

Provider Perspectives on the Use of Assistive Technology for Infants and Toddlers With Disabilities

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A random sample of 967 early intervention providers in 33 different states completed a telephone survey that was conducted with computer-assisted telephone interview technology. The survey solicited information about the service providers' views of assistive technology (AT) for infants and toddlers with disabilities. In particular, questions elicited information regarding the use of AT, factors important to making decisions about AT, access to resources (e.g., funding, lending libraries), and provider training about AT in early intervention. Data were analyzed for the group as a whole, for specific disciplines, and in terms of the amount of training providers reported they had about AT in early intervention. Results indicated similar response patterns across disciplines, but differences in terms of reported training.

A significant issue that early intervention providers face in serving infants and toddlers with disabilities is the provision of services within natural environments. The concept of natural environments in early intervention has been included in federal regulations since the early 1990s, and the most current child count data released by the Office of Special Education Programs (OSEP; 2005) indicate that states are serving most infants and toddlers with disabilities in their homes or other typical settings (e.g., childcare programs), with a national average of 83%, and a range of 35% to 100%. The average is encouraging, but the range suggests that there is still progress to be made on this critical service delivery issue.

Assistive technology (AT) devices and services are resources that create significant opportunities for infants and toddlers with disabilities to be served in natural environments and thereby participate in activities and routines in everyday settings (Benedict, Lee, Marrujo, & Farel, 1999; Campbell, McGregor, & Nacik, 1994; Judge, 2002; Langone, Malone, & Kinsley, 1999). AT was first included as a service for infants and toddlers with disabilities in the 1990 Amendments to the Education of the Handicapped Act, which, mirroring the Part B requirements, added AT services and devices to

the list of early intervention (EI) services that could be provided for eligible infants and toddlers. AT devices range from simple (e.g., adapted spoons and switches) to complex (e.g., computers, augmentative communication systems, environmental control devices, and electric wheelchairs). AT services may include such things as teaching a child or family to use a device in various settings, consultations on environmental changes (e.g., lighting and noise levels), or provision of technical expertise for device programming or modification.

Researchers have suggested that AT has the potential to dramatically alter growth and learning opportunities for many infants and toddlers with disabilities (e.g., Cook & Cavalier, 1999; Glennen & Church, 1992; Mistrett, Hale, Gruner, Sunshine, & McInerney, 2001; Sullivan & Lewis, 2000). The empirical database of outcomes associated with the use of AT by infants and toddlers with disabilities has documented several ways in which AT can enable infants and toddlers to perform functional skills (e.g., playing with toys, communicating, getting around) across varying contexts, thereby providing evidence in support of using AT to facilitate very young children's participation in their natural environments (e.g., Butler, 1986; Campbell, Milbourne, Dugan,

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& Wilcox, this issue; Daniels, Sparling, Reilly, & Humphry, 1995; McCormick, 1987; O'Connor & Schery, 1986; Schepis, Reid, Behrmann, & Sutton, 1998).

Policy and the growing empirical database both support the use of AT for very young children, but if infants and toddlers are to benefit from AT's promise, it will also be necessary for EI providers to understand the potential and use of AT. In terms of use patterns, some information is available through data that states reported to OSEP in 1995 and 1999 (U.S. Department of Education, 1997, 2000). In 1999, states documented AT on only 3.8% of Individualized Family Service Plans (IFSPs) for infants and toddlers served through Part C of IDEA and, similarly, 4.4% on IFSPs 4 years earlier. This utilization frequency is corroborated by data from the National Early Intervention Longitudinal Study (NEILS; 2001) that included analyses of service records from a nationally representative sample of 2,820 children in EI and found that 4% of the records listed AT. Overall, it appears that listing AT as a service on the IFSP has remained relatively stable over the past several years; what remains unknown is the extent to which this percentage is an accurate reflection of AT services or devices that actually are provided in EI. Differences in state data systems and the ways in which data are recorded on the IFSP may artificially understate actual AT use. For example, AT may be provided under another service name, such as occupational or physical therapy.

Irrespective of how AT may be represented on an IFSP, utilization remains low in early intervention (Lesar, 1998; Mistrett, 2001). Ronski and Sevcik (2005) suggested that clinical myths, "widely held but false beliefs" (p. 178), may contribute to underuse of augmentative communication devices and strategies for young children. Several experts and researchers have further discussed AT myths and have offered explanations as to why AT may be underused for infants and toddlers. These explanations can be summarized as follows:

1. EI service providers have limited knowledge of or experience with AT and its applications with infants and toddlers and, as a result, may not inform families of its potential in promoting and supporting development and learning (Lane & Mistrett, 1996; McInerney, Osher, & Kane, 1997; Parette, Huer, & Brotherson, 2001; Ronski, Sevcik, & Forrest, 2001).
2. Providers may believe that young children must demonstrate certain prerequisite skills prior to the introduction of AT, and if an infant or toddler does not demonstrate the assumed prerequisite, providers may inaccurately conclude that the child is not yet ready for AT (Ronski et al., 2001; Ronski & Sevcik, 2005).
3. Providers may view AT as too complex for a child to learn and may therefore think it is much easier to just do things for the child (Cress & Marvin, 2003; Mistrett, 2001).
4. Providers may be concerned that a very young child's use of AT will make things easier for the child, which may subsequently discourage or inhibit the child's skill development (Cress & Marvin, 2003; Ronski & Sevcik, 2005). This concern is often cited with regard to speech (e.g., "If she can communicate with a board, what is the motivation to learn speech?") or mobility (e.g., "If he uses a walker with success, then where is the motivation to walk by himself?").
5. Providers may view AT as primarily high tech (e.g., computers) and expensive, a view that may contribute to a tendency to wait and make sure a child really needs a particular device (Judge & Parette, 1998).
6. The AT selected may not be well matched with a given family and child, thereby contributing to a pattern of abandonment or limited use (e.g., Judge, 2002; Parette & Angelo, 1996; Phillips & Zhao, 1993).
7. Providers may believe that there are few resources to support the selection and use of AT. Funding, availability of trial devices, and support for maintenance and use in natural environments may be of particular concern (Judge, 2002; Lesar, 1998).

