipline (Figure 20), highest level of formal education completed (Figure 21), years of experience providing AT in their professional practice (Figure 22), years of early intervention experience (Figure 23), and area where their early intervention program provides services (Figure 24).

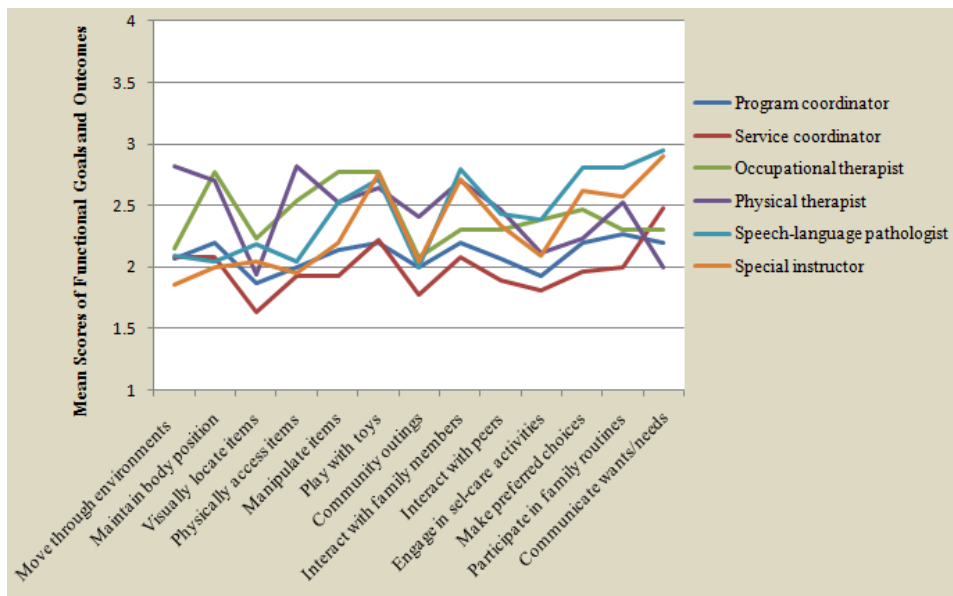


Figure 20. Mean Scores of Functional Goals and Outcomes Supported by AT in Relation to Participants' Professional Discipline.

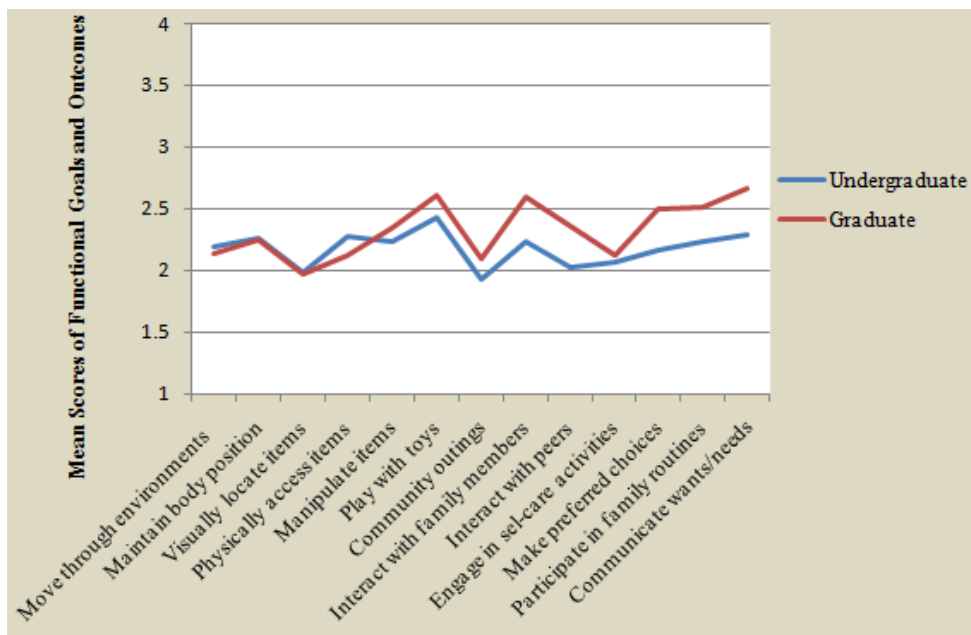
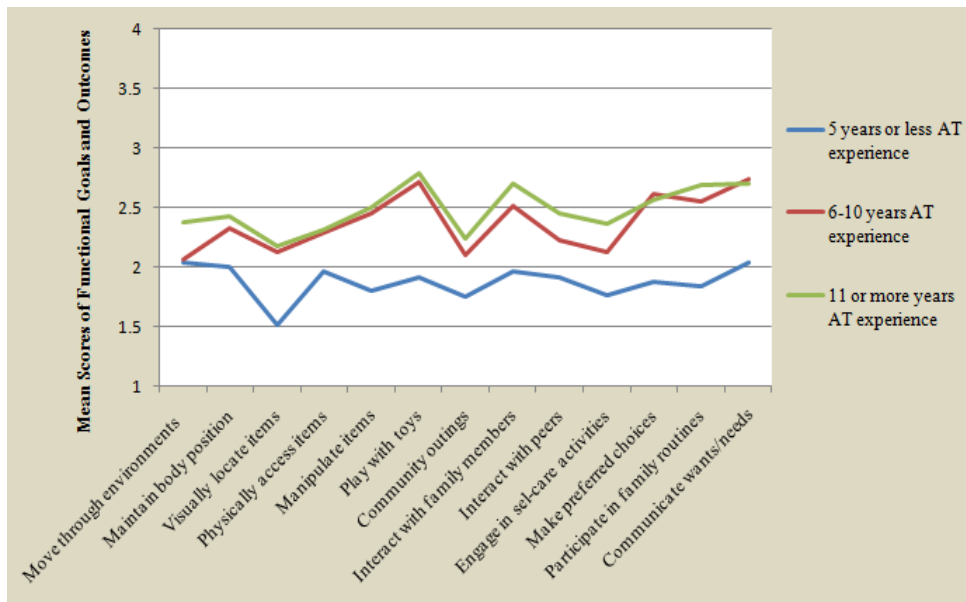
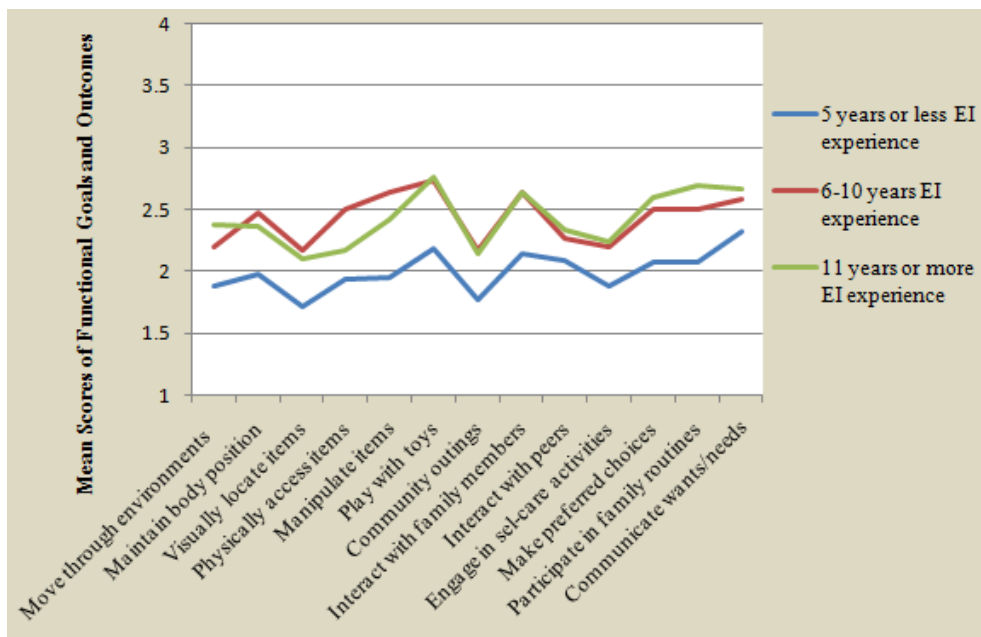


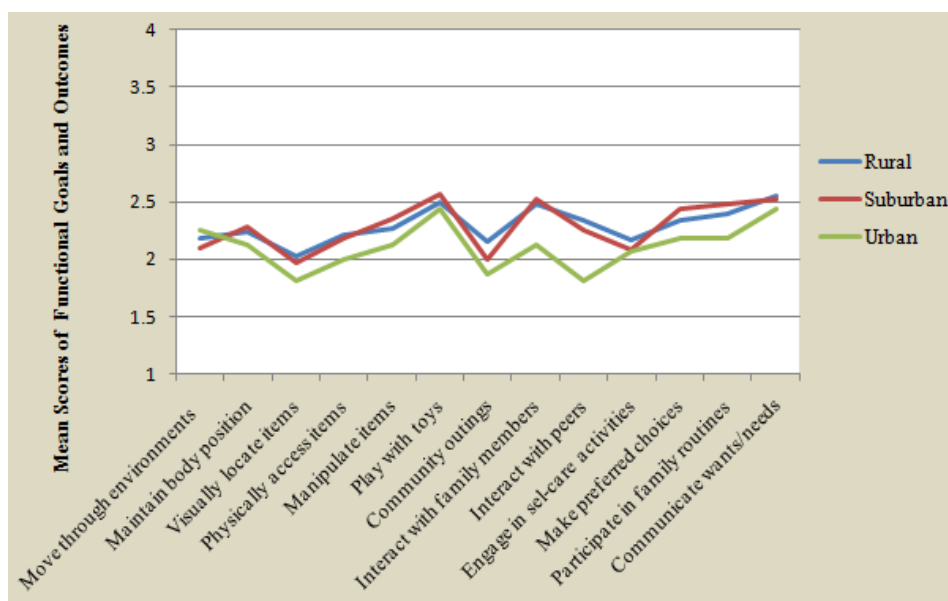
Figure 21. Mean Scores of Functional Goals and Outcomes Supported by AT in Relation to Participants' Level of Formal Education.



*Figure 22. Mean Scores of Functional Goals and Outcomes Supported by AT in Relation to Participants' Years of Experience Providing AT in Professional Practice.*



*Figure 23. Mean Scores of Functional Goals and Outcomes Supported by AT in Relation to Participants' Years of Working in Early Intervention Programs.*



*Figure 24. Mean Scores of Functional Goals and Outcomes Supported by AT in Relation to Area Where Participants' Early Intervention Program Provides Services.*

#### **Research Question 4**

To analyze data for research question 4, “What factors do the early interventionists consider to be influential, either as a negative barrier or a positive support, for the provision of AT devices and services to infants and toddlers and their families in early intervention programs?” descriptive statistics were generated to provide data on the variable of influential factors including frequency, percentage, mean, and standard deviation. Data were obtained from the participants’ responses to the survey question, “Please rate how the following factors influence you, either as a negative barrier or as a positive support, in providing assistive technology to infants and toddlers and their families in the early intervention program.”

As shown in Table 12, 50% or more of the participants indicated factors as being a “Mild to moderate support” in the areas of attitudes of the early intervention team toward using AT (58.6%), attitudes of families toward using AT (54.3%), Individualized Family Service Plan goals and outcomes (64.7%), natural environments where the AT will be used (59.5%), and daily activities and routines where the AT will be used (60.3%). More than 50% of the participants indicated the availability of funding for AT as being a “Significant barrier” (52.6%) and the time required for obtaining or providing AT as being a “Mild to moderate barrier” (50.9%).

Table 12

*Influential Factors in Providing AT to Infants and Toddlers and Their Families*

Influential Factors	Significant Barrier %	Mild to Moderate Barrier %	Mild to Moderate Support %	Significant Support %	<i>M</i>	<i>SD</i>
Availability of AT devices	24.1	47.4	19.0	6.9	2.09	.851
Knowledge of AT devices	18.1	34.5	37.1	8.6	2.37	.885
Knowledge of AT services	19.0	37.9	33.6	7.8	2.31	.874
Previous experience with a specific AT device	13.8	19.0	45.7	19.0	2.72	.940
AT policies and procedures of EI program	14.7	37.1	36.2	9.5	2.42	.863

Attitudes of EI team toward using AT	1.7	13.8	58.6	24.1	3.07	.675
Attitudes of families toward using AT	5.2	27.6	54.3	8.6	2.69	.711
Cost of providing AT	46.6	37.9	10.3	3.4	1.70	.797
Technical support for AT	40.5	41.4	12.9	3.4	1.79	.803
Availability of funding for AT	52.6	36.2	6.0	2.6	1.58	.730
Time required for obtaining or providing AT	38.8	50.9	6.9	1.7	1.71	.675
Availability of AT to borrow to trial with the families	36.2	39.7	17.2	5.2	1.91	.868
IFSP goals and outcomes	2.6	16.4	64.7	13.8	2.92	.643
Natural environments where the AT will be used	3.4	23.3	59.5	9.5	2.78	.666
Daily activities and routines where the AT will be used	2.6	21.6	60.3	11.2	2.84	.654

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*Note:* Significant barrier = 1, Mild to moderate barrier = 2, Mild to moderate support = 3, Significant support = 4.

