Chapter 14
Engaging in Play through Assistive Technology:
Closing Gaps in Research and Practice for Infants and Toddlers with Disabilities

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ABSTRACT

The importance of play for all infants and toddlers should not be underestimated. However, owing to barriers and tensions in Assistive Technology (AT) in early intervention, opportunities are often limited for infants and toddlers with special needs to play, and where early intervention exists, it is slow to develop with AT. This chapter first discusses the importance of play and then draws attention to some issues and tensions that limit play and AT in early intervention for infants and toddlers with special needs. It then discusses how crucial it is to explore the potential of play for infants and toddlers with disabilities and gives research and practice-based suggestions to enact the spirit of the law: the Individuals with Disabilities Act (IDEA): Part C – Early Intervention program for infants and toddlers using AT. It concludes with some thoughts for the future of AT through research, early intervention play-based practices, and on-going education and development of early intervention providers and parents of infants and toddlers with special needs.

DOI: 10.4018/978-1-4666-5015-2.ch014

INTRODUCTION

As early as infancy and toddlerhood, children may be identified as being at risk for cognitive, social-emotional and physical difficulties. Some have inherited disabilities, and others may be born pre-term leading to special needs such as intellectual disabilities, cerebral palsy, and hearing or vision loss. Such infants and toddlers may be slower in developing their functional and learning abilities and may be eligible for early intervention services in their natural environments: home and child care. In the U.S., the Individuals with Disabilities Act (IDEA): Part C – Early Intervention program for infants and toddlers, was designed to provide a broad array of services to children with special needs, from birth through three years of age, and their families. Anyone who has a concern about an infant or toddler's development may make a referral for Early Intervention services. A team, including parents, draw up an Individual Family Service Plan (IFSP) which is a document designed to identify supports and strategies for achieving outcomes that will enhance a child's academic, communication, developmental and functional needs. The Department for Children and Families Agency of Human Services in Vermont, for example, reported that in 2013, there were approximately 20,000 children from birth to three eligible for Early Intervention services statewide. Based on estimated prevalence, approximately 3% (or 600 children) may be eligible for early intervention services. Of this population, approximately 400 infants and toddlers are receiving early intervention services statewide (2% of the birth to three population). Assistive technology (AT) provision is dependent on services and AT use is reported on IFSPs for only a small percentage of infants and toddlers which, as Wilcox, Guimond, Campbell, and Weintraub Moore (2006) suggest, means that services should improve. A comparison of the Office of Special Education Programs Annual Reports to Congress from 1998 to 2002 indicated that AT is consistently listed as a service for only approximately 4% of infants and toddlers nationally (U.S. Department of Education, 2012). Additionally, there are infants and toddlers who have delays not severe enough to be eligible for early intervention services, yet would benefit from AT. Even if the AT device is used for only a brief period of time; it may give an infant or toddler the extra support they need to develop and use skills on their own which are essential to early childhood play. Regrettably, many infants and toddlers do not experience AT as an option.

The Purpose of this Chapter

The purpose of this chapter is to discuss the importance of play for infants and toddlers, including those with special needs. It discusses how AT can help those infants and toddlers with special needs experience the benefits of play by making important adaptations to the infant and toddler's natural environment accessible; explains how to position an infant and toddler for play with the use of low- and high-tech AT adaptations in the home and preschool, and gives examples of adaptations for toys. It makes suggestions for some easily applied practical solutions for providers and parents to demystify AT use and discusses some of the tensions that currently limit the provision of AT and services for infants and toddlers. This chapter ends by explaining where efforts should be made to provide more opportunities for children with special needs to enjoy and learn through play in natural settings.

It is anticipated that this chapter will bring current issues and tensions into focus and stimulate further research and debate. Most importantly though, it will contribute to the future of play for infants and toddlers with special needs by providing the impetus for those involved in early intervention to work toward enacting the spirit of the law in AT practice for infants and toddlers with special needs, especially for the development of pedagogical play-based practices.