These ideas and thoughts, which have been proposed as explanations for the limited use of AT in early intervention, are not necessarily data-based. A study by Lesar (1998) provides evidence in support of some of the preceding points. The study included a written survey of 62 early childhood special education teachers, speech-language pathologists, administrators, and other related providers who served 3- to 5-year-old children with disabilities. The survey focused on AT personnel preparation, knowledge, and use; family involvement; and concerns about using AT. In terms of AT knowledge, most respondents reported they either had no knowledge or were at a novice level. A significant concern for all was support for using AT, including on-site assistance, training in device use, training on how to teach a child to use a device, and technical support for families. Other areas of concern were family involvement in AT decision making, funding for AT, and access to devices.

In another study of providers, Lahm and Sizemore (2002) examined, through telephone interviews, decision-making processes of 15 EI providers who met their state requirements for provision of AT services and as a result had received specialized training about AT in early intervention. Hence, the providers in this study can be regarded as having high levels of expertise and experience in AT for infants and toddlers served through Part C. They rated child goals and family and environmental demands as the most important factors to consider when making decisions about AT. Further, all providers felt it was important to make AT decisions with a team, and all stated that they worked as members of an interdisciplinary team. However, none of the respondents identified the child or family member as being part of the team. Nearly all providers indicated that funding was an important consideration in decision making.

The findings from the Lesar (1998) and the Lahm and Sizemore (2002) investigations lend support to many of the explanations proposed to account for the underutilization of technology in early intervention and also provide some initial information about AT decision-making processes in early intervention. However, the sample sizes in these studies are quite small, and only the Lahm and Sizemore investigation focused on providers serving infants and toddlers. Beyond these two studies, there is remarkably little published data about the use of AT in early intervention from the perspective of EI providers. Although some initial data support the view that AT is widely underused for infants and toddlers with disabilities, a fuller understanding of factors that may influence, promote, or hinder the use of AT in early intervention practices is required. The purpose of the present investigation was to examine, from providers' perspectives, issues thought to be influential or important to the selection and use of AT in early intervention. Our specific research questions were as follows:

1. What are EI provider perspectives about AT use in their early intervention practices? In particular, what do EI providers view as AT, to what extent are children they are serving using AT, and are formal assessments for AT a typical practice?
2. Are there specific beliefs and factors that may influence EI providers' decision-making processes about AT, including conditions that might influence listing AT on IFSPs for infants and toddlers with disabilities?
3. Do EI providers perceive that they have access to resources that support AT use (e.g., general resources, funding, lending libraries)?
4. Are there differences in findings regarding Questions 1 to 3 in terms of specific disci-

plines or the amount of training about AT with infants and toddlers with disabilities that providers report receiving?

METHOD

We used survey research methodology to address the research questions. This approach afforded an efficient method for gathering information from a nationally representative sample of EI providers. We viewed this as essential to gaining a broader understanding of the important issues in the use of AT for infants and toddlers with disabilities.

Sample Recruitment

To obtain a nationally representative sample of 1,000 early intervention providers, 12 states were identified that represented the United States on a number of parameters including geography, population characteristics, population size, and EI service systems. The states chosen were in the West/Southwest (California, Arizona, Texas), Northwest (Oregon), Midwest (Kansas, Illinois, Michigan, Missouri), South/Southeast (Georgia, Louisiana), and Northeast (Pennsylvania, Massachusetts). Collectively, the states comprised 51.81% of the nation's population and 52.31% of the nation's infants and toddlers receiving early intervention services through Part C of the IDEA. The states were also selected to represent varying Part C lead agencies, with education being the lead agency in 3 states, health in 4 states, mental retardation and developmental disabilities divisions in 3 states, and other agencies (e.g., public welfare, family and consumer programs, interagency coordinating council) in the remaining 3 states. The states also varied in their EI eligibility criteria, with 3 serving children at risk in addition to children with developmental disabilities, and 10 states serving only children with diagnosed disabilities.

Direct mailings to early intervention providers served as the primary recruitment strategy. In addition, a recruitment notice was posted on the research Web site (<http://asu.edu/clas/tnt>) as well as a link to the research site on the National Early Childhood Technical Assistance Center (NECTAC) Web site. Those interested in participating were asked to either return a postcard with contact information or provide the information through the research Web site. To achieve the targeted completion rate of 1,000 providers, we determined that recruitment notices needed to be sent to 18,000 providers. Two assumptions led to this figure. First, the return rate of the recruitment notices was expected to be approximately 5% to 10%. Second, of those indicating a will-

ingness to participate, it was expected that about 50% would meet the inclusion criterion of providing services to at least three infants or toddlers. To further ensure representativeness of the sample, we decided to make it proportional with the population by recruiting more providers from larger states. To identify the number of providers in each state who should receive recruitment notices, we estimated the total number of EI providers across the states using (a) data reported to OSEP in 2000 and/or (b) data provided by individual state lead agencies. From these data we decided that if we sent recruitment notices to approximately 20% of the early intervention providers in each of the targeted states, we would achieve our goal of sending recruitment notices to 18,000 EI providers in proportion with each state's population.

For each of the sample states, we obtained EI provider lists from either the Web or lists provided by the Part C lead agencies. For some states, individual provider names were available; when this was the case, 20% were randomly selected for a given state, and research personnel mailed recruitment notices directly to these persons. In other states, the Part C lead agencies would not give research personnel names but offered to mail the notices themselves. In this case, mailings were prepared for 20% of the estimated provider population in that state and the sealed, stamped envelopes were sent to the Part C agency for mailing. To ensure random selection, the agencies were instructed to select providers based on the first initials of last names, and this varied from state to state. For example, in a state in which the Part C agency was sending out notices, research personnel would ask that the notices be mailed to all providers whose last names began with the letters *C* through *R*, and in another last names beginning with *D* through *H* and *S* through *Z*, and so on. Not all targeted states maintained lists of individual providers; rather, they maintained lists of agencies that employed providers. These agencies were contacted by research personnel and asked to mail recruitment notices to 20% of their providers. In these states, a similar process (i.e., one involving first letters of providers' last names) was followed to ensure random selection. Through this process we confirmed that the recruitment notices were sent to a total of 17,126 randomly selected early intervention providers (e.g., occupational and physical therapists; speech-language pathologists). A total of 2,166 EI providers indicated a willingness to participate in the research (12.9% of the selected sample).