Figure 25 illustrates the participants' mean scores of the factors that influence their provision of AT. Overall, the participants identified 5 of the 15 factors as being in the range of a "Significant Barrier" to a "Mild to Moderate Barrier" with mean scores



ranging between 1.58 to 1.91. These factors include the cost of providing AT ( $M = 1.70$ ), technical support for AT ( $M = 1.79$ ), availability of funding for AT ( $M = 1.58$ ), time required for obtaining or providing AT ( $M = 1.71$ ), and availability of AT to borrow to trial with the families ( $M = 1.91$ ).

The participants identified 6 of the 12 factors as being in the range of a “Mild to Moderate Barrier” to a “Mild to Moderate Support” with mean scores ranging between 2.09 to 2.92. These factors include the availability of AT devices ( $M = 2.09$ ), knowledge of AT devices ( $M = 2.37$ ), knowledge of AT services ( $M = 2.31$ ), previous experience with a specific AT device ( $M = 2.72$ ), established AT policies and procedures of the early intervention program ( $M = 2.42$ ), attitudes of families toward using AT ( $M = 2.69$ ), Individualized Family Service Plan goals and outcomes ( $M = 2.92$ ), natural environments where the AT will be used ( $M = 2.78$ ), and daily activities and routines where the AT will be used ( $M = 2.84$ ). The factor that the participants rated overall as being the most positive support influencing their provision of AT was the attitudes of their early intervention team towards using AT. It was the only factor with a mean score in the range of “Mild to Moderate Support” to a “Significant Support” ( $M = 3.07$ ).

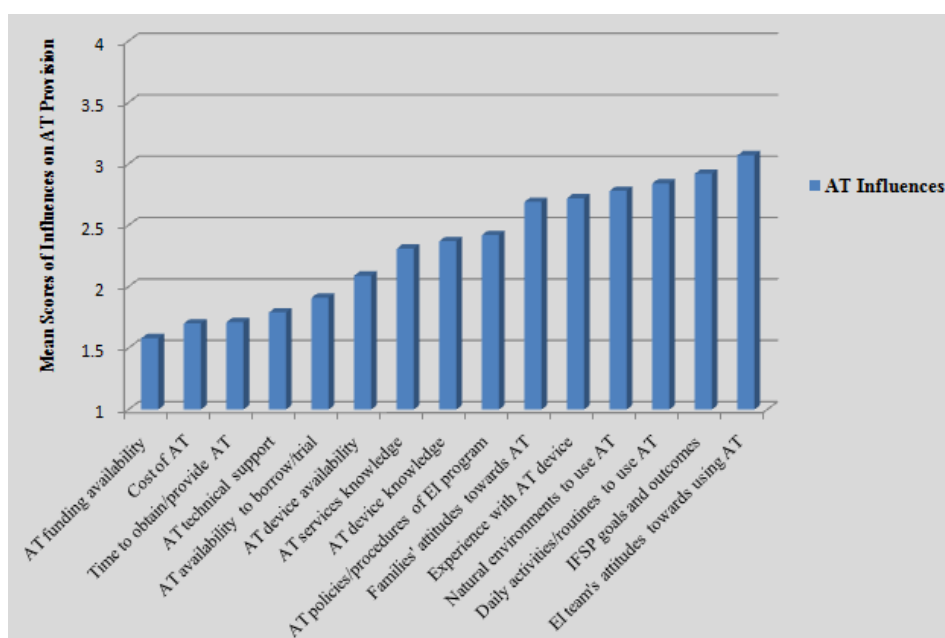


Figure 25. Mean Scores of Factors that Influence Participants' Provision of AT.

Figures 26, 27, 28, 29 and 30 depict the mean scores of the factors that influence the participants' provision of AT in relation to their professional discipline (Figure 26), highest level of formal education completed (Figure 27), years of experience providing AT in their professional practice (Figure 28), years of experience working in early intervention programs (Figure 29), and area where their early intervention program provides services (Figure 30).

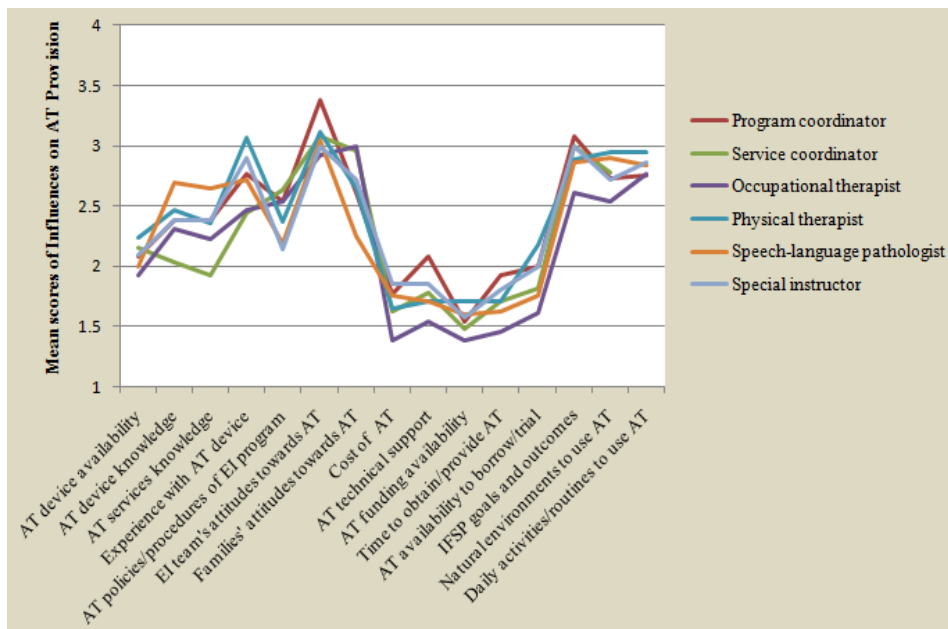


Figure 26. Mean Scores of Factors that Influence Participants' Provision of AT in Relation to Participants' Professional Discipline.

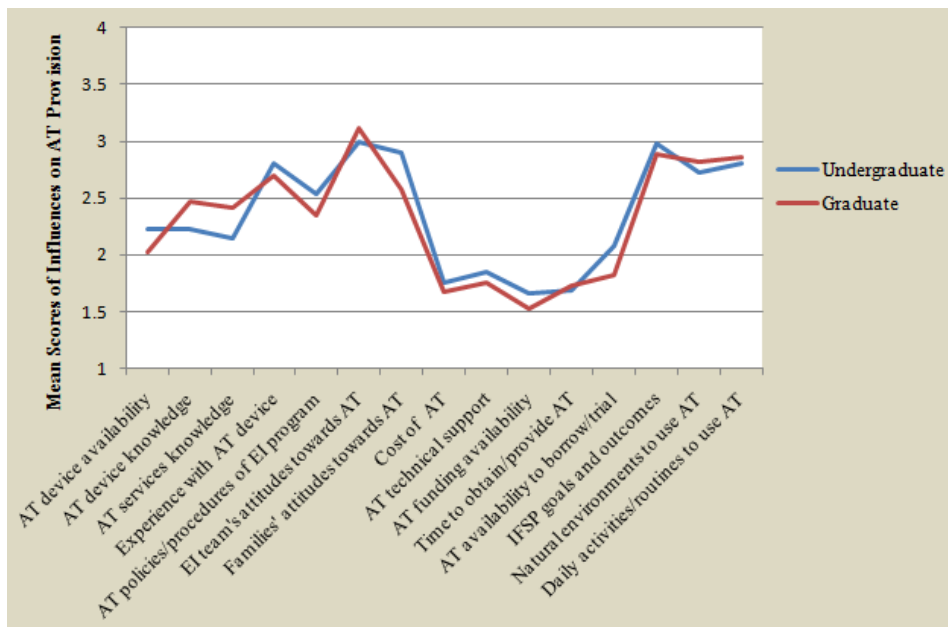


Figure 27. Mean Scores of Factors that Influence Participants' Provision of AT in Relation to Participants' Formal Educational Level.

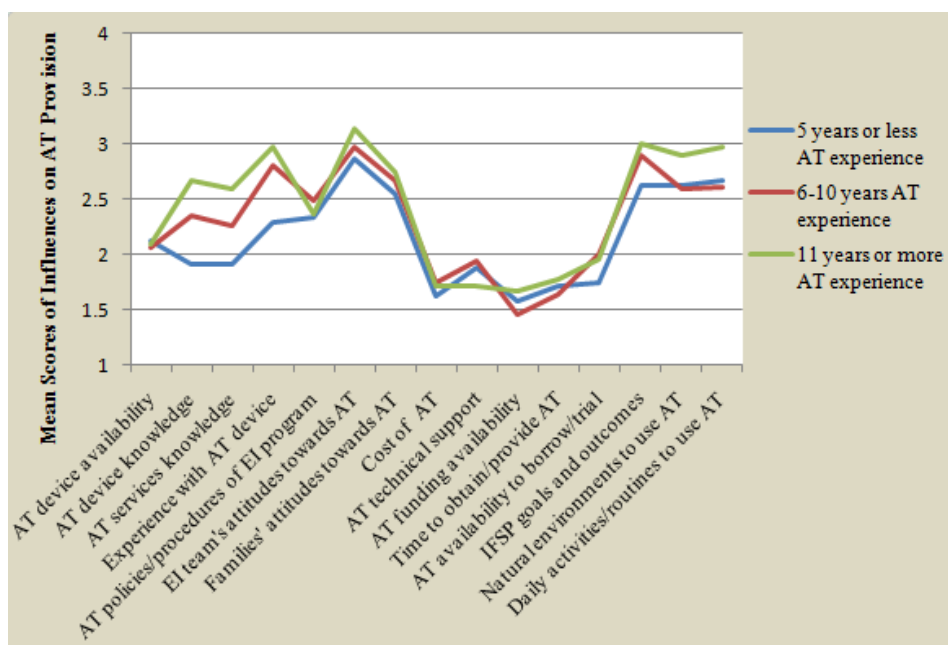


Figure 28. Mean Scores of Factors that Influence Participants' Provision of AT in Relation to Participants' Years of Experience Providing AT in Professional Practice.

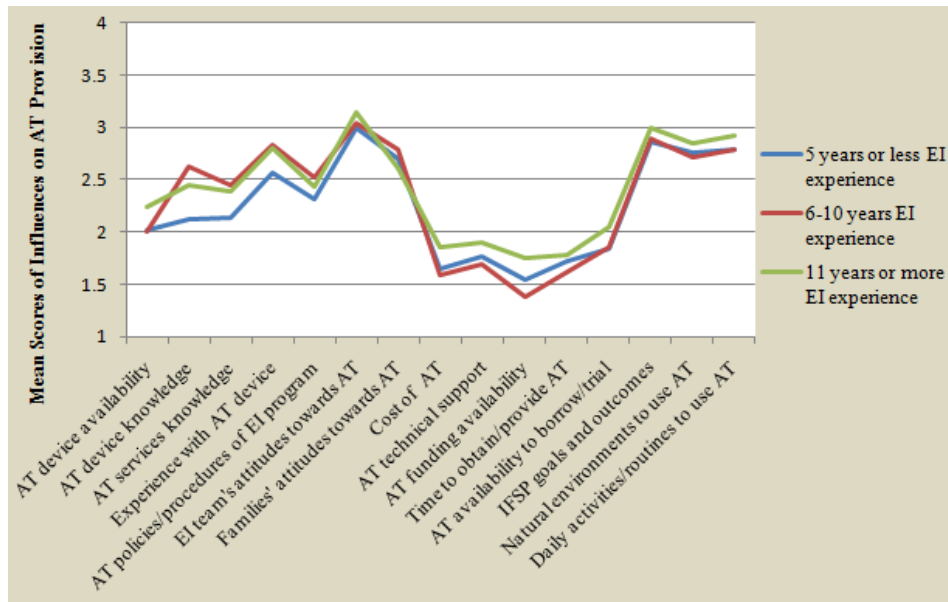
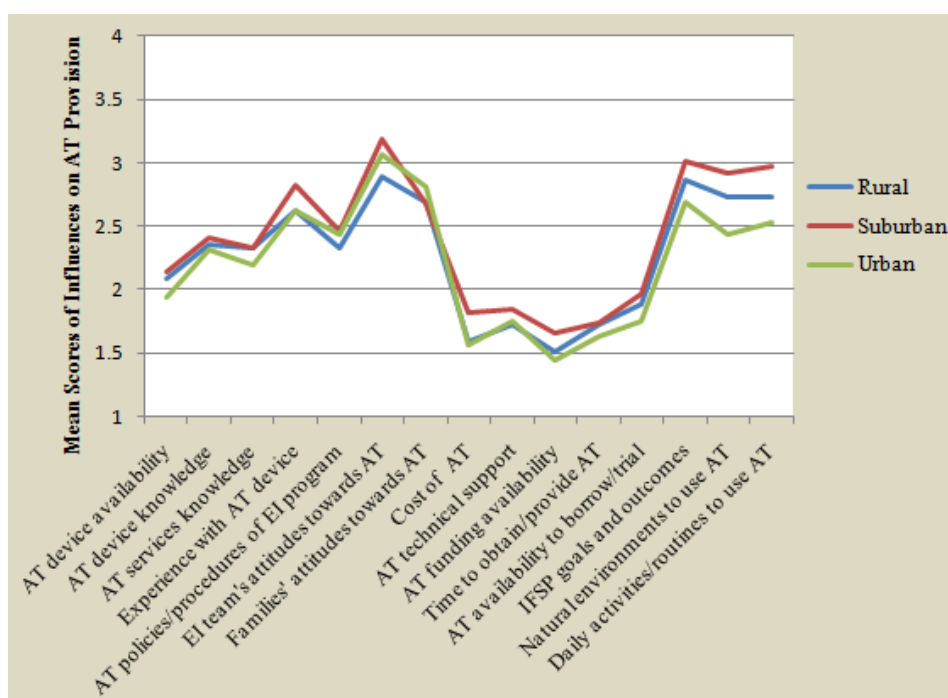


Figure 29. Mean Scores of Factors that Influence Provision of AT in Relation to Participants' Years of Experience Working in Early Intervention Programs.