BACKGROUND

The Importance of Play in Early Childhood

Play is the main preoccupation in early childhood (Parham & Primeau, 1997). Children explore their natural environment through play and as Rogers (2011) states, "there is a substantial well-documented empirical and theoretical research literature to support the view that play is a highly significant activity in human experience and development" (p. 9). As children interact with objects and materials, they start to establish relationships with an understanding of control and causality which means that they repeat and modify their actions. Children communicate as they explore and mimic activities in the real world within their social environment (Vygotsky, 1978). Children are playful if they are intrinsically motivated, internally controlled, free to suspend reality, and able to set and maintain a play frame (Bundy, 1997).

For early learners, play is self-initiated, self-directed and flexible in a way not found in the development and refinement of a specific skill. From birth, children learn how to solve problems, make decisions, persevere, and interact with people and objects in their environment. The benefits of play are numerous across all of the domains of development and Piaget (1962) theorized that play and cognitive skills are inseparable. Play has been associated with emotional, social, communication, and physical/motor development. For infants and toddlers, play is the primary mode of learning about how objects work and play develops the skills of learning as they interact with people in their world. According to Vygotsky (1978), when a child is engaging in play he is functioning close to his optimal developmental level. Successful play interactions and environmental control "lays the foundations for crucial life skills such as empathy, problem solving and imagination" (Rogers, 2011, p.9).

Indeed, the concept of learning through play has a long and established history and tradition in educational contexts stemming from the work of successive pioneer educators and enacted in innovative pedagogical practices of, for instance, Reggio Emilia in Northern Italy and Te Whariki in New Zealand. The Reggio Approach derives its name from its place of origin, Reggio Emilia, a city located in Emilia Romagna in Northern Italy. Shortly after World War II, Loris Malaguzzi, a young teacher and the founder of this unique system, joined forces with the parents of this region to provide childcare for young children. Te Whāriki is the curriculum framework for the Early Childhood Education (ECE) sector in New Zealand. It covers the education and care of children from birth to school age and is used by most New Zealand ECE services to guide children's learning opportunities. The literal meaning of Te Whāriki is 'the woven mat.' Early Childhood Education services use the curriculum's principles and strands to weave a learning programme for children. A child's strengths and interests, all the things they learn as part of their family, and the service's learning opportunities are all woven together to contribute to a child's unique learning story where learning is responsive to the needs, passions, and interests of children. These curricula are characterized by many features advocated by contemporary research on young children, including real-life problem-solving among peers, with numerous opportunities for creative thinking, playfulness and exploration which may derive directly from teacher observations of children's spontaneous play and exploration. For a toddler with a disability, such child-centred pedagogical practices characterized by spontaneous play are as equally desirable as for any other child, yet few may experience such opportunities. In accessing such opportunities, AT can play an important role.

Play for Children with Disabilities

A variety or combination of special needs can affect an infant or toddler's ability to play. This means that often an infant or toddler with a special need requires assistance to play with the degree of severity of the disability from mild to profound, requiring different degrees of assistance. Irrespective of the severity of disability though, all children have some capacity to engage in play and with adaptations and interventions, these infants and toddlers can be helped to experience a range of play activities on a par with their fellow peers.

What tends to happen though is that natural play for infants and toddlers with disabilities is diminished or absent. This is because it is replaced by therapies and/or special instruction which concentrate on the development of a skill. Indeed, many medical and therapeutic interventions for children with disabilities do not incorporate play. When play is limited, the ability to learn and develop the skills and attitudes of accomplishment associated with play is diminished. Disability then, tends to limit the infant and toddler's innate drive to play with interventions rarely designed to develop a child's ability to play. With an emphasis on skill development, play and playfulness become lost. While therapists use toys as therapeutic tools, the focus tends to be on what the child cannot do rather than what the child can do, as is fostered in spontaneous creative play.

In essence, there should be a combination of both therapy and play for infants and toddlers with special needs. It is crucial that methods be identified which can augment existing play abilities or compensate for limitations caused by disabilities. In play, the focus is on supporting success rather than remediating for disability and the focus is on what toys are interesting to the child rather than what toys work to remediate for disability. Play is important for all children, including those with cognitive delay; a population who may be thought of as being disinterested in play.