Survey Development

The survey was designed to gather information in each of the following research question areas: (a) definitions and use of AT in early intervention (Research Question 1), (b) beliefs and other factors that may influence decision

making about using AT (Research Question 2), (c) the availability of resources that support AT use (Research Question 3), and (d) provider training and disciplines (Research Question 4). An initial version of a written survey was developed and administered to 100 EI providers who attended a training workshop that focused on AT in early intervention. Feedback and responses on the preliminary survey served as the basis for elimination or refinement of some questions and the addition of new questions. The survey questions are summarized in Table 1. In addition to these questions, we also collected general demographic information from each respondent, including their disciplines. A complete copy of the survey is available at http://asu.edu/clas/tnt/home_files/appendix.htm. As can be seen in Table 1, there are question sequences for each research question area.

Sample Characteristics

The majority of the sample ($n = 922$) came from the 13 selected states; the remaining 45 persons, who had responded to Web-based recruitment notices, were distributed across 20 additional states throughout the country. The community settings represented urban (13.4%), suburban (25.5%), rural (21.4%), and mixed (38.5%) communities. Twenty-one of the 967 respondents were male. The majority of the respondents had a bachelor's (35.2%) or master's (60.5%) degree. Two percent held an associate's degree, 2.1% had a doctorate, and 0.3% had a high school education or less. In terms of ethnicity, 88.6% reported that they were European American, 2% Hispanic, 4.2% African American, and 0.9% Asian; the remainder either refused to identify their ethnicity or described themselves as of mixed race. The majority (80.5%) of the respondents reported their primary work setting as the home, followed by hospital (9.1%), school (3.9%), community center (2.7%), and day care (1.0%). Mean years of experience respondents reported working with infants and toddlers was 9.95 years, with a range from less than a year to 45 years. The median for years of experience was 8.

The providers' disciplines included occupational therapy ($n = 189$; 19.5%), physical therapy ($n = 187$; 19.3%), speech-language pathology ($n = 214$; 22.1%), and child development specialist/teacher ($n = 284$; 28.4%). Practitioners in other disciplines accounted for the remaining 9.6% ($n = 93$) and included nurses (2.5%), audiologists (2.1%), and paraprofessionals (0.4%) as well as others (4.6%). Those classified as "other" were those who refused to provide a discipline and those in disciplines such as recreational therapy and music therapy. The amount of specialized training providers reported receiving that focused specifically on AT with infants and toddlers was classified as a lot of specialized training ($n = 177$; 18.3%), some specialized training ($n = 484$; 50.1%), or little or

TABLE 1. Early Intervention Provider Survey for AT

Area	Question
Use	1. Which of the following best describes children on your current caseload regarding their use of assistive technology? a. All of the children who should be are using assistive technology. b. Most of the children who should be are using it. c. Too many of the children who should be using it are not. d. Don't know/refused.
Use/definitions	2. We are interested in how professionals like you define assistive technology. Can you give me an example of something in this field that you would a. consider high technology? b. consider low technology?
AT myths	3. I am going to read some statements that some people have made to us and ask you whether you agree or disagree with each. a. Young children need to have certain skills, like using their hands or being able to recognize symbols, before they can use assistive technology. b. Assistive technology requires extra effort of a child and it is much easier to just do things for the child instead. c. Using assistive technology means giving up on doing things the natural way and may prevent the child from learning certain things. d. Assistive technology costs a lot of money and it is a good idea to wait until the child is older to decide what will work.
Decision making	4. How likely are you to list assistive technology when developing or revising an Individualized Family Service Plan, or IFSP, when each of the following is a factor, using a five-point scale where five means you are very likely to write it into the IFSP and one means you are very unlikely to list AT on the IFSP. a. The child or family wants to participate in some activity and can't without assistance offered by a device. b. The assistive technology will promote family-child-sibling interactions. c. The child's parent requests the use of assistive technology. d. The child is having difficulty with something he or she wants to do. e. There is a change in the child's condition, such as detection of a vision, hearing, or motor problem. f. There is a change in the parent's expectations for the child. g. The child meets a developmental milestone and needs assistive technology to proceed. h. The IFSP team members suggest assistive technology for the child. i. There is a change in where the child spends time during the day. j. New assistive technology is available and makes sense for the child. k. Someone on the team finds out new information about assistive technology that may help the child. l. The IFSP outcomes have not been achieved. m. Consideration of assistive technology is part of the IFSP process requirements.
Decision making	5. How important is each of the following when considering the use of assistive technology with an individual child, using a five-point scale where one means not at all important and five means extremely important. a. The availability of assistive technology b. The parent's attitude toward assistive technology c. Your knowledge of assistive technology d. Technical support for using assistive technology e. Availability of funding for assistive technology f. Opportunity for trial by borrowing assistive technology g. Cost of the device h. Red tape or excessive requirements associated with using assistive technology for infants and toddlers i. Your previous experience with a given device j. Appropriateness of the device for an infant or toddler k. Established policies and procedures related to assistive technology l. The support of your colleague or supervisor m. The physical environment where the child will use the device

(Table continues)

(Table 1, continued)

Area	Question
Resources	6. How would you describe your access to resources in your community that would help you provide assistive technology for infants and toddlers? Are there a lot of resources, some resources, only a few, or no resources available to you? a. A lot b. Some c. Only a few d. None
Use	7. Do the infants and toddlers on your caseload who need assistive technology typically receive a formal assessment for it? If yes, who typically does the assessment? a. Occupational therapists b. Physical therapists c. Speech–language pathologists d. Teacher/child development specialist/early interventionist/early educator/special educator e. Nurse f. Audiologist g. Paraprofessional h. Social worker/service coordinator/administrator i. Other
Resources	8. Would families on your caseload have access to a center with a variety of devices they can borrow to try out? If yes, a. would they have high-tech items to try out? b. would they have low-tech items to try out?
Resources	9. If you and the parents of an infant or toddler were seeking funding for assistive technology in your state, what two sources would you say would be most likely to provide such funding? a. Medicaid b. Private insurance c. Grants/grant funding d. Community center e. School district f. Family g. Family support funds h. State funds i. Federal funds/Title 19 j. Other
Training	10. Have you had a lot, some, only a little, or no specialized training on assistive technology with infants and toddlers? a. A lot b. Some c. Only a little or no training

Note. AT = assistive technology.

no specialized training ($n = 306$; 31.5%). These proportions did not differ as a function of discipline (Pearson $\chi^2(8) = 8.65$, *ns*).