*Figure 30. Mean Scores of Factors that Influence Participants' Provision of AT in Relation to Area Where Participants' Early Intervention Program Provides Services.*

### Research Question 5

To analyze data for research question 5, “What is the level of perceived knowledge of the early interventionists in areas related to AT for infants and toddlers and their families in early intervention?” descriptive statistics were generated to provide data on the variable of level of perceived knowledge of AT including frequency, percentage, mean, and standard deviation. To determine the early interventionists' level of perceived knowledge, data were obtained from the participants' responses to the survey question, “Please rate your current knowledge of assistive technology in the following areas.”

As shown in Table 13, 50% or more of the participants indicated being “Fairly” knowledgeable in 12 of the 15 areas. These areas include the types of AT resources that

are available to practitioners and to families (72.4%), types of available AT devices for infants and toddlers (73.3%), AT assessment of infants and toddlers (57.8%), using AT to support Individualized Family Service Plan goals and outcomes (55.2%), using AT as a support in the infants' and toddlers' natural environments (56.0%), determination of appropriate AT devices and adaptations to use (58.6%), determination of appropriate AT services to provide (52.6%), teaching infants and toddlers to use AT devices (52.6%), teaching families in the use of AT devices and strategies with their child (50.9%), helping families integrate AT in daily activities and routines (50.9%), modifying or creating AT devices and adapting materials (56.0%), and sources to obtain AT devices (53.4%).

Table 13

*Perceived Knowledge of Assistive Technology*

AT Knowledge	Not at All %	Fairly %	Very %	Extremely %	<i>M</i>	<i>SD</i>
Types of available AT resources	6.9	72.4	18.1	2.6	2.16	.574
Types of available AT devices	10.3	73.3	12.9	3.4	2.09	.604
AT assessment of infants and toddlers	27.6	57.8	8.6	3.4	1.88	.709
Using AT to support IFSP goals	7.8	55.2	31.0	6.0	2.35	.713
Using AT as a support in natural environments	7.8	56.0	28.4	6.9	2.35	.726

Determination of appropriate AT devices and adaptations to use	19.8	58.6	15.5	6.0	2.08	.771
Determination of appropriate AT services to provide	20.7	52.6	19.8	6.0	2.11	.803
Teaching infants and toddlers to use AT devices	19.8	52.6	19.0	8.6	2.16	.844
Teaching families to use AT devices	18.1	50.9	24.1	6.9	2.20	.815
Helping families integrate AT in daily activities and routines	13.8	50.9	25.9	9.5	2.31	.828
Modifying or creating AT devices and adapting materials	23.3	56.0	12.9	6.9	2.03	.805
Care and maintenance of AT devices	33.6	49.1	13.8	3.4	1.87	.775
Sources to obtain AT devices	24.1	53.4	17.2	3.4	2.00	.753
Sources for borrowing AT devices to trial	33.6	47.4	12.9	6.0	1.91	.840
Funding sources for AT devices	45.7	46.6	4.3	2.6	1.63	.692

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*Note.* Not at all knowledgeable = 1, Fairly knowledgeable = 2, Very knowledgeable = 3, Extremely knowledgeable = 4.

Figure 31 illustrates the ratings of the participants' level of perceived AT knowledge. Overall, the participants indicated being in the "Not at all" to "Fairly" knowledgeable range in 4 of the 15 of the areas with mean scores ranging from 1.63 to 1.91. Their mean scores were lowest in the areas of AT assessment of infants and toddlers ( $M = 1.88$ ), care and maintenance of AT devices ( $M = 1.87$ ), sources for borrowing AT devices to trial ( $M = 1.91$ ), and funding sources for AT ( $M = 1.63$ ). Overall, the participants indicated being in the "Fairly" to "Very" knowledgeable range in 11 of the 15 areas with mean scores ranging from 2.00 to 2.35. Their mean scores were highest in the areas of using AT to support Individualized Family Service Plan goals and outcomes ( $M = 2.35$ ), using AT as a support in the infants' and toddlers' natural environments ( $M = 2.35$ ), helping families integrate AT in their child's daily activities and routines ( $M = 2.31$ ), and teaching families to use AT devices ( $M = 2.20$ ).



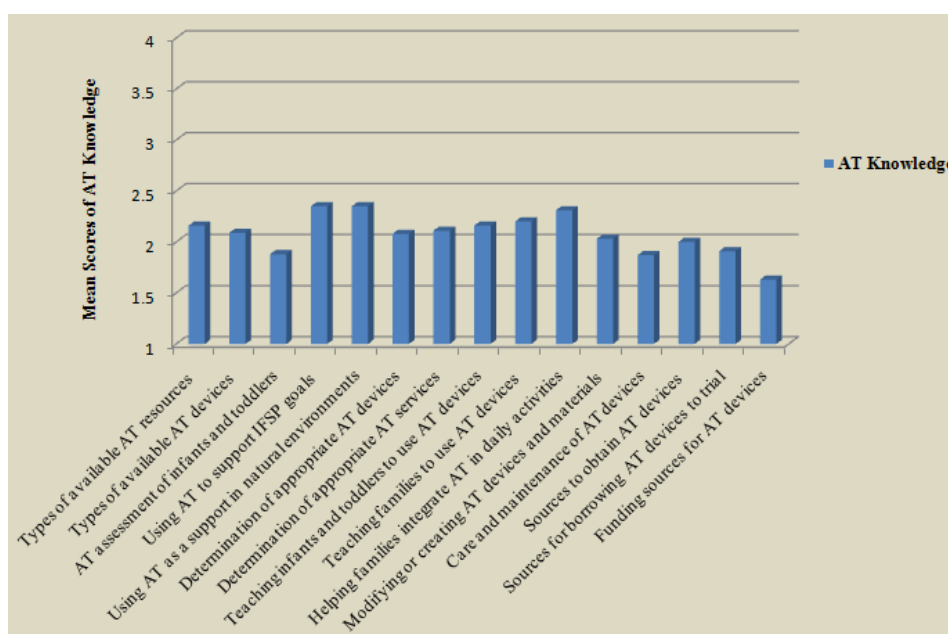


Figure 31. Mean Scores of Level of Perceived AT Knowledge.

Figures 32, 33, 34, 35 and 36 depict the mean scores of the participants' level of perceived AT knowledge in relation to their professional discipline (Figure 32), highest level of formal education completed (Figure 33), years of experience providing AT in their professional practice (Figure 34), years of experience working in early intervention programs (Figure 35), and area where their early intervention program provides services (Figure 36).

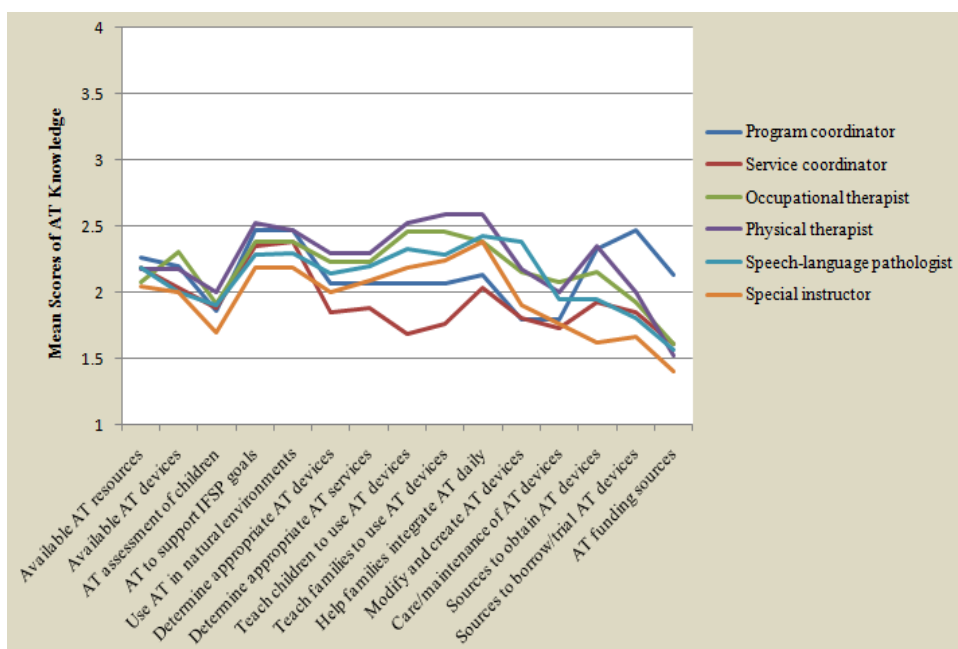


Figure 32. Mean Scores of Participants' Level of Perceived AT Knowledge in Relation to Participants' Professional Discipline.

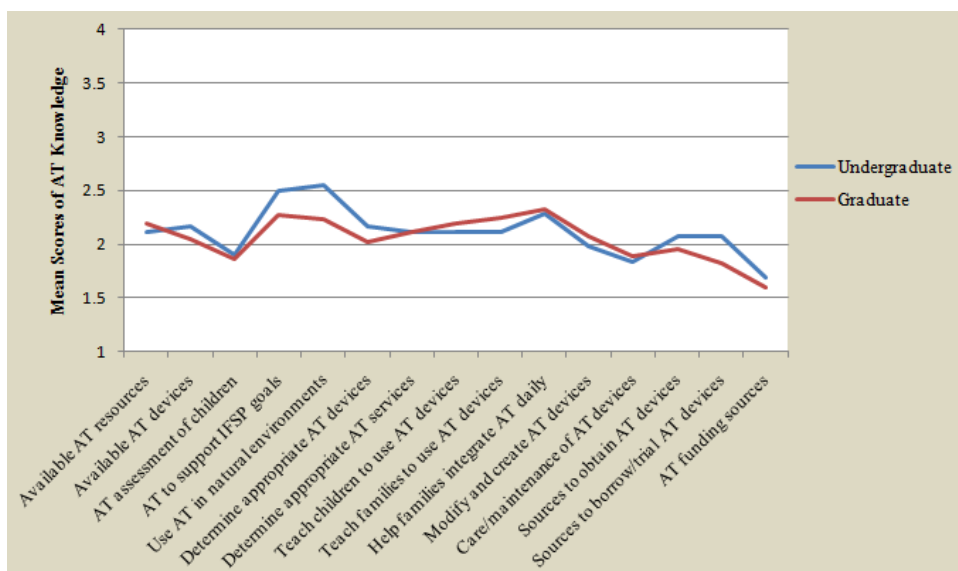


Figure 33. Mean Scores of Participants' Level of Perceived AT Knowledge in Relation to Participants' Formal Educational Level.

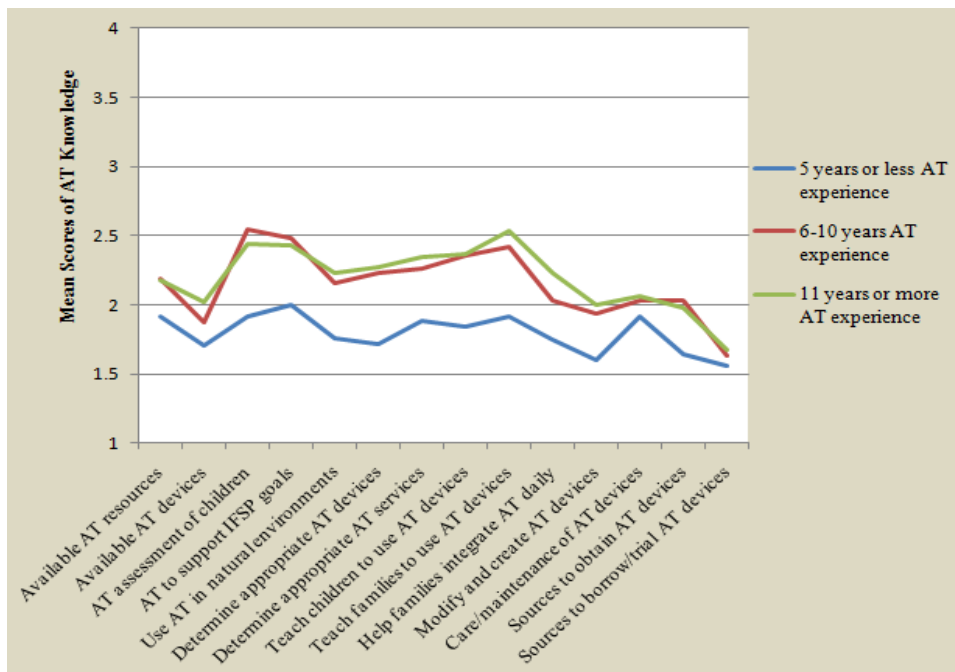


Figure 34. Mean Scores of Participants' Level of Perceived AT Knowledge in Relation to Participants' Years of Experience Providing AT in Professional Practice.