Play repertories may be more limited and play incidences may occur less frequently for children with developmental disabilities. Play for infants and toddlers with physical disabilities, for example, has been described as being more solitary with the amount of time spent in play less frequent. For some, there is play deprivation and the specific type of play deficits may be related to the type and severity of the disability. When play is too difficult for a child, it will negatively impact on social and cognitive development. Frustration will ensue when toys are too difficult to operate, and so play may become an obstacle to learning rather than a facilitator of the learning process. It is, therefore, imperative that early intervention providers and parents develop their awareness of how to nurture the development of an infant or toddler with a disability through play.

Research has shown that parents of young children may find play interactions with children with disabilities more challenging than with non-disabled children. Freeman and Kasari's study (2013) demonstrated that parents of autistic children found it more difficult to match or increase the level of play of their child compared to parents with typically developing children. Without positive play intervention though, children with disabilities may develop learned helplessness that can lead to indifference and apathy from as young as two years of age (Langley, 1990) as infants and toddlers are waiting for parents to initiate interactions (Van Tatenhove, 1987). Through positive play interactions, children develop pro-social skills and "construct their own understanding of a concept" (Bredekamp & Copple, 1997, p. 114). Children with disabilities however, are often frustrated by a lack of success when their every effort to explore the world, and to manipulate playthings and toys, or communicate is unsuccessful. Consequently, the child fails to develop cause and effect skills and choice making, which can lead to the development of passivity and dependency on others (Sullivan & Lewis, 2000) with the potential for apathy and lack of interest. It is crucial therefore, that adults

facilitate positive play interactions for infants and toddlers with special needs through the use of a variety of strategies and adaptations.

Making Play Accessible

The Environment, Child Positioning for Play, and Adapted Toys and Materials

The environment for play should be accessible for infants and toddlers with special needs and lighting and noise levels should be adjusted to the individual. Especially important are modifications of space and an accessible location for toddlers using wheelchairs and other mobility aids. Assistive technology positioning items can help infants and toddlers with disabilities as they often have difficulty in changing and maintaining different positions when they play. Infants born with cerebral palsy, Down syndrome, or other disabilities may have motor difficulties and very low muscle tone which may result in an inability to support oneself to be in a position to play. Using a supportive Boppy® pillow may allow a young child to be more upright to observe his or her world and interact in play. An infant with very high muscle tone may be unable to reach out efficiently to interact with his or her environment. The positions a child can use greatly impact their quality of play, such as a sitting opposed to a lying position. A child's head can be propped up using a horse-shoe shaped pillow which provides support in a range of positions and rolled towels, pillow, or stuffed animals placed under the head, neck, and knees are also valuable. A soothing bouncer seat or a three stage reclining seat assists a child in a semi-reclined position. To lie on the side, items designed for sleeping can be used to support a side lying position for play. These may be commercially made or can consist of rolled towels, pillows, and couch cushions which can be used in front of and behind a child for side support. Lying on the tummy is a good developmental position for a child as it strengthens the muscles in their neck, back, shoulders, and hips, but the infant or toddler needs to be positioned using wedges under the child's chest. In a sitting position, the child can see and interact with the environment. Again, these are commercially made for safety and allow the child security. With an accompanying lock on tray, the child will have front support which can free up the child's hands for play. In the same way, the standing position is beneficial as infants and toddlers can see and interact with their environment. Such AT can provide swivels and positioning items that allow the individual to move, bounce, and/or turn in place. Everyday materials such as cardboard boxes, car seat head positioners, towels, pillows, and cylinders can also be used as positioning options for infants and toddlers.