Data Collection

We contracted a behavioral research firm to conduct the survey. We provided the firm with the names and telephone numbers of the 2,166 persons who had indicated a willingness to participate in the survey. A total of 967

of the 2,166 providers (44.6%), who worked with a minimum of three infants or toddlers per week, completed the telephone interviews, which resulted in an excellent completion rate of 45.0%. The data collection procedure included computer-assisted telephone interview (CATI) technology. Interviewers read questions from a computer screen and entered responses into a database; then, the next question was provided for the interviewer based on the respondent's answer (e.g., Question 7, Question 8). The sequence for Questions 3,

TABLE 2. Provider Reports of Use of AT by Children in Their Caseload by Provider Discipline

Children’s use of AT	Occupational therapist (%)	Physical therapist (%)	Speech–language pathologist (%)	Teacher (%)	Other specialist (%)
None are using it who should be	14.8	10.7	20.1	18.0	10.8
Few are using it who should be	34.9	28.9	26.2	28.5	22.6
Most who should be are using it	37.0	40.6	35.5	35.2	38.7
All who should be are using it	12.7	19.8	17.3	18.0	28.0
No response/refused	0.5	0.0	0.9	0.4	0.0
Total responses (% of sample)	189 (19.5)	187 (19.3)	214 (22.1)	284 (29.4)	93 (9.6)

Note. The percentages shown are totals within each discipline. AT = assistive technology.

4, 5, and 9 was rotated randomly by the computer software. Question 2 was open-ended, and the interviewers entered responses verbatim into the database. Each interview took approximately 15 min to complete.

Analytic Plan

Descriptive analyses were initially conducted with respect to the first three research questions. Analysis for the fourth research question used one-way analyses of variance (ANOVAs), which were conducted to assess whether there were significant differences among provider disciplines and levels of training in AT based on mean ratings of provider responses to survey items in the areas of use, decision making, and resources related to AT. Discipline categories and levels of training were also compared with provider agreement with several statements related to AT using an omnibus chi-square test and follow-up pairwise comparisons.

RESULTS

Research Question 1: Provider Perspectives Regarding AT Use

The first research question focused on factors that might influence or be related to AT use in EI. Three survey questions addressed this area. First, providers were asked to indicate the extent to which children on their caseloads were using AT. Second, they were asked to provide definitions of high versus low technology. Third, they were asked about the extent to which they made use of formal AT assessments for infants and toddlers.

Extent to Which Children Used AT. A two-way contingency table analysis revealed a significant relationship between discipline categories and perceived use

of AT by children on their caseload (all, most, few, and none). Table 2 presents reports by each discipline. Follow-up pairwise comparisons were conducted, and results indicated a significant difference between occupational therapists and other disciplines. Compared with other disciplines, a significantly smaller proportion of occupational therapists (OTs) reported that all of the children on their caseload who should be using AT were doing so.

A chi-square test was also conducted to determine whether there was a relationship between the amount of training providers reported with respect to AT and their reports of children’s use of AT on their caseloads. Percentages for children’s use of AT within each training category (little/none, some, a lot) are presented in Table 3. The omnibus test revealed a significant relationship between training level and provider reports of the use of AT by children on their caseload. Follow-up pairwise comparisons were conducted to evaluate the difference among these proportions. All pairwise comparisons were significant for differences between training levels of little/none versus some, little/none versus a lot, and some versus a lot of training.

Provider Definitions of AT. Providers’ examples of what they viewed as AT in terms of high tech and low tech were entered into the database verbatim and then recoded in the categories of orthotics, mobility, communication, positioning, electronic devices, off-the-shelf devices of variable functions, and other. The frequency and percentage of mentions in each category are listed in Table 4. Providers were much more likely to provide examples of low tech than high tech. The most frequent reports for low tech pertained to communication and off-the-shelf items. Devices for mobility and other variable-function electronic devices were the most frequently mentioned categories for high tech. Many providers reported the same items as examples of high and low tech.

TABLE 3. Provider Reports of Use of AT by Children in Their Caseload by Provider Training

Children's use of AT	Training		
	A lot (%)	Some (%)	Little/none (%)
None are using it who should be	6.6	43.0	50.3
Few are using it who should be	13.3	48.6	38.2
Most who should be are using it	22.3	55.3	22.4
All who should be are using it	28.6	48.0	23.4
Total responses (% of sample)	177 (18.3)	484 (50.1)	304 (31.5)

Note. The percentages shown are totals within each level of use. AT = assistive technology.

TABLE 4. Provider Definitions of High Technology and Low Technology

Category	Low technology		High technology	
	Frequency	(%)	Frequency	(%)
Orthotics (braces, shoe inserts, splints, etc.)	88	10.3	33	7.3
Mobility (adapted stroller, crutches, gait trainer, stroller, walker, wheelchair)	65	7.6	165 ^a	36.5
Communication (book, PECS, pictures, schedule board, sign language)	297 ^b	35.0	4	.8
Positioning (car seat, sling, belt, bench, bolster, headband, cervical collar, feeding chair, noodles, side-laying device, slant board, towel/blanket)	50 ^c	5.9	9	1.9
Electronic devices (apnea monitor, closed-circuit TV, computer, dynavox, advanced medical breathing vent, stoma pump, electric toothbrush, light box, muscle stimulator, TTY, VCR, voice recorder)	19	22.4	165 ^d	36.5
Off-the shelf/variable function (ace wrap, adaptive feeding utensils, adaptive button on clothing, blackboard, clay, easel, color chart, duct tape, eraser, eyeglasses, flashlight, foam, hair curlers, helmet, induction loops, laser pointer, magnifier, microphone, music, nuk brush, objects, oral stimulation equipment, ponytail holder, popsicle stick, pencil grip, paintbrushes, PVC piping, reacher/ extender, books, toy, vibrator, etc.)	325 ^e	38.3	72 ^f	15.9
Other (bilingual provider, biofeedback, Braille, small room)	4	.9	4	1.7
Total	848		452	

Note. PECS = Picture Exchange Communication System. ^aMost frequent mentions were powered wheelchairs (125) and gait trainers (20). ^bMost frequent mentions were PECS (148), sign language (46), and pictures (80). ^cMost frequent mentions were towels/blankets (27). ^dMost frequent mentions were computer devices (144), especially those for augmentative communication. ^eMost frequent mentions were toys (91), adapted feeding utensils (60), pencil grips (23), gym equipment (17), and books (17). ^fMost frequent mentions were foam (20) and toys (27).