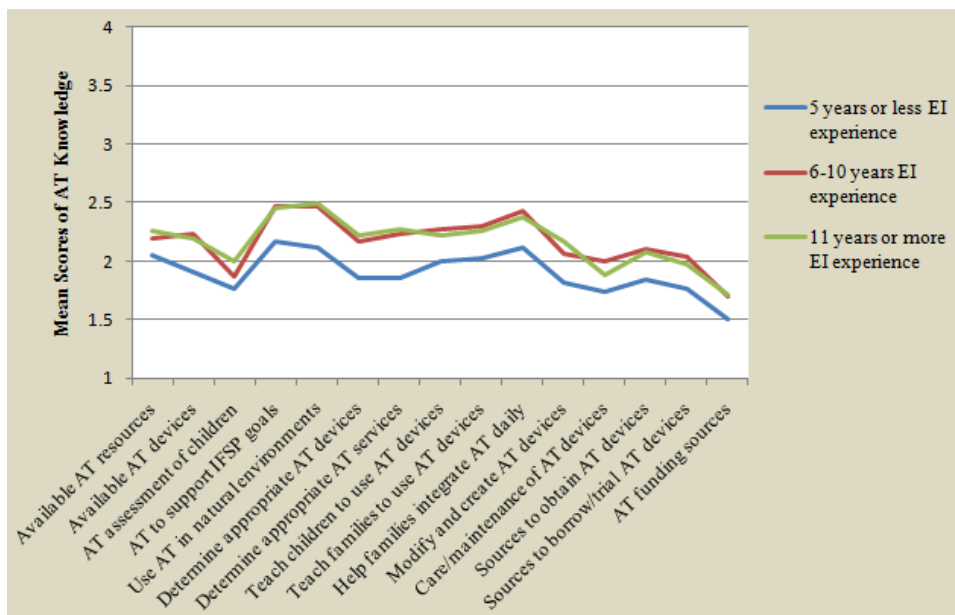
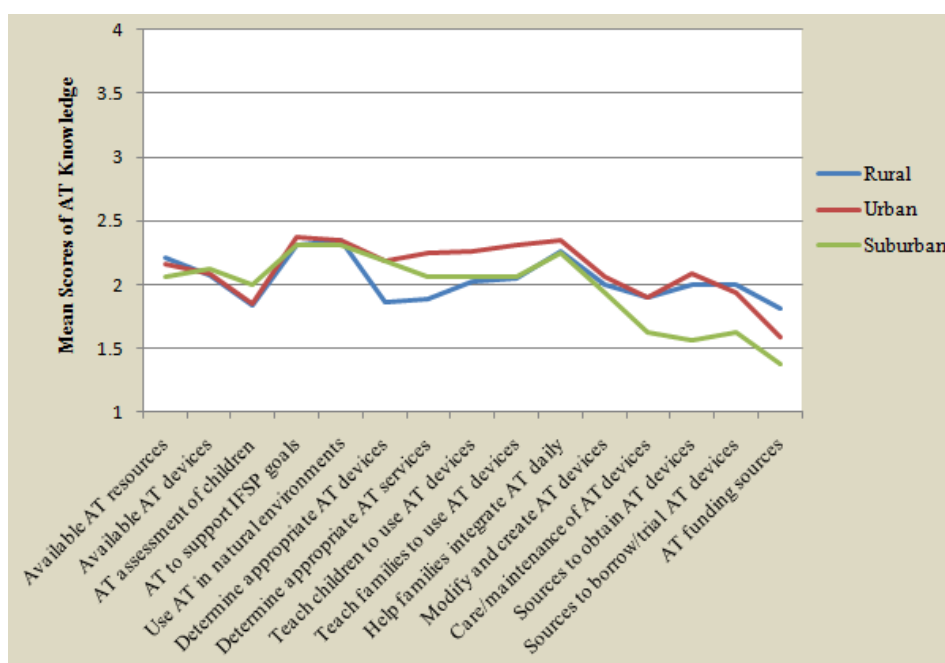


Figure 35. Mean Scores of Participants' Level of Perceived AT Knowledge in Relation to Participants' Years of Experience Working in Early Intervention Programs.



*Figure 36. Mean Scores of Participants' Level of Perceived AT Knowledge in Relation to Area Where Participants' Early Intervention Program Provides Services.*

### **Research Question 6**

To analyze data for research question 6, “What is the level of perceived need of the early interventionists for additional education or training in areas related to AT for infants and toddlers and their families in early intervention programs?” descriptive statistics were generated to provide data on the variable of level of perceived need for additional AT education or training including frequency, percentage, mean, and standard deviation. Data were obtained from the participants’ responses to the survey question, “Please rate how important it is for you to receive additional education or training in assistive technology training in the following areas.”

As shown in Table 14, 40% or more of the participants indicated the importance of having additional AT education or training as being “Very” important in 10 of the 15 areas including types of AT resources that are available to practitioners and to families (48.3%), types of available AT devices for infants and toddlers (44.0%), AT assessment of infants and toddlers (44.8%), using AT to support Individualized Family Service Plan goals and outcomes (46.6%), using AT as a support in the infants’ and toddlers’ natural environments (45.7%), determination of appropriate AT devices and adaptations to use with infants and toddlers and their families (45.7%), determination of appropriate AT services to provide to infants and toddlers and their families (46.6%), teaching families to use AT devices and strategies with their child (44.0%), sources to obtain AT devices for infants and toddlers (40.5%), and sources for borrowing AT devices to trial (42.2%). Funding sources for AT was an area in which 42.2% of the participants indicated as being “Extremely” important for additional AT education or training.

Table 14

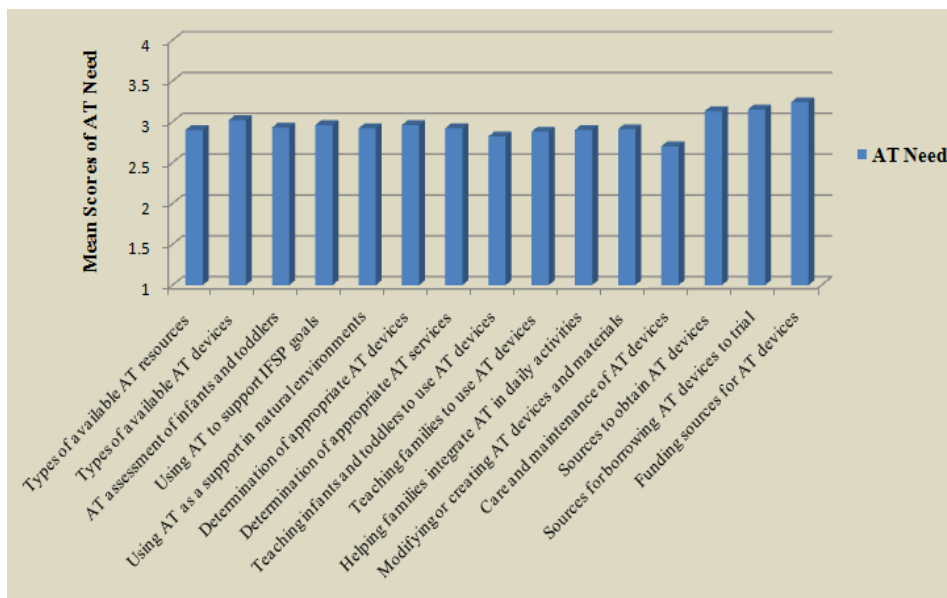
*Perceived Need/Importance of Having Additional AT Education or Training*

AT Education or Training	Not at All %	Fairly %	Very %	Extremely %	<i>M</i>	<i>SD</i>
Types of available AT resources	2.6	26.7	48.3	21.6	2.90	.765
Types of available AT devices	1.7	24.1	44.0	29.3	3.02	.783
AT assessment of infants and toddlers	5.2	21.6	44.8	25.0	2.93	.835

Using AT to support IFSP goals	4.3	21.6	46.6	25.9	2.96	.813
Using AT as a support in natural environments	4.3	24.1	45.7	25.0	2.92	.818
Determination of appropriate AT devices to use	2.6	25.0	45.7	25.9	2.96	.788
Determination of appropriate AT services to provide	2.6	25.9	46.6	23.3	2.92	.777
Teaching infants and toddlers to use AT devices	5.2	31.0	37.9	24.1	2.82	.865
Teaching families to use AT devices	5.2	25.9	44.0	24.1	2.88	.839
Helping families integrate AT in daily activities and routines	4.3	28.4	38.8	27.6	2.90	.858
Modifying or creating AT devices/materials	5.2	25.9	39.7	27.6	2.91	.868
Care and maintenance of AT devices	7.8	36.2	31.0	22.4	2.70	.915
Sources to obtain AT devices	2.6	18.1	40.5	36.2	3.13	.807
Sources for borrowing AT devices to trial	3.4	15.5	42.2	37.1	3.15	.812
Funding sources for AT devices	1.7	15.5	38.8	42.2	3.24	.779

*Note.* Not at all important = 1, Fairly important = 2, Very important = 3, Extremely important = 4.

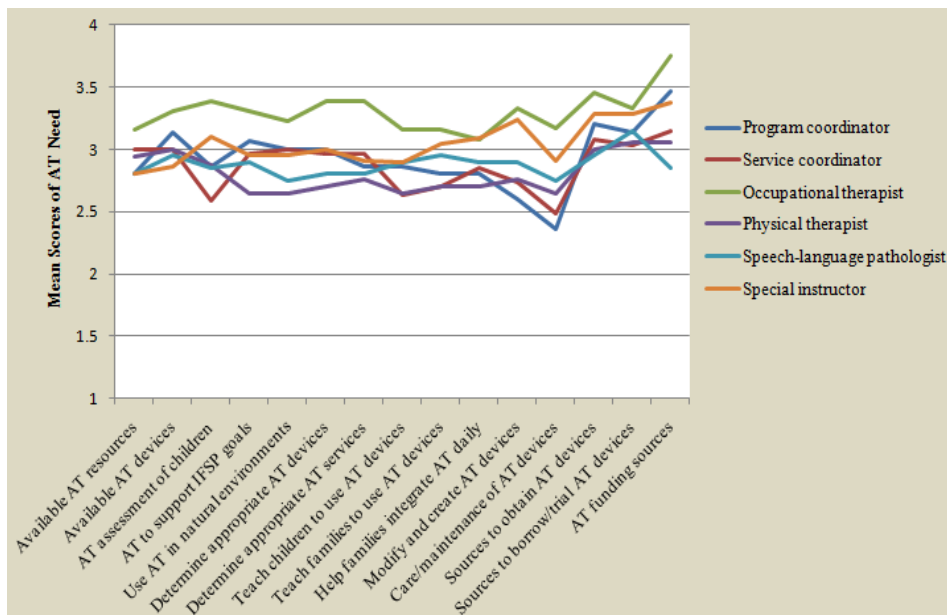
As illustrated in Figure 37, the participants indicated overall that having additional AT education or training was in the “Fairly” to “Very” important range in 11 of the 15 areas with mean scores ranging from 2.70 to 2.96. The areas with the highest mean scores ranging between 3-4 and indicating the “Very” to “Extremely” important range, were learning about types of AT devices that are available to practitioners and to families ( $M = 3.02$ ), sources to obtain AT devices for infants and toddlers ( $M = 3.13$ ), sources for borrowing AT devices to trial ( $M = 3.15$ ), and funding sources for AT devices ( $M = 3.24$ ).



*Figure 37. Mean Scores of Level of Perceived Need for Additional AT Education or Training.*

Figures 38, 39, 40, 41 and 42 depict the mean scores of the participants’ level of perceived need for additional AT education or training in relation to their professional

discipline (Figure 38), highest level of formal education completed (Figure 39), years of experience providing AT in their professional practice (Figure 40), years of experience working in early intervention programs (Figure 41), and area where their early intervention program provides services (Figure 42).



*Figure 38. Mean Scores of Participants' Level of Perceived Need for Additional AT Education or Training in Relation to Participants' Professional Discipline.*



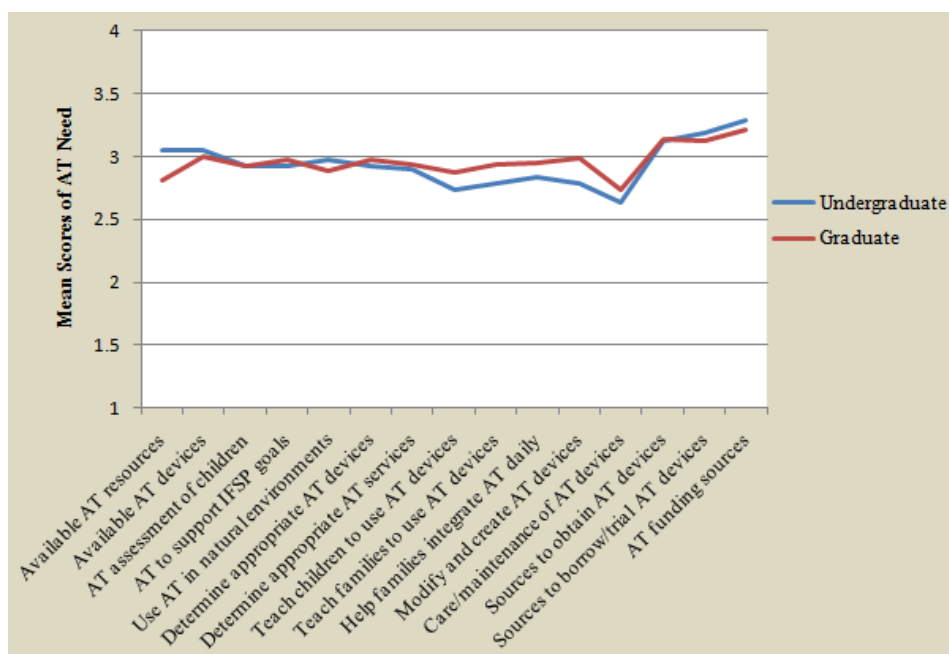


Figure 39. Mean Scores of Participants' Level of Perceived Need for Additional AT Education or Training in Relation to Participants' Formal Educational Level.