Infants and toddlers may need assistance in moving to explore their environments which is a critical component of play. Assistive devices are available that encourage and support children to move. These are commercial walkers, rocking and riding toys, and climbing and sliding equipment, and well-designed swings. Switches, adapted battery-operated toys, and interfaces make it possible for children to turn a toy on and off with a movement of a body part against a switch. Single switch use can also be applied to motorized scooters, which give the child the opportunity to move through space independently at a young age. Adapted computer peripherals and appropriate software for infants and toddlers, can also be adapted. A single switch which reduces control to a single key, or the use of a touch window, may be the most appropriate input device for this population. Some communication devices can act as a switch interface to include a message which is heard when the toy is activated. This strategy can be used to enhance opportunities for pretend play for young learners with disabilities.

When an infant with a disability grows into toddlerhood, a simple box easel can allow participation in creative activities like painting and drawing by moving paper to a vertical surface. By

adding binder clips to an easel, the toddler may find a book to be more engaging to explore than one that lies flat on a table. A carpet square can become a play mat for a child. Cars and blocks can also be safely attached to the carpet so they won't roll away when played with.

The use of a well-placed switch (i.e., a device attached to a toy that allows the child to interact in play when pressed) makes the toy accessible to a toddler who may not otherwise be able to make the toy move or make noise. To build an interaction with electronic toys, children can begin with highly reactive toys that provide immediate and intense reaction when touched (Mistrett, Lane, & Goetz, 2000). AblePlay.org (2009), for instance, has a comprehensive list of switch accessible toys that are available. A switch may also allow the infant to activate a mobile or play music to self-soothe.

Restrictions to Assistive Technology Use

Assistive technologies range from low-tech toys with simple switches to expansive high-tech systems capable of managing complex environments. Assistive technology can increase young children's options and facilitate their physical and social inclusion in various settings (Judge & Lahm, 1998). When used thoughtfully, AT can empower young children, increasing their independence and supporting their inclusion in play with their peers. Assistive technology can, for example, be used as a tool to augment sensory input and reduce distractions. It can provide support for cognitive processing or enhancing memory and recalls and it promotes children's learning and development by allowing them to more effectively participate in activities and routines in their natural environments (Langone, Malone, & Kinsley, 1999; Mistrett, Lane, & Ruffino, 2005).

Although using AT with infants and toddlers holds much promise, it is often overlooked. Assistive technology devices remain underutilized and poorly integrated into IEPs for young children with disabilities (Dugan, Cambell, & Wilcox, 2006; Lesar, 1998). In the U.S., annual state child count reports identify a surprisingly small and consistently stable percentage of infants and toddlers who have AT listed on their IFSPs (Wilcox, Bacon, & Campbell, 2004). In 1999, for example, states documented AT on only 3.8% of IFSPs for infants and toddlers served through Part C of IDEA and similarly, only 4.4% of IFSPs 4 years earlier. Data from the National Early Intervention Longitudinal Study (NEILS, 2001) appear to help substantiate such findings. While examining a nationally representative sample of 2,820 children in early intervention, NEILS found that 4% of the records listed AT. Illustrating that utilization remains low in early intervention (Lesar, 1998; Mistrett, Hale, Gruner, Sunshine, & McInerney, 2001).

Barriers That Limit Assistive Technology Use for Play

There are several barriers and tensions that may account for limited AT use in early intervention (Lahm & Sizemore, 2002; Lesar, 1998; Mistrett, 2001a). Tensions that exist are the dichotomy between therapy and play; family and provider beliefs about using AT, funding issues, the availability of AT devices, a lack of providers trained in the use of AT devices, and attitudinal barriers (e.g., negative images or a fear of technology). Scarce use of AT may also be attributed to the relative newness of AT with infants and toddlers (Lesar, 1998; Mistrett, 2001a) and a lack of research examining the selection, use, and efficacy with this population of children (Campbell, Milbourne, Dugan, & Wilcox, 2006; Mistrett, Milbourne, Dugan, & Wilcox, 2001). Some of these barriers and tensions will now be further examined.