AT Assessment. When providers were asked whether the infants and toddlers on their caseload needing AT typically received a formal assessment, 42 (4.0%) were unable to respond or didn't know, 343 (35.5%) reported that formal assessment wasn't used, and 582 (60.2%) reported that formal assessment was used. Of those providers who reported that formal assessment was used, 25.3% reported that individuals from more than one discipline typically do the assessment, 22.7% reported that occupational therapists do the assessment, 19.4% re-

ported speech-language pathologists, 9.1% reported AT specialists, 6.0% reported teachers, and 8.4% reported that other professionals or consultants (e.g., rehabilitation engineer, nurse, physician) typically do the assessment.

Research Question 2: Provider Decision Making About AT for Infants and Toddlers

Three survey questions provided information for this question area. First, providers were asked about their be-

liefs regarding AT for infants and toddlers. Second, they were asked to rate circumstances under which they would be likely to list AT on the IFSP. Third, they were asked to rate the importance of several factors they would consider when making a decision to use AT with infants and toddlers.

Beliefs About AT. These data (Survey Question 3) were analyzed with two-way contingency tables to determine whether there was a relation between discipline category and provider agreement with the belief statements (see Table 1). The relation between provider discipline and responses to the statement that young children need to have certain skills before they can use AT was significant (see Table 5). Responses to all other statements above were not significantly related to the various discipline categories, and, in fact, a majority of the providers across all disciplines disagreed with the statements regarding decisions related to using AT. Pairwise comparisons revealed a significant difference between the speech–language pathology, occupational and physical therapy, and teacher groups with the other specialist group. Speech–language pathologists were more likely than providers in all other disciplines to agree with the statement that young children need to have certain skills before they can use AT.

A similar analysis was conducted to detect differences in responses to the belief statements among providers with various levels of training. Table 6 presents proportions among training levels for responses to the various items. Again, a significant omnibus chi-square test revealed differences among the three training levels in the proportions of providers' responses to the statement that young children need to have certain skills before they can use AT. Post hoc tests indicated a significant difference between providers who reported that they received a lot of specialized training in AT and those in the little/no and some training groups. Providers with more training tended to disagree more with the statement that young children need to have certain skills before they can use AT.

Factors Influencing the Likelihood of Listing AT on the IFSP. Factors that might influence a provider's tendency to list AT on a child's IFSP (Survey Question 4) were evaluated by having respondents rate the factors from 1 to 5, with a rating of 1 meaning they would not be likely to list AT on the IFSP, given a particular condition, and a rating of 5 associated with a very high likelihood of including AT on the IFSP. Overall, results indicated that across the disciplines and training groups, similar factors were rated as important. However, mean difference tests did indicate some differences in rankings by discipline and training groups (see Tables 7 and 8).

Post hoc least significant difference (LSD) contrasts indicated five areas where providers across the disci-

plines differed in their inclination to list AT on the IFSP (see Table 7): (a) when a child was having difficulty with something he or she wanted to do, (b) when there was a change in a child's condition (such as detection of a vision, hearing, or motor problem), (c) when there was a change in parent expectations regarding a child's condition, (d) when there was a change in where a child was spending time during the day, and (e) when the IFSP goals were not being achieved. As is apparent in the LSD contrasts in Table 7, there are no particular patterns to discipline-specific differences.

When providers were asked how likely they would be to list AT when developing or revising an IFSP, no training differences were observed when a child's parent requests AT, when the IFSP team suggests it, or when a team member finds out new information about AT that may help a child. Significant training level differences were found for nearly all other factors (see Table 8), and significant LSD pairwise comparisons were conducted. In general, those with little or no training were not as likely to be influenced by these factors as were those with some or a lot of training.

Factors Influencing the Decision to Recommend or Consider AT. Providers were asked how important several different factors might be when considering the use of AT with an individual child (Survey Question 5). Providers again rated the importance of the specific factors on a scale of 1 to 5. Significant mean differences were found between discipline categories and the importance ratings of several factors, namely the opportunity for trial by borrowing AT, previous experience with the device, established policies and procedures related to AT, and the support of a colleague or supervisor when considering the use of AT (see Table 9). On review of Table 9, no single discipline trend stands out other than the fact that teachers were more likely than providers of all other disciplines to consider established policies and procedures related to AT as well as the support of a colleague or supervisor as important to their decision to use AT.

Significant post hoc pairwise differences were also found between the training groups (see Table 10). Providers with little or no training reported the availability of AT, red tape or excessive requirements associated with using AT, and the support of a colleague or supervisor as important influences when considering using AT, more so than providers with some or a lot of training in AT. Further, providers with some training reported that the availability of AT was more important to their decision than did those with a lot of training. Conversely, providers with a lot of training reported that their knowledge of AT was more important to their decision than did those in the other two training groups (some training, little/no training).

TABLE 5. Relationship Between Provider Agreement With Decision-Making Statements (Q3) and Provider Discipline

Variable	Agree/ disagree	Discipline					Pearson chi-square ^a
		Occupational therapist (%)	Physical therapist (%)	Speech-language pathologist (%)	Teacher (%)	Other specialist (%)	
Q3a. Young children need to have certain skills, like using their hands or being able to recognize symbols, before they can use AT.	Agree Disagree	21.6 78.4	25.0 75.0	34.8 65.2	19.4 80.6	19.8 80.2	17.72***
Q3b. AT requires extra effort of a child and it is much easier to just do things for the child instead.	Agree Disagree	2.1 97.9	5.4 94.6	5.2 94.8	7.1 92.9	6.5 93.5	5.77
Q3c. Using AT means giving up on doing things the natural way and may prevent the child from learning certain things.	Agree Disagree	2.1 97.9	2.2 97.8	2.3 97.7	3.9 96.1	2.2 97.8	2.20
Q3d. AT costs a lot of money and it is a good idea to wait until the child is older to decide what will work.	Agree Disagree	7.4 92.6	7.8 92.2	5.6 94.4	4.6 95.4	4.3 95.7	3.18

Note. The percentages shown are responses within each discipline; total percentage is response within the item. Q3c= Question 3c in Table 1. AT = assistive technology.

^adf = 4.