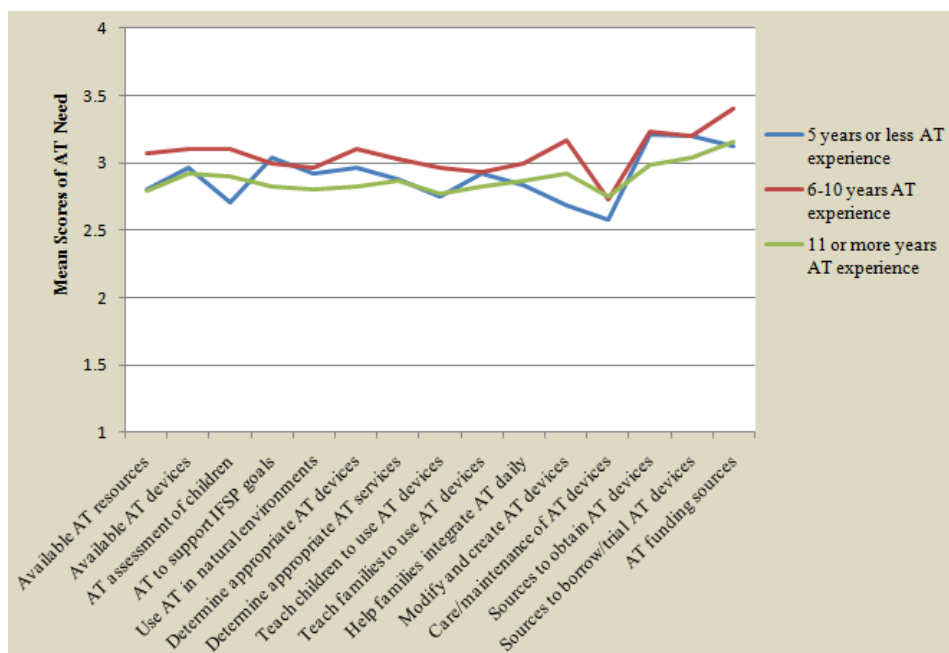


Figure 40. Mean Scores of Participants' Level of Perceived Need for Additional AT Education or Training in Relation to Participants' Years of AT Experience.

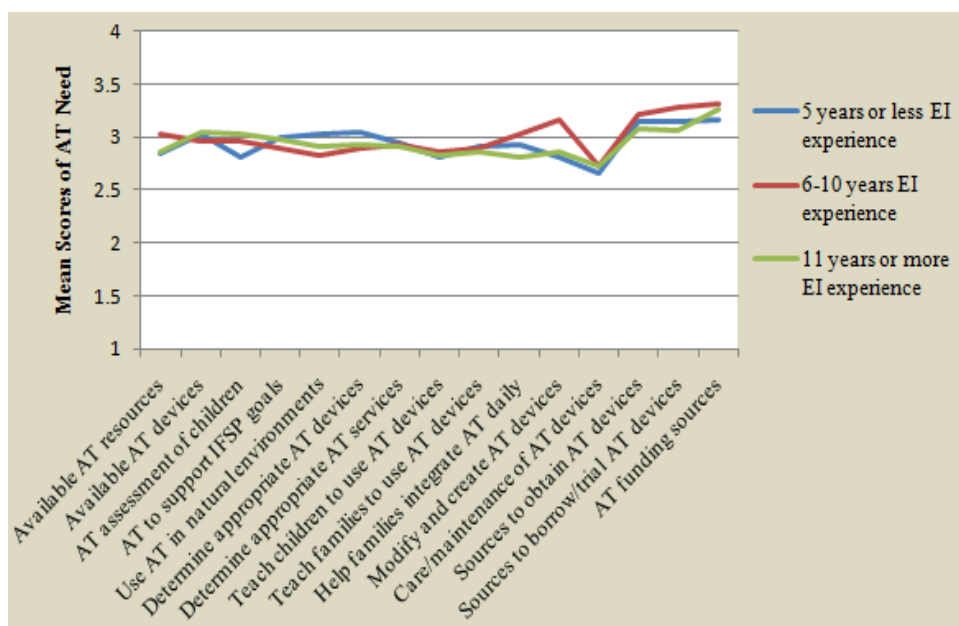


Figure 41. Mean Scores of Participants' Level of Perceived Need for Additional AT Education or Training in Relation to Participants' Years of Experience Working in Early Intervention Programs.

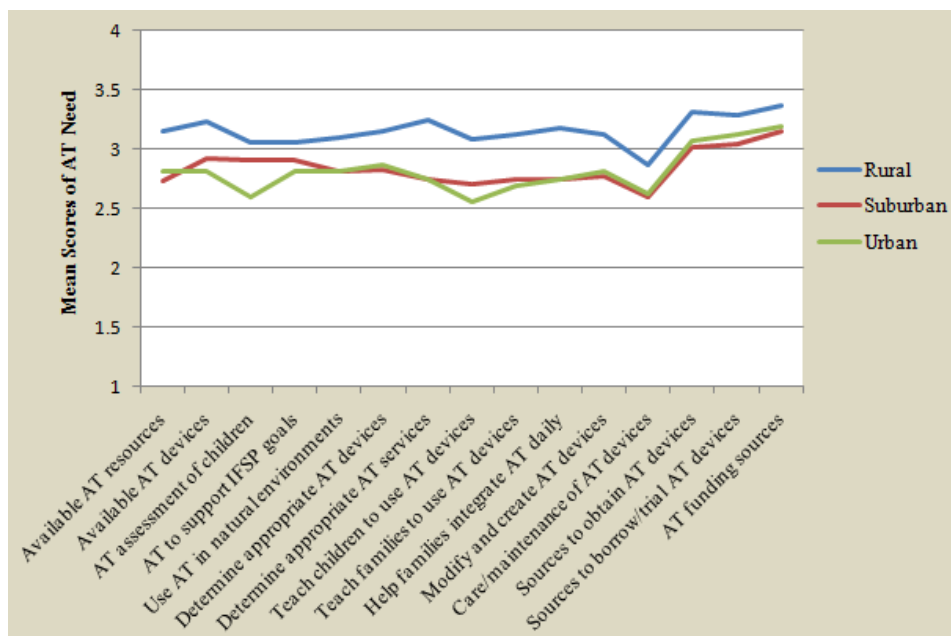


Figure 42. Mean Scores of Participants' Level of Perceived Need for Additional AT Education or Training in Relation to Area Where Participants' Early Intervention Program Provides Services.

### Perceived Level of AT Knowledge and Perceived Level of Need for Additional AT Education or Training

Figure 43 illustrates a comparison of the ratings of the participants' level of perceived knowledge and the ratings of their perceived need for additional AT education or training in the 15 areas. Their mean scores for "AT Knowledge" ranged between 1.63 to 2.20, rated as being "Somewhat" to "Fairly" knowledgeable. Their mean scores for "AT Need" ranged between 2.70 to 3.24, rated as having a "Fairly" to "Very" important need for additional AT education or training. Therefore, their mean scores for perceived AT knowledge were lower than their mean scores for perceived need for additional AT education or training in all 15 areas.

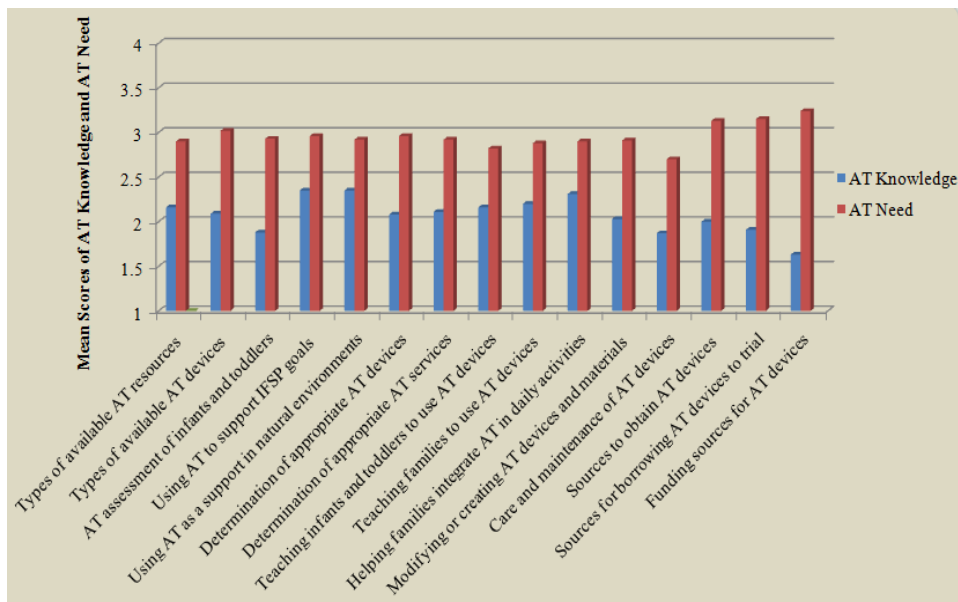


Figure 43. Mean Scores of Perceived Knowledge of AT and Perceived Need Of Importance of Having Additional AT Education or Training.

## 5. Discussion

The Individuals with Disabilities Education Act and subsequent amendments mandate that early intervention services include provision of AT devices and services. Early intervention services are provided through an Individualized Family Service Plan through which family members and early interventionists collaborate to develop a family-centered plan to support the child's functional skill development. Although federal laws define EI services to include AT devices and services, data on the inclusion of AT devices and services on the IFSPs of infants and toddlers nationwide, in the years 1995 through 2004, determined that only 3.07% to 7.41% had AT included on their IFSPs (Goode, Lazara, & Danaher, 2008). Campbell and Wilcox (2004) found that the 2002 Office of Special Education Programs' congressional report indicated that only 4.07% of children enrolled in EI programs had AT listed as a service or device on their IFSPs and the National Early Intervention Longitudinal Study indicated that only 4% had AT listed on their IFSP. Furthermore, only 0.7% of children receiving Part C services in Virginia had AT listed as an EI service on their initial IFSP (Reinhard, 2007).

These statistics are disconcerting and bring into question, why are such a small percentage of children reported to be receiving AT devices and services through their early intervention programs, and is this an accurate depiction of AT provision by early interventionists? What types of AT devices and services are early interventionists in

Virginia providing to infants and toddlers and their families who receive Part C early intervention services? For what functional goals and outcomes are they providing AT supports? What are their perceptions of their knowledge of AT and need for additional AT education or training? What factors are influencing their provision of AT?

Early interventionists who provide Part C services in Virginia completed a web-based survey designed to address these research questions. Descriptive statistics were generated using SPSS, and the data were represented in tables and narrative form in chapter four. In addition, bar and line graphs were created using Microsoft Excel based on the results by the participants' demographics for the research questions and are also displayed in chapter four to provide visual representations of the data. The findings and conclusions from this study are discussed in this chapter along with the implications for practice and further research.

### **Summary of Participants' Responses to Research Questions**

#### **Research Question 1**

What types of AT devices do the early interventionists currently provide to infants and toddlers and their families in early intervention programs?

- The participants indicated providing AT devices in the “Occasionally” to “Frequently” range in the areas of battery-operated or adapted toys, sensory items with touch or movement input, communication symbols or communication boards, and positioning devices, such as standers, adapted chairs, adapted tables, side-lyers, wedges, and rolls.

- However, they reported providing AT devices in the “Never” to “Occasionally” range in 10 of the 14 device areas, including voice output communication devices, mobility devices, adapted books, adaptive switches, environmental control units, computer access devices, computer software programs, visual aids, assistive listening devices, and aids for bathing, eating, dressing, or hygiene.
- The types of AT devices that they reported providing to infants and toddlers and their families followed a continuum, with high technology devices provided less frequently and low technology devices provided more frequently.

## **Research Question 2**

What types of AT services do the early interventionists currently provide to infants and toddlers and their families in early intervention programs?

- The participants reported providing AT services in the “Occasionally” to “Frequently” range in 7 of the 12 areas including evaluating the AT needs of infants and toddlers and their families, collaborating with families to determine appropriate AT devices and strategies, collaborating with early intervention providers to determine appropriate AT devices and strategies, providing AT to support Individualized Family Service Plan goals and outcomes, providing AT to support infants and toddlers in their daily activities and routines in their natural environments, teaching infants and toddlers to use AT devices, and teaching families to use AT devices and strategies.
- On the other hand, they indicated providing AT services in the “Never” to “Occasionally” range in 5 of the 12 areas, including selecting and customizing AT

devices, maintaining and repairing AT devices, providing information to families on AT funding sources, providing information to families on sources for borrowing AT devices to trial, and teaching early intervention providers in the use of AT devices and strategies.