Therapy and Play

Supporting infants and toddlers in play and playful experiences through the use of both low-tech and high-tech AT is important for the developing

child. It is critical to realize that the child needs a combination of skills-based therapeutic work and play-based learning. Assistive technology allows for comfort and can broaden the scope for the infant and toddler to play. The notion is that infants and toddlers with disabilities should not be restricted in their provision and ability to play, but rather should be given every opportunity to do so through adaptive and enabling technologies. There are many simple adaptations that can be made to get the most out of play even for novices, so parents and teachers should be involved in workshops and other training type events so that they can learn how to work with these adaptations and develop them.

In therapy, the first use of *play* is as a distracter. A therapist may use the child's motivation to interact with a toy as a way to position him longer on his stomach or to shift weight from side to side.

Sensory and cognitive skills are targeted during focused skills development. For instance, toys are provided that encourage a child to use both hands to manipulate an object, or play which is designed to strengthen "bilateral hand coordination" which can then be used in higher level play activities. The goal is to increase the quality and quantity of the play interactions.

Interventions focused on facilitating playfulness emphasize the quality of a child's play with the child guiding play to incorporate motor, sensory, language, creative and cognitive skills in a holistic manner, without focusing on any specific goal or skills.

While all three approaches on play are important, it is the third perspective which is so often ignored for infants and toddlers with special needs. Assistive technology is a solution that can be leveraged to help to begin to address barriers that exist by affording the child the opportunity to initiate and sustain playful activity within the stages of play development from sensory through to pretend play, creative expression and literacy development.

Family Beliefs

Sometimes parents and educators are reluctant to begin to use an AT device as they may believe it will discourage their child from learning important skills. Research has shown that the opposite may be true, as using AT devices may encourage a child to increase communication efforts and skills. Indeed, as Alliance Action (2006) reports, the earlier the child is taught to use an AT device, the more easily the child will learn to accept and use it. Although concerns have been expressed that AT use in early childhood may mean that children do not develop to the best of their capability as they become reliant on the technology or that it may slow them down in their learning, research has not shown this to be true.

Instead, AT opens up opportunities for a child with special needs to play in early childhood. Assistive technology has the potential to open up play options to the child and parents which means the child has opportunities to learn. Through the use of different levels of technology, ranging from wheelchairs to infrared control units, children with disabilities are able to access physical environments and technological devices such as computers and interactive videos. Toys can be adapted through switches and adaptations so children can activate them when their manual dexterity is severely limited, thus enabling them to participate with their peers with typical development. Augmentative communication materials and devices allow young children who cannot speak to communicate with the world around them. These devices can be simple such as pointing at a photo on a picture board, or they can be more complicated, such as pressing message buttons on a device that activates pre-recorded messages such as "I'm thirsty."

Provider Beliefs and Training

Providers may be concerned that a very young child's use of AT will inhibit an infant or toddler's skills development (Cress & Marvin, 2003; Romski & Sevick, 2005) such as, speech and mobility. Some may also hold the view that AT necessitates expense which leads to a parent or provider ensuring that a particular device is needed (Judge & Parette, 1998). The AT may not be well-matched with the child leading to disuse or abandonment (Judge, 2002; Parette & Angelo, 1996; Philips & Zhao, 1993). 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). In Lahm and Sizemore's (2002) study, for example, providers felt it was important to act as an interdisciplinary team. However, none of the 15 respondents identified the family and child as part of the team. Nearly all of the providers indicated that funding was an important consideration in decision making. Although the Lahm and Sizemore study had methodological concerns, such as it focusing on providers serving infants and toddlers, and a small sample size, the findings are still worthy of attention.

Unfortunately, beyond this study there is remarkably little data about the use of AT in early intervention practices. Lesar (1998) found that among 62 early childhood special education teachers, speech-language pathologists, administrators, and other related providers, that most respondents reported they either had no knowledge of were at a novice level. A significant concern for all participants was support for using AT, including on-site assistance, training in device use, training in 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. Lahm and Sizemore (2002) examined 15 early intervention providers who met state requirements for provision of AT services in early intervention. They rated child goals and family and environmental demands as the most important factors to consider when making decisions about AT. All stated how important it was to work as a member of an interdisciplinary team. Nearly all providers indicated that funding was an important consideration in decision making.