***p = .001.

TABLE 6. Relationship Between Provider Agreement With Decision-Making Statements (Q3) and Provider Training

Variable	Agree/ disagree	Training			Pearson chi-square ^a
		Little/none (%)	Some (%)	A lot (%)	
Q3a. Young children need to have certain skills, like using their hands or being able to recognize symbols, before they can use AT.	Agree	25.9	27.1	13.9	12.62**
	Disagree	74.1	72.9	86.1	
Q3b. AT requires extra effort of a child and it is much easier to just do things for the child instead.	Agree	6.0	5.2	4.5	0.48
	Disagree	94.0	94.8	95.5	
Q3c. Using AT means giving up on doing things the natural way and may prevent the child from learning certain things.	Agree	2.3	3.5	1.1	0.22
	Disagree	97.7	96.5	98.9	
Q3d. AT costs a lot of money and it is a good idea to wait until the child is older to decide what will work.	Agree	8.1	5.8	2.8	0.06
	Disagree	91.9	94.2	97.2	

Note. The percentages shown are responses within each level of training; total percentage is response within the item. Q3c = Question 3c in Table 1. AT = assistive technology.

^a*df* = 2.

***p* < .01.

Research Question 3: Access to Resources

An additional purpose of this research was to explore the perceived access to general AT resources, funding support and options, and lending programs (Survey Questions 6, 8, and 9). Percentages of providers reporting that they had access to a lot, some, only a few, and no resources were 23.6%, 48.0%, 25.3%, and 2.3%, respectively. A small number of individuals (*n* = 8) did not know or did not report on this item. In addition, 49.6% of providers reported that families on their caseload would have access to a center with a variety of devices they could borrow or try. Conversely, 43.5% reported that families would not have access to devices they could borrow, and 6.8% did not know whether these resources were available. Of the 480 providers who reported that AT devices were available for families to try, 71.9% reported that high-tech devices were available, 22.1% reported that high-tech devices were not available, and 6.0% did not know whether high-tech options were available. With respect to low-tech devices, of the 480 providers responding, 93.3% reported that low-tech devices were available to borrow or try, and only a small minority reported either that low-tech options were not available (4.2%) or that they did not know whether low-tech options were available (2.5%).

When providers were asked to list which two sources would be most likely to provide funding for AT, their response options included Medicaid, private insurance, grants or grant funding, a community center, a school district, the family, family support funds, state funds, and federal funds/Title 19, as well as other sources of support. A total of 1,780 responses were calculated for this item; 967 providers indicated one funding source, and an additional 813 reported an additional funding source. The most frequently named sources of funding were Medicaid and state funds, with 372 (20.9%) and 345 responses (19.4%), respectively. Private insurance and other unspecified funding sources were named second most frequently (18.0% and 18.5%, respectively), followed by grants and grant funding (6.7%), federal funds/Title 19 (5.8%), school districts (4.33%), family support funds (2.9%), community centers (1.7%), and families (1.7%).

DISCUSSION

This research provides a variety of insights into EI providers’ beliefs about (a) AT in general, as well as AT use for particular infants and toddlers they were serving; (b) their own decision making; and (c) resources available for infants and toddlers with disabilities. These ar-

TABLE 7. Discipline Differences in Circumstances Under Which Providers Are Likely to List AT When Developing or Revising an IFSP

Variable	Discipline												LSD contrasts
	OT		PT		SLP		TCHR		O		F(4, 879-960)		
	M	SD	M	SD	M	SD	M	SD	M	SD			
Child/family wants to participate in activity that requires use of AT	4.77	0.55	4.82	0.47	4.69	0.72	4.70	0.71	4.83	0.43	2.06		
AT will promote family interactions	4.70	0.60	4.72	0.66	4.71	0.70	4.67	0.67	4.57	0.74	1.04		
Child's parent requests use of AT	4.19	0.94	4.19	1.06	4.34	0.93	4.33	0.93	4.49	0.82	2.30		
Child is having difficulty with something he/she wants to do	4.15	0.93	4.26	0.93	3.86	1.15	3.96	1.11	4.23	1.07	5.30***	OT, PT, O > SLP, TCHR	
Change in child's condition	4.17	0.92	4.15	0.95	4.03	1.05	4.47	0.85	4.46	0.89	8.92***	TCHR, O > OT, PT, SLP	
Change in parent's expectations	3.63	1.09	3.66	1.09	3.38	1.09	3.75	1.10	3.92	1.04	4.88**	OT, PT, TCHR, O > SLP; O > OT	
Child meets a developmental milestone and needs AT to proceed	4.73	0.66	4.78	0.49	4.67	0.62	4.70	0.66	4.78	0.62	1.07		
IFSP team suggests AT	4.44	0.79	4.57	0.71	4.46	0.84	4.51	0.84	4.69	0.51	2.11		
Change in where the child spends time during the day	3.33	1.28	3.45	1.19	3.23	1.31	3.48	1.27	3.69	1.32	2.55*	TCHR, O > SLP; O > OT	
New AT is available	4.58	0.75	4.62	0.76	4.66	0.74	4.59	0.82	4.71	0.72	0.66		
Team member finds out new information about AT that may help child	4.31	0.86	4.41	0.80	4.29	0.87	4.42	0.89	4.48	0.84	1.47		
IFSP outcomes have not been achieved	3.43	1.10	3.41	1.16	3.52	1.16	3.65	1.12	3.94	1.09	4.30**	O > OT, PT, SLP, TCHR; TCHR > OT, PT	
Consideration of AT is part of the IFSP process requirements	4.27	0.99	4.20	1.13	4.29	1.08	4.32	1.07	4.40	1.06	0.60		

Note. AT = assistive technology; IFSP = Individualized Family Service Plan; LSD = least significant difference; OT = occupational therapist; PT = physical therapist; SLP = speech-language pathologist; TCHR = teacher; O = other specialist. All listed LSD contrasts were significant at $p \leq .05$. Higher scores = greater likelihood of listing AT.

* $p < .05$. ** $p < .01$. *** $p < .001$.