### **Research Question 3**

For what functional goals and outcomes of infants and toddlers in the early intervention program do the early interventionists currently provide AT devices or services?

- The participants reported providing AT to support the functional goals and outcomes of infants and toddlers in the “Occasionally” to “Frequently” range in 12 of the 13 areas, including moving throughout their daily environments, maintaining body positions for engaging in activities, physically accessing items in their daily environments, manipulating items in their daily environments, playing with toys, going on community outings, interacting with family members, interacting with peers, making choices for preferred items or activities, participating in activities that are part of family routines, and engaging in self-care activities, such as dressing, feeding, or hygiene.
- The one functional area in which they reported providing AT in the “Never” to “Occasionally” range was visually locating items in the infants’ and toddlers’ daily environments.

#### **Research Question 4**

What factors do the early interventionists consider to be influential, either as a negative barrier or as a positive support, for the provision of AT devices and services to infants and toddlers and their families in early intervention programs?

- The participants identified 5 of the 15 factors as being in the range of a “Significant Barrier” to a “Mild to Moderate Barrier”, including the cost of providing AT, technical support for AT, availability of funding for AT, time required for obtaining or providing AT, and availability of AT to borrow to trial with families.
- They identified 6 of the 12 factors as being in the range of a “Mild to Moderate Barrier” to a “Mild to Moderate Support.” These factors included the availability of AT devices, their knowledge of AT devices, their knowledge of AT services, their previous experience with a specific AT device, established AT policies and procedures of their early intervention program, attitudes of families towards using AT, Individualized Family Service Plan goals and outcomes, natural environments where the AT will be used, and daily activities and routines where the AT will be used.
- The one factor identified as being the most positive support influencing their provision of AT was the attitudes of their early intervention team towards using AT. It was the only factor rated in the range of “Mild to Moderate Support” to “Significant Support.”



### **Research Question 5**

What is the level of perceived knowledge of the early interventionists in areas related to AT for infants and toddlers and their families in early intervention programs?

- The same 15 items were included in the survey sections for perceived level of AT knowledge and perceived need for additional AT education or training.
- For perceived level of AT knowledge, participants indicated being in the “Fairly” to “Very” knowledgeable range in 11 of the 15 areas including types of available AT devices for infants and toddlers, sources to obtain AT devices, types of AT resources that are available to practitioners and to families, determining appropriate AT devices and adaptations to use, modifying or creating AT devices and adapting materials, determining appropriate AT services to provide, teaching infants and toddlers to use AT devices, teaching families to use AT devices, helping families integrate AT in their child’s daily activities and routines, using AT to support IFSP goals and outcomes, and using AT as a support in the infants’ and toddlers’ natural environments.
- They indicated being least knowledgeable about AT, in the “Not at all” to “Fairly” knowledgeable range, in the areas of AT assessment of infants and toddlers, funding sources for AT, care and maintenance of AT devices, and sources for borrowing AT devices to trial.

## **Research Question 6**

What is the level of perceived need of the early interventionists for additional education or training in areas related to AT for infants and toddlers and their families in early intervention programs?

- The participants identified 11 of the 15 areas as being at least in the “Fairly” to “Very” important range for having additional AT education or training, including AT assessment of infants and toddlers, types of available AT resources, using AT to support IFSP goals, using AT as a support in natural environments, determining appropriate AT devices and adaptations to use, determining appropriate AT services to provide, teaching infants and toddlers to use AT devices, teaching families to use AT devices and strategies, helping families integrate AT in daily activities and routines, care and maintenance of AT devices, and modifying or creating AT devices and adapting materials.
- They identified the other four areas as being in the “Very” to “Extremely” important range for having additional AT education or training, including learning about types of AT devices that are available to practitioners and to families, sources to obtain AT devices for infants and toddlers, sources for borrowing AT devices to trial, and funding sources for AT devices.
- Their ratings of their knowledge of AT were lower than their ratings of their need for additional AT education or training in all 15 areas. Therefore, even though participants indicated being “Fairly” to “Very” knowledgeable in 11 of the 15

areas and being “Very” to “Extremely” knowledgeable in the other four areas, they still indicated needing additional AT education or training in all 15 areas.

### **Overview of Visual Representations of Participants’ Demographics and Responses**

Were there differences between the participants’ responses in relation to their demographics? There were not enough data to generate statistical analyses to compare participants’ responses for professional discipline, formal education, years of EI experience, years of AT experience, or area where their early intervention program provided services. However, the line graphs illustrated visual similarities or visual differences between the participants’ responses based on their mean scores. Although the information represented in the line graphs is not statistically significant, they do provide useful information for discussion. The lines and points on many of the line graphs were strikingly similar, indicating similar responses, but some of the line graphs depicted visual differences between participants’ responses.

### **Professional Discipline/Primary Area of Practice in Early Intervention Program**

All of the professional disciplines were represented in the survey with the exception of assistants. Approximately one-fourth of the participants were service coordinators. The next two largest groups were speech-language pathologists and special instructors, followed by physical therapists and program coordinators. When looking at the line graphs, it appeared that there were some differences between professional disciplines in a few areas.

- For provision of AT devices, physical therapists reported providing positioning and mobility devices more often than the other disciplines. Occupational

therapists indicated more frequently providing sensory items, battery-operated or adapted toys, adaptive switches, and aids for eating, dressing, bathing and hygiene. Special instructors also reported providing sensory items more often, as well as picture communication symbols or communication boards.

- For provision of AT services, physical therapists reported providing services more frequently in 10 of the 12 service areas with the exceptions of providing information on AT funding and providing information on sources to borrow and trial AT devices.
- For level of perceived AT knowledge, service coordinators appeared to have reported having less knowledge in the areas of teaching infants and toddlers to use AT devices and teaching families in the use of AT devices and strategies with their child.
- For level of perceived need of additional AT education or training, the line graph showed that occupational therapists reported higher levels of need in all 15 areas with the exception of helping families integrate the use of AT devices and strategies in their child's daily activities or routines.

### **Formal Educational Level**

Approximately two-thirds of the participants reported completing their masters degree and about one-third indicated completing their bachelors degree. A few indicated that their highest level of formal education completed was either an associates degree or a doctorate. This factor was grouped into two categories, graduate and undergraduate educational levels.

- For provision of AT devices, the line graph showed that there was a spike for provision of picture communication symbols or communication boards reported by participants at the graduate level, suggesting that they provided this type of device more often than participants whose highest level of formal education was at the undergraduate level.

### **Years of Early Intervention Experience**

Participants reported having a wide range of years of experience working in early intervention programs, with more than one-third of the participants indicating 5 years or less, approximately one-fourth reporting 6-10 years, and more than one-third indicating 11 years or more early intervention experience. The line graphs appeared to show visual differences between responses in relation to years of EI experience.

- For provision of AT to support functional goals and outcomes, participants who had 5 years or less EI experience reported that they provided AT to support the 13 functional goals and outcomes less frequently than participants with more EI experience.
- The line graph depicted that participants with 5 years or less EI experience indicated having lower levels of perceived AT knowledge in all 14 areas than participants with more EI experience.

### **Years of Assistive Technology Experience**

Almost half of the participants reported that they had 11 years or more experience providing AT in their professional practice. Approximately one-fourth indicated having 5 years or less AT experience and about one-fourth reported having 6-10 years AT

experience. The line graphs appeared to show that there were some visual differences in responses between participants in relation to AT experience.

- For provision of AT services, participants with 5 years or less AT experience reported providing all 12 AT services less frequently than reported by participants with more AT experience.
- For provision of AT to support functional goals and outcomes, the line graph depicted that participants with 5 years or less AT experience reported providing AT supports less often than participants with more AT experience for all 13 functional goals and outcomes.

#### **Area Where Early Intervention Program Provides Services**

Approximately half of the participants indicated that their early intervention program provided services primarily in urban areas, and about one-third reported providing services in rural areas. The remaining participants noted that their early intervention programs provided services in suburban areas. One of the line graphs depicted visual differences in relation to this factor.

- For level of perceived need for additional AT education or training, participants whose EI programs provided services primarily in rural areas reported higher levels of need in all 15 areas.

#### **Early Intervention Caseloads and AT on Individualized Family Service Plans**

Participants identified the approximate number of families on their EI caseload. They also indicated the number of families on their EI caseload who had specific AT

devices or services listed on their IFSP. Overall, they reported that 26.31% of the families on their caseload had AT listed as a device or service on their IFSP.

Descriptive statistics were generated to compare the number of families on the participants' EI caseloads with the number of families on their caseloads who had AT listed on the IFSP, in relation to the area where their EI program primarily provided services. Participants who provided EI services in rural areas reported the largest number of families on their caseload yet, conversely, also indicated the smallest number of families on their caseload with specific AT devices or services listed on their IFSP. The percent of families on their rural caseloads who had AT listed on their IFSP was 19.74%. In comparison, more than 30% of their families who received EI services in suburban or urban areas were reported to have AT listed on their IFSP.

### **Discussion of Findings**

It is challenging to compare the results of this study with previous research studies because, as the literature review indicated, there were only a few studies that specifically addressed the use of AT by early interventionists working with children ages birth to three years. Some of the studies cited in the literature review included early childhood providers who worked with preschool-aged children, thus providing school-based services for a different population in a different setting.

For provision of AT devices, the participants in this study reported overall that they provided AT devices to infants and toddlers and their families in the “Never” to “Occasionally” range in 10 of the 14 areas. This is a significant concern because children infants and toddlers who are receiving early intervention services may be more likely to

have more significant challenges that were identified early, and AT could be used effectively to support their functional goals and outcomes.

The findings in this study that the participants more frequently provided low technology AT devices to infants and toddlers confirmed the findings in the Dugan et al. (2006) study that surveyed early intervention providers. The early childhood providers in the Trachtman and Pierce (1995) reported that they more frequently provided seating and positioning devices and adapted toys, similar to the participants in this study. Conversely, they also reported frequently providing high tech computer access devices, which differs from the participants in this study. Is this a reflection of the settings in which they provided services, which included school-based programs that might include computer-based activities in their curriculum?

The participants in the Trachtman and Pierce (1995) study indicated that that they least frequently provided augmentative communication devices. In the Lesar (1998) study that surveyed early childhood special education professionals serving children ages three to five years, more than half of the participants indicated that they seldom or never used communication devices. Similarly, the early intervention providers in my study reported that their provision of voice output communication devices was in the “Never” to “Occasionally” range. On the other hand, they indicated that they more frequently provided low technology picture communication symbols or communication boards. Trachtman and Pierce and Lesar did not specify what they considered to be communication devices, thus it is not known if it included picture communication symbols and voice output devices.



There are also concerns about the participants' reported provision of AT services. They indicated overall that they provided AT services to infants and toddlers and their families in the "Never" to "Occasionally" range in 5 of the 12 areas. In the Trachtman and Pierce (1995) study, the types of AT services that were most frequently reported as being provided included AT assessment, selecting AT devices and training the child and family in the use of AT. Comparably, the participants in my study also indicated that they more frequently provided the AT services of evaluating the AT needs of infants and toddlers and their families and teaching infants and toddlers to use AT devices.

Conversely, the participants in my study reported that they less frequently provided the services of teaching families to use AT devices and strategies and selecting and customizing AT devices than the participants in the Trachtman and Pierce (1995) study indicated. In the Mistrett et. al (2001) study with early interventionists, they found that one of the most highly rated services that they provided was AT to support IFSP goals and outcomes. Comparably, the participants in my study indicated providing AT to support IFSP goals in the "Occasionally" to "Frequently" range.

One of the most encouraging findings from my study is that the participants reported that the percent of families on their caseloads who have specific AT devices or services listed on their IFSP ranged from 19% to 30%, with families who received EI services in suburban or urban areas reported to have AT listed on their IFSP more often than families who received services in rural areas. These percents are much higher than the literature review reported, which found that only 3.07% to 7.41% of children

nationwide had AT included on their IFSPs and only 0.7% of children receiving Part C services in Virginia had AT listed as an EI service on their initial IFSP.

Overall, the participants in my study indicated providing AT to support the functional goals and outcomes of infants and toddlers in the “Occasionally” to “Frequently” range in 12 of the 13 areas. These findings reflect that the participants appear to be engaging in best practices recommended for early intervention service providers by the Division for Early Childhood (DEC) of the Council for Exceptional Children to provide AT to support children’s skills in “communication and language, environmental access, social-adaptive, mobility and orientation, daily life, social interaction, health, and positioning/handling” (Sandall et al., p. 151).

In regards to the factors that the participants consider to be influential in their provision of AT devices or services, they reported barriers in the areas of cost of providing AT, technical support for AT, availability of funding for AT, time required for obtaining or providing AT, and availability of AT to borrow to trial with the families. The one factor that the participants rated as a support was the attitudes of their early intervention team towards using AT. Comparably, the early childhood special education professionals in the Lesar (1998) study also noted having concerns about obtaining funding for AT devices and the lack of technical support for AT, similar to the early interventionists in my study.

In the Milbourne and Campbell (2008) survey of Part C early intervention coordinators from 29 states, including the commonwealth of Virginia, the participants noted that the top barriers to provision of AT included availability of funding for AT,

availability of early intervention providers who are knowledgeable and experienced in AT, access to AT lending libraries or loan programs, and access to conveniently located AT professional development and training. Their concerns about the availability of funding for AT and the availability of AT to borrow mirror the concerns of the early interventionists in my study.