Lack of awareness and lack of training for service providers continue to be barriers to use of AT for early learners (Judge, Floyd, & Jeffs, 2008). For this reason, early intervention providers may not inform families of its potential in promoting and supporting development and learning (Lane & Mistrett, 1996; McInerney, Osher, & Kane, 1997; Romski, Sevik, & Forrest, 2001). Sawyer, Milbourne, Dugan, and Campbell (2005) reported that a reason for underutilization of AT with infants and toddlers may be limited knowledge of parents and providers and a lack of training to provide them with the knowledge required. A primary research question of the Tots n Tech Research Institute has been to identify the current methods in which early intervention providers and families of infants and toddlers learn about AT. The results of these related research studies indicate the need for increased training and reference material which focuses on AT for the infant/toddler population.

Optimistically though, Wilcox, Guimond, Campbell, and Weintraub Moore (2006) found that providers have a relatively broad view of technology that encompasses high-tech and low-tech. They also found that training makes a difference in many areas concerning AT practices in early intervention. Providers with more training focused on AT in early intervention 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. 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 early intervention.

Providers have been found to believe that a child should demonstrate assumed pre-requisites before they are ready to use AT (Romski, Sevik, & Forrest, 2001; Romski & Sevick, 2005), or that the AT is too difficult for the child, and therefore, it is easier to simply do things for the child (Cress & Marvin, 2003; Mistrett, 2001b).

MacArthur (2001) studied early childhood teachers and found that to be successful, teachers need opportunities to discuss their beliefs about technology and its relationship with pedagogy. Stoner, Parette, Watts, Wojcik, and Fogal (2008) found that teacher input was critical to developing effective approaches for the integration of AT into the preschool curricula. To encourage professional development teachers suggested the use of stipends to support teacher professional development (PD) through a range of approaches and to provide continuous learning opportunities for teachers. One strategy found to hold particular promise was AT user groups which required one person who has expertise and is the facilitator to hold sessions with a small group of people who express interest in cooperating.

Low-Tech and High-Tech Assistive Technology and its Benefits for Play

Research has shown positive outcomes associated with the use of AT by infants and toddlers with special needs and has documented several ways in which AT can enable infants and toddlers to perform functional skills such as playing with toys across various contexts, thereby providing evidence in support of using AT to facilitate very young children's participation in their natural environments and to enable infants and toddlers to perform functional skills (Mistrett, Hale, Gruner, Sunshine, & McInerney, 2001; Sullivan & Lewis, 2000). Studies undertaken in the child's natural environment (Benedict, Lee, Marrujo, & Farel, 1999; Judge, 2002; Langone, Malone, & Kinsely, 1999) all point to the participation of children in activities and routines and in everyday settings facilitated by AT. It should therefore, be included as part of early intervention under IDEA. Assistive technology services may include teaching a child or family how to use a device, providing consultations on the environment, or offering provision of technical expertise for device programming or modification.

Demystifying Assistive Technology Use for Parents through Low-Tech Assistive Technology

There are a number of low-tech AT adaptations that can be used to enhance play which are inexpensive and work to create an environment to meet play outcomes for infants and toddlers, where children are in a position to initiate playful interaction. These are positioning options for children which include materials to ensure the comfort and safety of children in getting ready to play, and supports that encourage movement, such as rolling to walking. Included are adaptations to toys available for purchase on the market which make them easier to access or to activate. Low-tech AT also includes the use of positioning items that make it easier for the child to sit or lay on his tummy or back, thus allowing the child to be able to reach toys. Furthermore, it also includes the use of specially adapted toys and appropriate switches and interfaces, and the use of communication aids, which can be used to enhance playful interaction. Toys that are engaging may be linked to an overhead gym to bring the toy closer to the child's hands or feet, or Velcro could be attached to the bottom of the toy to secure it to a surface so it doesn't move

out of reach. Toys and play materials are vital elements of the play environment with strategies to use them in enhancing playfulness.