TABLE 8. Training Differences in Circumstances Under Which Providers Are Likely to List AT When Developing or Revising an IFSP

Variable	Training						F(2, 880–960)	LSD contrasts
	N		S		A			
	M	SD	M	SD	M	SD		
Child/family wants to participate in activity that requires use of AT	4.63	0.77	4.78	0.54	4.84	0.50	8.06***	A > N, S
AT will promote family interactions	4.59	0.76	4.71	0.60	4.77	0.67	5.01**	A, S > N
Child’s parent requests use of AT	4.34	0.93	4.31	0.92	4.16	1.04	2.10	
Child is having difficulty with something he/she wants to do	3.75	1.17	4.18	0.96	4.25	0.96	19.33***	S, A > N
Change in child’s condition	4.01	1.06	4.33	0.87	4.47	0.86	16.32***	S, A > N
Change in parent’s expectations	3.48	1.08	3.65	1.08	3.91	1.13	8.18***	A > N, S; S > N
Child meets a developmental milestone and needs AT to proceed	4.62	0.68	4.75	0.59	4.81	0.56	6.43**	S, A > N
IFSP team suggests AT	4.43	0.84	4.54	0.77	4.59	0.69	2.73	
Change in where the child spends time during the day	3.17	1.29	3.41	1.24	3.82	1.24	13.63**	A > N, S; S > N
New AT is available	4.53	0.82	4.65	0.72	4.69	0.78	3.18*	S, A > N
Team member finds out new information about AT that may help child	4.30	0.91	4.40	0.83	4.42	0.86	1.46	
IFSP outcomes have not been achieved	3.31	1.13	3.62	1.10	3.80	1.20	11.26***	S, A > N
Consideration of AT is part of the IFSP process requirements	4.14	1.14	4.30	1.06	4.52	0.88	7.19***	A > N, S; S > N

Note. AT = assistive technology; IFSP = Individualized Family Service Plan; LSD = least significant difference; N = little or none; S = some; A = a lot. All listed LSD contrasts were significant at $p \leq .05$. Higher scores = greater importance. * $p < .05$. ** $p < .01$. *** $p < .001$.

As was also examined to determine possible differences in response patterns related to disciplines and amount of training on using AT with infants and toddlers. Results indicated some discipline-specific differences in these areas, but no particular patterns were apparent. Findings regarding specialized training in AT for infants and toddlers indicated that about half of the sample had some training about AT in EI. These findings are in accord with the Lesar (1998) provider reports, in which a majority rated themselves as being novices or having no training. Although terms such as *some* and *a lot* are relative, the fact that these groups sorted out on several survey questions (discussed in the following sections) suggests that there was some degree of homogeneity among the subcategories. Perhaps most important is the fact that only 18% of the sample reported having “a lot” of training, a finding that suggests there is much work to be done in terms of helping EI providers understand how to select and use AT services and devices.

Research Question 1: Provider Perspectives Regarding AT Use

It was encouraging that 55% of providers reported that most or all of the children they served were receiving AT if they needed it; the fact that 44% reported that few or no children who needed AT were receiving it is of concern. This finding suggests that AT may well be underutilized in EI. Training may be a mitigating factor for this issue. When providers have more training on AT use in EI, they are likely to report higher use for the infants and toddlers they serve.

Use of high- and low-tech AT by providers was also explored. It is worth noting that some providers could not provide a definition of either, and these tended to be those who reported little to no AT training. However, as can be seen by inspecting Table 5, providers were about twice as likely to provide exemplars for low tech as high tech. The diversity of responses suggests that those who

TABLE 9. Discipline Differences in the Importance of Various Characteristics When Considering the Use of AT With an Individual Child

Variable	Discipline												LSD contrasts
	OT		PT		SLP		TCHR		O		F(4, 936-961)		
	M	SD	M	SD	M	SD	M	SD	M	SD			
Availability of AT	4.34	0.88	4.25	0.94	4.19	1.02	4.28	0.92	4.40	0.97	1.10		
Parent's attitude toward AT	4.60	0.64	4.55	0.69	4.55	0.74	4.55	0.74	4.57	0.63	0.24		
Your knowledge of AT	4.07	0.95	4.14	0.91	4.04	1.00	3.97	1.06	4.06	0.95	0.92		
Technical support for using AT	4.17	0.85	4.26	0.84	4.28	0.86	4.32	0.89	4.45	0.79	1.88		
Availability of funding for AT	4.24	0.91	4.13	1.08	4.15	1.02	4.23	1.04	4.08	1.14	0.74		
Opportunity to try/borrow AT	4.57	0.72	4.58	0.73	4.55	0.69	4.42	0.88	4.31	0.99	3.14*	OT, PT > TCHR, O; SLP > O	
Cost of the device	3.78	1.11	3.59	1.06	3.68	1.23	3.67	1.20	3.57	1.25	0.80		
Red tape or excessive requirements associated with using AT	3.16	1.27	2.94	1.30	3.18	1.29	3.26	1.33	3.00	1.30	1.96		
Your previous experience with a given device	3.55	1.08	3.80	1.05	3.38	1.14	3.64	1.15	3.68	1.25	3.69**	PT > OT, SLP; TCHR, O > SLP	
Appropriateness of the device	4.92	0.32	4.90	0.33	4.91	0.35	4.85	0.53	4.90	0.36	1.11		
Established policies and procedures related to AT	3.59	1.03	3.66	1.04	3.66	1.11	3.94	1.00	3.66	1.18	4.26**	TCHR > OT, PT, SLP, O	
Support of your colleague or supervisor	3.47	1.23	3.61	1.02	3.39	1.25	4.02	1.07	3.70	1.28	11.08***	O > SLP; TCHR > OT, PT, SLP, O	
Physical environment where the child will use the device	4.27	0.85	4.29	0.84	4.13	0.89	4.15	0.93	4.20	0.84	1.34		

Note. AT = assistive technology. LSD = least significant difference. OT = occupational therapist. PT = physical therapist. SLP = speech-language pathologist. TCHR = teacher. O = other specialist. All listed LSD contrasts were significant at $p \leq .05$. Higher scores = greater importance.

* $p < .05$. ** $p < .01$. *** $p < .001$.