Regarding their perceived knowledge of AT, the participants indicated being least knowledgeable in the areas of AT assessment of infants and toddlers, care and maintenance of AT devices, funding sources for AT, and sources for borrowing AT devices to trial. It is interesting to note that two of these areas, AT funding sources and sources for borrowing AT devices to trial are also considered to be barriers in their provision of AT. It is of concern that they perceived themselves as being least knowledgeable in AT assessment, yet they indicated that they provided the service of AT assessment in the “Occasionally” to “Frequently” range.

In the Lesar (1998) study, a large percentage of the participants rated their AT knowledge as being “Nonexistent” or “Novice” in all of the AT device areas, including mobility aids, communication devices, agencies that provide services or access to assistive technology, switch-activated devices, software, low technology devices, and computers. In contrast, most of the participants in my study indicated being “Fairly” knowledgeable about the types of AT devices that are currently available for infants and toddlers, although specific types of AT devices were not identified. In addition, at least half of the participants in my study reported being “Fairly” knowledgeable in determining

appropriate AT devices and adaptations to use and the sources to obtain AT devices for infants and toddlers.

The participants in my study reported that having additional AT education or training in all 15 areas was in the “Fairly” to “Very” important range in 11 of the 15 areas. When asked to identify areas in which they perceived having needs for additional AT education or training, the participants in the Lesar study reported needing additional training in the areas of types of available AT devices, determining appropriate AT devices to provide in the child’s natural environments, instructing children, families, and teachers in the use of AT devices, sources to obtain AT devices, length of time to acquire AT devices, sources to obtain funding for AT devices, services, and training, and maintaining or updating the AT devices when needed. Similarly, the early interventionists in this dissertation study also indicated that having additional AT education or training in these same areas was fairly to extremely important. The length of time to acquire AT devices was not included in this study. The areas in which they reported the greatest need were learning about types of AT devices that are available to practitioners and to families, sources to obtain AT devices for infants and toddlers, sources for borrowing AT devices to trial, and funding sources for AT.

### **Implications for Practice**

The research findings identified AT areas in which the participants perceived as being barriers in their provision of AT services, perceived as having a lack of AT knowledge, or perceived as needing additional AT education or training. These areas were AT assessment of infants and toddlers, types of AT devices that are available for

infants and toddlers and sources to obtain them, time required for obtaining or providing AT, sources for borrowing AT devices to trial with families, cost of providing AT, funding sources for AT, care and maintenance of AT devices, and AT technical support.

The participants consistently rated their overall need for additional AT education or training more highly than their overall knowledge of AT in all of the areas. Perhaps this is an accurate reflection of their need for additional education and training in these areas. Another possibility may be related to the fact that the field of assistive technology is rapidly changing, with new AT devices, strategies, resources, funding sources, loan sources, and more appearing regularly. In my opinion, it is important to keep updated on changes in the field of AT and to be aware of new AT devices, strategies, and resources in order to provide best practice. Thus, in order to provide best practice and keep up to date on current AT supports, perhaps the perceptions of the needs of early interventionists for additional AT education and training may always be greater than their perceptions of their knowledge base.

It is encouraging that when asked to identify the sources that they have used to learn more about AT, more than half of the participants in this study indicated collaborating with colleagues and with families, attending professional conferences, workshops, or staff development inservices, using print sources (books, vendor catalogs, and professional journals, magazines, and newsletters), and accessing Internet resources (tutorials, research articles, webinars, listservs, podcasts, or other website resources). In addition, at least one-third indicated using the sources of AT vendor demonstrations, AT specialists, and taking face-to-face college courses as a source to learn about AT. Only a

small percent reported taking online college courses to learn about AT. It was disturbing to note that a few indicated that they did not use any of the AT resources listed.

Early interventionists in Virginia have access to a wide range of AT services, supports, and educational opportunities. Perhaps this is one reason why the reported percentages of families whose IFSPs include specific AT devices or services is higher than reported in previous studies. However, it is important to note that the participants whose EI programs provided services primarily in rural areas reported higher levels of perceived need for additional AT education or training in all 15 areas, as compared to participants whose EI programs primarily provided services in suburban or urban areas. This finding may indicate that early interventionists practicing in rural areas may need more educational outreach and support. In Virginia, there are a wealth of resources to obtain additional AT education, training, or supports and many of these are free.

- George Mason University's Helen A. Kellar Institute for Human disabilities, an interdisciplinary campus based organization and research center that develops products, services, and programs for individuals with disabilities, works with numerous Virginia counties and other Virginia colleges and universities. The Kellar library, a collaborative effort between George Mason University, the Kellar Institute for Human disabilities, and the Virginia Department of Education's Training and Technical Assistance Centers (T/TAC) offers an extensive collection of books, software, videos, assistive technology devices, and reference materials that can be checked out by families and professionals working with children.

- T/TAC provides training and technical assistance to support individuals with disabilities, ages birth to 22 years. T/TAC centers are located at seven universities located throughout Virginia. Services are provided to professionals, individuals with disabilities, and their families. These services include providing special education and AT workshops, consultations with school-based teams, a multi-media and AT lending library, and a website with extensive resources and online training. Their Early Childhood Priority Project supports professionals providing educational services to children ages birth through kindergarten, and collaborates with the Infant & Toddler Connection of Virginia.
- The Virginia Assistive Technology System (VATS), a statewide program authorized and funded by the Assistive Technology Act of 2004, has a central office and three regional sites that provide technical assistance, including information and referral, training, screenings, and printed resources for professionals and consumers in need of AT support. VATS has AT equipment to loan to families and professionals, including devices to support daily living skills, communication, play, learning, mobility, hearing, and vision. VATS also published the “Resource Guide to Assistive Technology Funding” (Virginia Assistive Technology System, 2001).

Many AT vendors loan equipment to trial and have websites that provide a wealth of resources, frequently asked questions, and technical support that is available online or by phone. The Infant & Toddler Connection of Virginia website has a document entitled “Resources for Funding Assistive Technology” that includes information on the Assistive

Technology Loan Fund Authority, Medicaid Waiver Programs, and numerous foundations and organizations that provide equipment loans or funding for AT.

Low tech AT supports can be easily made for little or no cost, often from recycled materials, including adapted books, adaptive switches, adapted toys, positioning supports, communication boards and books, visual enhancements and other sensory items, and aids for eating, dressing, and hygiene. There are instructions available on the Internet, in books and newsletters, at workshops and conferences, and even in college courses. For example, George Mason University teaches a course on *Low-Tech Assistive Technology Solutions* which focuses on the vast array of low technology supports that are available, sources for obtaining them, and hands-on experiences in creating a variety of low tech supports, including making adaptive switches and adapting battery-operated toys.

It is important to help early interventionists and families to become more aware of AT resources and educational opportunities that are readily available, including networking with colleagues, accessing Internet websites that offer free resources, trainings, and opportunities to network with other professionals and families to share information about AT, attending national and state conferences and local workshops, accessing free materials at public libraries, including computers for Internet access, taking college courses that are increasingly available online, borrowing materials through AT lending libraries, and contacting organizations that specialize in providing AT supports. Perhaps a webpage could be created that focuses on assistive technology resources could be created and linked to the Infant & Toddler Connection of Virginia



website, providing easy access for early interventionist and families to learn more about AT and potentially reduce the perceived barriers to providing AT.

### **Implications for Research**

The results of this study bring forth additional research questions to consider investigating. Why did the early interventionists in this study report much higher percentages of families on their caseload having specific AT devices or services listed on their IFSPs? Is it an accurate reflection of early intervention practice in Virginia?

Why did the participants consistently rate their overall need for additional AT education or training more highly than their overall knowledge of AT in all of the areas? Is this an accurate reflection of their need for additional education and training in these areas, or a perception that it is important to keep updated with current AT practice because the field of AT is rapidly changing? Do early interventionists' perceptions of their AT knowledge and need for additional AT education change after accessing various AT resources and participating in different types of AT educational opportunities?

Does accessing various AT resources and participating in different types of educational opportunities influence early interventionists' views of barriers and supports for the provision of AT? Does accessing various AT resources and participating in different types of educational opportunities impact the types of AT devices and services that they provide to support the functional goals and outcomes of infants and toddlers and their families, including listing them as supports on the Services page of the IFSPs? If so, which types of AT resources and educational opportunities impact or influence these areas?

Exploring these questions can provide important information on effective ways to provide AT education, further contribute to the research knowledge base, and inform best practice for early interventionists in the appropriate provision of AT devices and services to support the IFSP functional goals and outcomes of infants and toddlers and their families.

### **Conclusion**

This study has identified the types of AT devices and services that early interventionists in Virginia are providing to infants and toddlers and their families who are receiving Part C early intervention services, the purposes for which they are providing AT, the factors that influence their provision of AT, their perceived knowledge of AT, and their perceived needs for additional AT education and training. A Part C consultant with the Infant & Toddler Connection of Virginia, has noted that this research will be “helpful in identifying training and technical assistance needs as well as areas in which revision or clarification to policies and/or practices are needed” (K. Patterson, personal communication, January 5, 2009). It is anticipated that the results of this study will add to the research knowledge base and inform practice on assistive technology in early intervention.

APPENDIX A: Infant & Toddler Connection of Virginia's IFSP Form  
Section V. Services Needed to Achieve Early Intervention Outcomes

Child's Name: _____ IFSP Date: _____ DOB: _____						<b>Infant &amp; Toddler Connection of Virginia</b> Page 6			
<b>V. Services Needed to Achieve Early Intervention Outcomes</b>									
ENTITLED SERVICE	FREQUENCY (# x/wk/ month/once)	INTENSITY (# min/visit)	GROUP(S) / INDIVIDUAL (I)	METHODS** (a, b, c, d)	NATURAL ENVIRONMENT/ LOCATION <small>(Must be a natural setting unless justified below)</small>	PAYMENT <small>1. Family Fee 2. Insurance 3. Medicaid, State Funds 4. Local Funds 5. Part C</small>	PROJECTED START DATE	PROJECTED END DATE	ACTUAL END DATE
1. Service Coordination	*	*	I	Service coordination					
2.									
3.									
4.									
5.									
6.									
7.									
8.									
* This is the minimum frequency and intensity of direct contact from your service coordinator. The frequency and intensity of service coordination actually provided will vary since service coordination is an active, ongoing process that changes based on your family's priorities and needs.									
** Methods:      a = Coaching, including hands-on as appropriate      b = Consultation      c = Assessment d = Provision of assistive technology device									
Justification of why early intervention outcomes can't be achieved satisfactorily in a natural setting <u>and</u> a plan with timelines and supports necessary to return early intervention services to natural settings: _____									
Reason for later projected start date - For each service that is planned to start more than 30 calendar days after the family signs the IFSP, indicate whether the reason is family scheduling preference, team planned a later start date to meet child and family needs, or other: _____									

## APPENDIX B: Survey Questionnaire

### *Introduction*

The goals of this survey are:

1. To determine the types and purposes of assistive technology devices and services that early interventionists provide to infants and toddlers and their families in Part C early intervention programs in the state of Virginia.
2. To identify potential needs of early interventionists for additional education in assistive technology.

Your responses will be kept confidential.

The Individuals with Disabilities Education Improvement Act of 2004 defines assistive technology as:

- Any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability.
- Any service that directly assists a child with a disability in the selection, acquisition, or use of an assistive technology device.

Assistive technology may include, but is not limited to, devices, adaptations, or strategies to support children's positioning, mobility, communication, socialization, behavior, play, environmental access and exploration for participation in their daily activities and routines in their natural environments. There is a wide range of assistive technology, from no tech to high tech. For example, assistive technology for communication ranges from sign language to picture communication symbols to battery-operated voice output devices to dynamic screen devices.

### *Survey Questionnaire*

1. Which of the following professional disciplines best describes your primary area of practice in the early intervention program? Please select one of the following:

- ☐ Program coordinator
- ☐ Service coordinator
- ☐ Occupational therapist
- ☐ Physical therapist
- ☐ Speech-language pathologist
- ☐ Special instructor
- ☐ Occupational therapy assistant / Physical therapy assistant/ Instructional assistant
- ☐ Other (Please indicate your area)  (fill-in-the-blank)

2. Which of the following best describes the area where your early intervention program provides services?

- ☐ Rural
- ☐ Suburban
- ☐ Urban

3. What is your highest level of formal education that you have completed? Please select one of the following:

- ☐ High school / GED
- ☐ Associates degree
- ☐ Bachelors degree
- ☐ Masters degree
- ☐ Doctorate

4. How many years of experience do you have working in early intervention programs?

(drop-down menu of numbers)

5. How many years of experience do you have providing assistive technology in your professional practice?

(drop-down menu of numbers)

6. Approximately how many families do you currently have on your early intervention caseload?

(drop-down menu of numbers)

7. Approximately how many families on your early intervention caseload have specific assistive technology devices or services listed on their Individualized Family Service Plan?

(drop-down menu of numbers)

8. Which of the following sources have you used to learn about assistive technology devices, strategies, or services? (Please select all that apply.)