Parents should recognize that very often low-tech devices are extremely useful, affordable, and versatile. However, it is important to understand that parents need time to explore, be creative, and know where to purchase adapted toys and materials. First, commercial, off-the-shelf play materials can be selected by identifying the toy's features that appeal to the child and can be adapted to make them easier to use. Each infant and toddler has his/her own preferences but a toy can be evaluated for its sensory interaction which includes sound, visual appearance, and touch. Toys can also be assessed for their access, addressing questions such as, "How is it activated?" "How can it be positioned?" "How does it handle?" and "How can its knobs and parts be adapted?" For their physical characteristics, a toy can also be assessed for its size, construction, stability and versatility. Commercial toys can be adapted for their positioning and access. Attachers are materials that are used to bring the item closer to the infant or toddler and can be made from simple materials, such as, elastic to give a pulling effect, shoelaces, or snap straps. These can be anchors to the toy with the child simply pulling on the links to retrieve it. Extenders are materials that can be used to build up access features of the toy. Where buttons are too small, this feature can be extended using foam, Popsicle sticks, or larger knobs from kitchen stores which will make puzzles easier to complete. Clay can also be used to make a knob larger or a key longer, for example. Stabilizers are materials that support play by preventing a toy from moving out of the child's reach or vision. Often toys need less adaptation if they can stay in one place. Stabilizers can be used to hold a toy in place or connect a communication device to it. To stabilize a toy, non-slip materials can be used such as Velcro and carpet squares can all improve stability of an item. Magnets may also be useful in stabilising a toy on a metal sheet surface. Bed trays with tilt tops can be used as floor tables and covered with carpet squares for a more stable play environment. Any materials that contain toys and prevent them from moving too far away from a child – items such as hula-hoops, box tops, or planter bases – help a child to control his immediate play environment.

FUTURE RESEARCH DIRECTIONS

Assistive technology research for infants and toddlers is still in its formative years. Research is needed to better understand how young children use and learn with AT as they play, and also to better understand the short- and long-term effects. The established body of research and literature on the positive effects of AT does not adequately inform early intervention providers. As AT becomes more readily available for infants and toddlers, new research is needed on what young learners are able to do and how these tools can be integrated successfully into the natural environment to promote play-based experiences. Research-based evidence about what constitutes quality AT for play-based learning is needed to guide policy and inform practice, and to ensure that AT is used in effective, supportive, engaging, and appropriate ways in infant and toddler play-based programs in natural settings.

It is a team effort to enhance future efforts for AT in early intervention. Libraries should have access to facilities and special lending libraries for mothers of young children with disabilities where parents can borrow toys with switches, computer software and other devices, or parents may choose to purchase a device directly for their child. Parents should be fully aware and involved in this endeavour. Issues of equity and access remain unresolved for device use. Early childhood providers have an opportunity to provide leadership in assuring equitable access to AT tools for the children, parents, and families in their care. When early intervention providers appropriately integrate AT, equity and access are addressed by

providing opportunities for all children to participate and learn, including those with special needs (Hasselbring & Glaser, 2000). Research and awareness of the value of AT need to be shared with policy makers who are interested in issues of access and equity for children, and parents and families within the framework of developmentally appropriate practice (NAEYC, 2009), to support learning goals for individual children in child care settings.

To make informed decisions on the intentional use of AT in ways that support a child's play-based learning and development, early intervention providers need information and resources on the nature of these technologies and the implications of their use with children along with responsive interactions between adults and children which are essential for early brain development and cognitive, social, emotional, physical, and linguistic development. Professional judgement is required to determine if and when a specific use of AT is appropriate and the provider role is essential in making certain that thoughtful planning, careful implementation, reflection, and evaluation, all guide decision-making about how to introduce and integrate any form of technology into the child's experience to promote positive experiences for the child (NAEYC, 2009).