TABLE 10. Training Level Differences in the Importance of Various Characteristics When Considering the Use of AT With an Individual Child

Variable	Discipline						F(2, 936–961)	LSD contrasts
	N		S		A			
	M	SD	M	SD	M	SD		
Availability of AT	4.41	0.83	4.26	0.93	4.09	1.14	6.80***	N > S, A; S > A
Parent’s attitude toward AT	4.55	0.71	4.58	0.68	4.53	0.72	0.50	
Your knowledge of AT	3.90	1.03	4.06	0.95	4.28	0.98	8.27***	A > N, S; S > N
Technical support for using AT	4.32	0.84	4.24	0.87	4.31	0.86	0.89	
Availability of funding for AT	4.27	0.99	4.17	1.03	4.03	1.07	2.88	
Opportunity to try/borrow AT	4.47	0.82	4.53	0.76	4.46	0.86	0.71	
Cost of the device	3.78	1.12	3.64	1.18	3.55	1.21	2.43	
Red tape or excessive requirements associated with using AT	3.33	1.29	3.09	1.27	2.91	1.38	6.42**	N > S, A
Your previous experience with a given device	3.47	1.17	3.62	1.09	3.79	1.15	4.44**	A > N
Appropriateness of the device	4.87	0.46	4.90	0.38	4.92	0.34	1.09	
Established policies and procedures related to AT	3.74	1.08	3.68	1.04	3.85	1.09	1.64	
Support of your colleague or supervisor	3.80	1.11	3.62	1.16	3.55	1.33	3.23*	N > S, A
Physical environment where the child will use the device	4.17	0.87	4.24	0.87	4.16	0.92	0.75	

Note. AT = assistive technology. LSD = least significant difference. N = little or none. S = some. A = a lot. All listed LSD contrasts were significant at $p \leq .05$. Higher scores = greater importance.
 $*p < .05$. $**p < .01$. $***p < .001$.

did provide examples had a relatively broad view of AT. This is in contrast to the suggestion that EI providers may view AT rather narrowly and as comprising predominantly high tech (e.g., Judge & Parette, 1998). For the most part, providers appeared to define AT in a manner consistent with the idea that AT includes items or devices that can be provided to help the child do something.

Research Question 2: Provider Decision Making About AT for Infants and Toddlers

In terms of beliefs, the providers did not confirm common reasons that have been proposed as barriers to provision of AT in EI (e.g., children need prerequisite skills, or it is better to wait until a child is older). However, it is important to note that provider-reported beliefs may not necessarily bear a direct relationship to practice. A minimal relationship may exist between what the providers say they believe and what they actually do, particularly when other factors (e.g., policies, funding, organizational practices) conflict with beliefs (e.g., Bruder, 2000; Campbell, Milbourne, & Silverman, 2001).

When providers were asked about the conditions under which they would be likely to list AT on a child’s IFSP, there were similar trends across disciplines and training levels. Specifically, providers who reported little to no AT training were less influenced by any of these factors than those with some or a lot of training. Overall, the most important situations (ranked at 4.5 or above across the disciplines in terms of likelihood) were those in which the AT would enhance a child’s participation in an activity that he or she could not otherwise participate in, promote family interactions, or assist a child in achieving a developmental milestone. Lower ranked items included those in which the IFSP outcomes were not being achieved and in which there was a change in where a child spends time during the day. This finding is interesting and might suggest that providers are not yet consistently thinking about ways in which AT can enhance IFSP outcomes, or the important role that AT may serve in enhancing children’s participation, especially where there are changes in where the child spends time during the day.

Providers also rated the importance of a variety of factors when considering AT, and again high degrees of

similarity arose across the disciplines. As a group, the most important considerations for providers (ranked above 4, on a scale of 1–5) were parents' attitudes toward AT, the opportunity to try or borrow AT devices, the availability, funding, and technical support for AT, provider knowledge about AT, and the environment in which the child would use the device. Training differences were that those having little or no training rated availability, red tape, and support of a colleague or supervisor as significantly more important than providers with more training.

Overall, the information gleaned about beliefs and decision making is encouraging, but it also identifies areas in which it may be necessary to broaden providers' bases for deciding to recommend and use AT in EI. On the positive side, providers appeared somewhat attentive to children's participation in activities and family interactions, as indicated by their willingness to consider AT if it would promote family interaction. Similarly, providers were focused on the importance of such factors as parents' attitudes about AT and the environments in which a child would use the AT. However, providers may not have fully integrated the potential of AT to enhance children's participation across settings and as a tool to promote achievement of IFSP outcomes. This is supported by the fact that they ranked the use of AT to promote developmental skill acquisition as an important factor in listing AT on the IFSP. In addition, and as expected, AT availability, funding, and technical support play a prominent role in decision making, especially for those with minimal training.

Research Question 3: Access to Resources

Findings for Research Question 3, in terms of general access to resources, were not surprising. Only half of the providers reported that families in their communities would have access to a center where they could borrow or try out a device. When such a center was an option, there was a greater likelihood of borrowing a low-tech than a high-tech device, although reports of each were relatively high (93% and 72%, respectively). In terms of funding, the most frequently cited sources were Medicaid and state funds, and all providers indicated awareness of at least one funding source. These findings are straightforward and suggest that access to resources is spotty and that providers are aware of funding options.

Summary and Future Directions for Research and Practice

Several conclusions can be drawn from this investigation. First, providers appear to have a relatively broad view of technology that encompasses high and low tech.

Second, training makes a difference in many areas concerning AT practices in EI. Providers with more training focused on AT in EI reported greater use of AT and a greater sensitivity to important factors to consider in AT decision making, including enhancing children's participation in daily activities and routines. Third, irrespective of training, providers appeared aware of the importance of AT in facilitating children's participation in activities and in promoting family interactions. In addition, providers viewed parental attitudes and children's environments as important factors in making decisions about AT. This suggests that providers recognize the potential that AT brings in terms of increasing children's ability to be included in everyday activities and routines. Finally, providers tended to disagree with many of the reasons that have been identified as barriers to AT use in EI.

The findings also identify areas of AT practices in EI that should be strengthened. Of high concern is the fact that too many infants and toddlers who need AT are not receiving it. Of equal concern is the fact that only 18% of the providers viewed themselves as well trained, or as having a lot of knowledge about AT for infants and toddlers with disabilities. Also of concern is the fact that the providers viewed facilitation of developmental skills as very important to AT decision making, a situation which may mean that AT efforts are more focused on skill sets than on promoting participation in natural environments.

Although the results of the investigation contribute to our knowledge of AT practices, the conclusions must be tempered by some methodological limitations. First, given the interdisciplinary nature of EI, it is possible that we may have sampled providers who delivered services to the same children. This could introduce a source of bias in the data. Although the large sample size tempers this possible bias, it is still important to consider. Second, there are some difficulties inherent in survey research. In particular, there may be a disconnect between what respondents report and what they actually do. There may be a tendency for people to report what they would like to be influenced by versus what they are actually influenced by, given the realities of their practice settings. The survey data in the present investigation provide some initial insight into factors that have been identified as important to the selection and use of AT in EI. However, additional research, with other methodologies, will be required to understand the complexities surrounding AT in EI, as well as the best ways to enhance the use of AT to promote young children's full participation in their natural environments. ♦

AUTHORS' NOTES

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