- ☐ Courses for college credit, face-to-face
- ☐ Courses for college credit, online
- ☐ Professional conferences or workshops
- ☐ Staff development inservices
- ☐ Assistive technology vendor demonstrations
- ☐ Print sources, such as books, vendor catalogs, professional journals, magazines, or newsletters

- ☐ Internet resources, such as tutorials, research articles, listservs, webinars, podcasts, or other website resources
- ☐ Collaboration with colleagues
- ☐ Collaboration with families
- ☐ Assistive technology specialists
- ☐ None of the above

9. Please rate your current knowledge of assistive technology:

Not at all knowledgeable	Fairly knowledgeable	Very knowledgeable	Extremely knowledgeable	Knowledge of Assistive Technology (AT)
				Types of AT resources that are available to practitioners and to families
				Types of AT devices that are currently available for infants and toddlers
				AT assessment of infants and toddlers
				Using AT to support Individualized Family Service Plan outcomes and goals
				Using AT as a support in the infants' and toddlers' natural environments
				Determination of appropriate AT devices and adaptations to use with infants and toddlers and their families
				Determination of appropriate AT services to provide to infants and toddlers and their families
				Teaching infants and toddlers to use AT devices
				Teaching families in the use of AT devices and strategies with their child
				Helping families integrate the use of AT devices and strategies in their child's daily activities and routines
				Modifying or creating AT devices and adapting materials for infants and toddlers
				Care and maintenance of AT devices
				Sources to obtain AT devices for infants and toddlers
				Sources for borrowing AT devices to trial
				Funding sources for AT devices

10. Please rate how important it is for you to receive additional education or training in assistive technology:

Not at all important	Fairly important	Very important	Extremely important	Assistive Technology (AT) Education or Training Needs
				Types of AT resources that are available to practitioners and to families
				Types of AT devices that are currently available for infants and toddlers
				AT assessment of infants and toddlers
				Using AT to support Individualized Family Service Plan outcomes and goals
				Using AT as a support in the infants' and toddlers' natural environments
				Determination of appropriate AT devices and adaptations to use with infants and toddlers and their families
				Determination of appropriate AT services to provide to infants and toddlers and their families
				Teaching infants and toddlers to use AT devices
				Teaching families in the use of AT devices and strategies with their child
				Helping families integrate the use of AT devices and strategies in their child's daily activities and routines
				Modifying or creating AT devices and adapting materials for infants and toddlers
				Care and maintenance of AT devices
				Sources to obtain AT devices for infants and toddlers
				Sources for borrowing AT devices to trial
				Funding sources for AT devices

11. Please rate how often you provide the following types of assistive technology devices to infants and toddlers and their families in the early intervention program:

Never	Occasionally	Frequently	Always	Assistive Technology (AT) Devices Provided
				Positioning devices, such as standers, adapted chairs, adapted tables, side-lyers, wedges, and rolls
				Mobility devices, such as braces, orthotics, walkers, and wheelchairs
				Visual aids, such as magnifying devices, light-up toys, Braille, and tactile symbols
				Assistive listening devices, such as hearing aids, microphones, speakers, headphones, and FM systems
				Aids for bathing, eating, dressing, or hygiene
				Battery-operated or adapted toys
				Adapted books
				Sensory items that provide touch or movement input
				Adaptive switches
				Environmental control units
				Picture communication symbols or communication boards
				Voice output devices
				Computer software programs
				Computer access devices, such as trackballs, touch screens, switches, alternate keyboards, and pointers



12. Please rate how often you provide the following types of assistive technology services to infants and toddlers and their families in the early intervention program.

Never	Occasionally	Frequently	Always	Assistive Technology (AT) Services Provided
				Evaluating the AT needs of infants and toddlers and their families
				Collaborating with families to determine appropriate AT devices and strategies
				Collaborating with early intervention providers to determine appropriate AT devices and strategies
				Providing AT to support Individualized Family Service Plan goals and outcomes
				Providing AT to support infants and toddlers in participating in their daily activities and routines in their natural environments
				Selecting or customizing AT devices
				Maintaining and repairing AT devices
				Providing information to families on funding sources for AT devices
				Providing information to families on sources for borrowing AT devices to trial
				Teaching infants and toddlers in the use of AT devices
				Teaching families in the use of AT devices and strategies
				Teaching early intervention providers in the use of AT devices and strategies

13. Please rate how often you provide assistive technology to support the functional goals and outcomes of infants and toddlers in the early intervention program in the following areas:

Never	Occasionally	Frequently	Always	Functional Goals and Outcomes of Infants and Toddlers Supported by Assistive Technology (AT)
				Moving throughout their daily environments
				Maintaining body positions for engaging in activities, such as sitting for feeding, bathing, or play
				Visually locating items in their daily environments
				Physically accessing items in their daily environments
				Manipulating items in their daily environments
				Playing with toys
				Going on community outings
				Interacting with family members
				Interacting with peers
				Engaging in self-care activities, such as dressing, feeding, or hygiene
				Making choices for preferred items or activities
				Participating in activities that are part of family routines
				Communicating their wants or needs

14. Please rate how the following factors influence you, either as a negative barrier or as a positive support, in providing assistive technology to infants and toddlers and their families in the early intervention program:

Not at all important	Fairly important	Very Important	Extremely important	Factors that Influence Provision of Assistive Technology (AT)
				Availability of AT devices
				Your knowledge of AT devices
				Your knowledge of AT services
				Your previous experience with a specific AT device
				Established policies and procedures of your early intervention program related to AT
				Attitudes of your early intervention team toward using AT
				Attitudes of families toward using AT
				Cost of providing AT
				Technical support for AT
				Availability of funding for AT
				Time required for obtaining or providing AT
				Availability of AT to borrow to trial with the families
				Individualized Family Service Plan goals and outcomes
				Natural environments where the AT will be used
				Daily activities and routines where the AT will be used

15. If there are any additional comments that you would like to share regarding your use of assistive technology with infants and toddlers and their families in early intervention programs, please indicate here.  (fill-in-the-blank)

***Thank you for your time. Please submit your answers.***

Submit

## APPENDIX C: Phone Script to Part C Local System Managers

Hello, my name is Cynthia Feist and I am following up on an email sent by Mary Ann Discenza, the Part C Coordinator for the Infant & Toddler Connection of Virginia.

As a doctoral student at George Mason University, I am interested in exploring the types of assistive technology that early interventionists are providing to children and their families receiving Part C services in early intervention programs in Virginia, the purposes for which they are providing assistive technology, and the factors that are related to their provision of assistive technology. I have developed a web-based survey questionnaire for this research study.

In order to survey local service providers, I am contacting you and each of the other local system managers to ask for your support in this research. I will be sending you an email that explains the purposes of the study, the reasons why participation in the study is important, assurance of confidentiality of responses, and a web link to the survey. Would you please forward the email to each member of your early intervention team? Participation in the study is completely voluntary and responses will be kept confidential. Thank you so much for your support.

#### APPENDIX D: Initial Email to Potential Participants

Hello, my name is Cynthia Feist and I am a doctoral student at George Mason University. I am conducting a study on the use of assistive technology (AT) by early interventionists in Virginia. The purpose of this study is to help understand how and when AT is being provided to children and families receiving early intervention services.

If you agree to participate, you will complete a web survey questionnaire that should take approximately 10-15 minutes to complete. Your responses are completely confidential as the survey is anonymous. Participation is completely voluntary, and there is no penalty if you decide not to participate. There is no compensation for participation. However, your participation can help identify the needs of early interventionists for AT education and technical assistance.

The survey link is provided below. When you access the link, you will first be asked to review the Informed Consent Form. After reviewing the form, if you click the “I agree to participate” button, you will then be connected to the survey.

**Survey Link**

Thank you for your consideration and prompt response.

Cynthia Feist  
George Mason University

## APPENDIX E: Informed Consent Form

### RESEARCH PROCEDURES

You are invited to participate in a research study. This research is being conducted to determine the types and purposes of assistive technology (AT) devices and services that early interventionists provide to infants and toddlers and their families in Part C early intervention programs in the state of Virginia, and to identify potential needs of early interventionists for additional education in AT.

If you agree to participate, you will be provided a web link to the survey questionnaire. The questionnaire should take approximately 10 to 15 minutes to complete.

### RISKS

There are no foreseeable risks for participating in this research.

### BENEFITS

There are no benefits to you as a participant other than to further research in the use of AT by early interventionists and to help identify AT education needs.

### CONFIDENTIALITY

The data in this study will be confidential, as this is a confidential survey. Therefore, names and other identifiers will not be placed on surveys. While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of the transmissions.

### PARTICIPATION

Your participation in the study is voluntary. There will be no costs to you. If you decide not to participate, there will be no penalty.

### CONTACT

This research is being conducted by Cynthia Feist under the direction of Dr. Michael Behrmann, Professor of Special Education and Director of the Helen A. Kellar Institute for Human disAbilities at George Mason University. The researcher, Cynthia Feist, may be reached at (703) 777-5095 for questions or to report a research-related problem. Dr. Michael Behrmann may be reached at (703) 993-3670 for questions or to report a research-related problem. You may contact the George Mason University Office of Research Subject Protections at (703) 993-4121 if you have any questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

## CONSENT

The George Mason University Human Subjects Review Board has waived the requirement for a signature on this consent form. However, if you wish to sign a consent form, please contact Cynthia Feist at (703) 777-5095.

## PLEASE SELECT ONE OF THE FOLLOWING:

- ☐ I have read this form and agree to participate in this study.
- ☐ I have read this form and do not agree to participate in this study.

## APPENDIX F: Follow-up Email to Part C Local System Managers

I am extremely grateful for your support in forwarding my email with the link to my dissertation survey on The Use of Assistive Technology by Early Interventionists in Virginia to the providers on your early intervention team. I am contacting you again because I really need your help. Out of a potential pool of approximately 1000 early intervention providers, only 69 people responded to my survey. That is not enough participants for a valid study.

Would you be willing to send a follow-up email to your providers which I will provide?

In that email, I will thank those who have already completed the survey, and ask those who have not yet responded to please consider completing the survey. The Infant & Toddler Connection of Virginia is supporting this survey because, in addition to determining how early interventionists in Virginia are using assistive technology, an important component of the study is to identify their needs for additional education or training in assistive technology. Thanks so much for considering my request.

Cynthia Feist  
George Mason University



## APPENDIX G: Follow-up Email to Potential Participants

Thanks so much to those of you who have completed the web-based survey questionnaire for my dissertation study on “The Use of Assistive Technology by Early Interventionists in Virginia”. I truly appreciate it!

So far, 69 early interventionists have responded, and the Infant & Toddler Connection of Virginia estimates that there are approximately 1000 early interventionists providing Part C services in Virginia. In order for my study to be valid, and to accurately determine the use of AT and the needs for additional AT education and training, I urgently need more respondents.

Please consider completing the survey this week, if you have not yet had a chance to do so. It should take approximately 10-15 minutes to complete. Your responses are completely confidential as the survey is anonymous. Your participation can help identify the needs of early interventionists for AT education and technical assistance, and help us in developing AT resources.

The survey link is provided below. When you access the link, you will first be asked to review the Informed Consent Form. After reviewing the form, if you click the “I have read this form and agree to participate in this study” button, you will then be connected to the survey.

[http://spedsurvey.gmu.edu/snap/assistive\\_technology\\_for\\_early\\_intervention/](http://spedsurvey.gmu.edu/snap/assistive_technology_for_early_intervention/)

If, for some reason, clicking the above link does not connect you directly to the survey, you can copy and paste the link into your Internet browser window. Thank you for your consideration and prompt response.”

Cynthia Feist  
George Mason University

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## REFERENCES

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## CURRICULUM VITAE

Cynthia Diaz Feist knew early in life that she wanted to be an occupational therapist because it truly integrated art and science in helping people who have various challenges. She received her bachelors degree in occupational therapy (OT) from Virginia Commonwealth University and has worked through the years as a pediatric occupational therapist with children, from infants to teenagers, in early intervention programs, hospitals, school systems and her own private practice. She returned to VCU to pursue her masters degree in pediatric OT. After completing all the coursework, she was in the midst of working on her thesis when life took her onto a different path. After a whirlwind courtship, she married and moved with her fabulous chef husband, John, to Switzerland when he was offered a job as a chef apprentice. Regrettably, the thesis fell by the wayside as she learned other amazing life lessons while camping, biking, and travelling across Europe while living in Switzerland.

When Cindy returned home she moved to Leesburg, Virginia. Her family grew through the years with the addition of three lovely daughters, Tanya, Chelsea, and Josie. She continued to work as a pediatric occupational therapist. Along the way, she received her certification in sensory integration and in neuro-developmental treatment. She eventually felt that she needed a fresh career challenge. Since she had received her OT degree in the dinosaur era, she decided that she needed to go back to school to learn about assistive technology (AT). Little did she know that she had been using AT all along, creating and using adapted materials and equipment in her OT practice.

Cindy began by taking an introductory AT course at George Mason University. It became immediately apparent that she had found her new passion. After completing the coursework to obtain her graduate certificate in AT, she was on her way to pursuing her doctorate in special education, specializing in AT. Along the way, she has taught numerous AT courses at GMU as an adjunct instructor, worked as a supervisor for the GMU CompuWrite and CompuPlay camps, been a consultant with the Virginia Assistive Technology System North, and was the managing editor of the *Journal of Technology and Teacher Education*. She was a co-author of an article for the American Occupational Therapy Association on using computers to design accessible learning environments, has been a guest lecturer for OT graduate students, and has been a presenter at many conferences on the topic of AT. Cindy now happily works as an assistive technology trainer with Loudoun County Public Schools, providing AT supports and strategies for students with special needs, their teachers and school staff members, and their families.