Early intervention providers and parents must take time to train, evaluate, and select AT, and observe the child as he/she uses them. So they must be willing to learn about and become familiar with the various options and make appropriate adaptations, being intentional in the choices they make. Early intervention providers have always had a responsibility to support parents and families by sharing knowledge about child development and learning. Assistive technology tools offer new opportunities to build relationships, maintain ongoing communication, exchange information, and share online resources with parents and families. There is also the responsibility of providers to model appropriate effective and positive uses of AT in play for families. For this to happen, professional development courses would need to integrate understandings of AT, and workshops should be available for parents and families.

There is a desperate need to educate parents and families on the delivery of services. As there are many tensions that surround AT use in early intervention which are not research-based, greater awareness is needed in the professional population of the value of AT and its potential benefits, if it is to be demystified. The findings of Wilcox, Bacon, and Campbell (2006) identify areas of AT practices in early intervention that should be strengthened. Only 18% of providers considered themselves to be well trained, or having a lot of knowledge about AT for infants and toddlers with disabilities. 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. Additional research is required to understand the complexities surrounding AT in early intervention, as well as the best ways to promote young children's full participation. A fuller understanding of the factors that may influence, promote, or hinder the use of AT in early intervention practices is required.

Judge, Floyd, and Jeffs (2008) suggest that the use of an AT toolkit approach that anticipates the learning, language, motor, and sensory needs of young children that would give immediate access to meaningful experiences and allow young children to participate in play, should be considered. Judge (2006) found, in a survey of early childhood teachers, that devices teachers required were low-tech items that should be included in a toolkit. By demystifying AT and giving parents and families solutions they can implement right away, there is greater hope for infants and toddlers to play. When parents and early intervention providers are creative, AT is by no means expensive and restricted in use for some children. For painting, for example, using a natural sponge may be easier to grasp than a paintbrush. If the child cannot hold a paintbrush or marker, a ruler with a Velcro

handle can be secured on the child's arm. Brushes and markers can then be attached to the ruler. Assistive technology is responsible for providing the child access to self-initiated playful learning experiences to develop in all of the domains of development in much the same way as for any other child. Assistive technology sets aside the need for a focus on individual skills to develop through therapy as a prerequisite to play, potentially increasing participation in playful learning and greater joy and access to learning in general.

More commercially adapted toys for children with disabilities should emerge on the market created with the knowledge of AT experts. Adaptations and adjustment accessories should be available to purchase alongside a toy in every major toy store. Such an addition would help parents to make their own purchasing decisions when an expert or teacher is not available and would mean that adapted toys can simply be purchased at a regular rather than a specialized store. More support should develop for parents and early intervention providers whose professional development opportunities should include in-depth, hands-on use of AT for infants and toddlers accompanied by on-going support and access to the latest AT tools for play, as they enter the market.

To improve and enhance AT use, providers need positive examples of how toys and the play environment has been adapted, selected, used and integrated, and evaluated successfully in natural environments. Assistive technology providers also need education in play-based pedagogies and practices of play. Research is also needed to support evidence-based practice for the effective and appropriate uses of AT as tools for learning and development in early childhood settings. It is anticipated that as more is learned and newer advances are made in AT, more opportunities will be possible for infants and toddlers with disabilities to participate in early childhood play, so providers and parents should be continually updated.

CONCLUSION

New connections need to be made between AT, research, and play in natural early intervention settings. To be effective advocates for play, practitioners and parents alike, need comprehensive and sophisticated understandings of how play can be enabled by AT in natural settings which is grounded in research in natural contexts. Providers need to grapple with the notion that some children may not respond favourably to play in the first instance and may find toys frustrating, so it is worth balancing advocacy with some healthy scepticism that acknowledges there may be a challenge in enabling and encouraging play-based activity for some infants and toddlers with special needs. However, all children can play and should experience play, so it is critically important to continue to stimulate thought on this topic amongst professionals and parents. It is anticipated that this chapter will continue to motivate research, debate, and practice, to close the gaps in play experiences for infants and toddlers with special needs by enacting the spirit of the law for what has been an often overlooked phenomenon.

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