Playing with Technology: Mother-Toddler Interaction and Toys with Batteries

by

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#### Abstract

To investigate play with electronic toys (battery-operated or digital), 25 mother-toddler (16-24 months old) dyads were videotaped in their homes playing with sets of age-appropriate electronic and non-electronic toys for approximately 10 minutes each. Parent-child interactions were coded from recorded segments of both of the play conditions using the PICCOLO checklist. Mean scores for each play session were compared and the result showed significantly lower means in the electronic toys condition for three of the four sub-scales of the PICCOLO. Family demographic and play pattern data were collected via self-report questionnaire. Results indicated that the play experiences of toddlers were compromised by the lower quality of parent-child interaction during joint play with electronic toys. The potential impact on early child development and suggestions for future research are discussed.

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## Acknowledgements

Like many, my relationship with technology has been one of love-hate. As I continue trying to keep up with technological changes. I find myself both in awe of its power to provide us with incredibly easy access to a vast amount of information while at the same time being a demanding, and sometimes, disruptive force in family life. I have witnessed my own children incorporate ever-new media into their understanding of the world and how to function within it. Dr. Jennifer Shapka, my research supervisor, along with the DCTech laboratory team, offered me an academic home to pursue this particular combination of research interests. I thank both past and present members of the DCTech team for their support, constructive feedback, and plain fun during our weekly meetings. I am grateful to Dr. Shapka for taking a chance on a research study that included the very youngest members of society into the arena of technology and developmental change. I am further grateful for the support provided by faculty members Dr. Laurie Ford and Dr. Hillel Goelman who comprise my research committee. Also, Dr. Jennifer Vadeboncoeur was instrumental in keeping me focused on reaching this goal, as well as setting new ones. I owe a debt of gratitude to Yvonne Adebar, a colleague and a friend, who partnered with me over the course of a decade on the topic that led to this thesis. Lastly, this project would not have been even remotely possible without the unwavering support and love of my family, in particular my husband, Stuart. He has been a companion, champion, and at times, my psychological and emotional sherpa (his term). And, he has endured my cursing of technology even as I grudgingly, but admiringly, adapt to it.

#### Introduction

The idea of play as the quintessential activity of childhood has deep, historic roots, with a body of literature that is rich and theoretically diverse. From 1880-1979, at least 730 scholarly articles and books have been written about children's play (Christie & Roskos, 2006). The connection between play and development started to be recorded a century ago by psychologists Karl Groos (1898) and G. Stanley Hall (1907). Play takes several forms—physical, didactic, socio-dramatic, relational-and occurs when the child is alone or with others. During the period of early childhood development—birth to six years—play has been shown to relate directly to positive developmental outcomes across domains, learning and mental health, as well as indirectly through nurturing parent-child interaction, and influences of institutional practices within the broader culture. Play has been characterized as the 'leading activity' of the preschool period of human development (Duncan & Tarulli, 2003). Moreover, when play is threatened, including opportunities to play, children's development has been shown to suffer (Azar, 2002; Pellegrini, 1995). It is therefore important for understanding child development to investigate factors that both augment children's play and those that devalue play's contribution to healthy development.

## Links Between Play and Development

One of the earliest established links between play and development is in the area of cognition. Piaget (1932) considered play to be one of the foremost contexts in which cognitive development occurs by providing the child manifold opportunities to construct his or her knowledge about the world through interaction with objects in the environment. The "zone of proximal development"—where more skilled play partners guide the child's activities toward

mastery—serves as the primary context for cognitive development, according to Lev Vygotsky (1978). Representational skills, memory, concepts, problem solving, perspective-taking, language skills, and creativity can be learned through both child-directed play and adult-guided play (Davidson, 1998; Singer, Singer, Plaskon & Schweder, 2003). Pretend play in particular is the forum in which young children develop problem-solving, divergent thinking, alternative coping strategies, adaptive perspective-taking as well as more complex emotional expressions (Russ, 2004).

Emotional health is one of the products of early play. The development of pretend play, in particular, serves as a forum in which confidence and social and emotional competencies may flourish (Howes, 1992; Howes & Matheson, 1992; Lindsey & Colwell, 2003; Raver, 2002; Singer & Singer, 2005). At the foundation, the development of self-regulation that includes complex capacities such as impulse and emotion control, self-guided thought and behaviour, planning, self-reliance, and socially responsible behaviour, is considered a vital component of healthy development and learning capacity that develops primarily through various forms of play (Bronson, 2001; Kopp, 1991). Parents who assist infants in the first few months with arousal control and moderation of sensory input find self-regulation developing into impulse control and greater compliance in the second year of life (Kopp, 1982). Based on work by Bronson (2001) and Eisenberg and colleagues (2004), Laura Berk considers self-regulation "a crowning achievement of early childhood" (Berk, Mann & Ogan, 2006).

Play has been strongly linked to the development of language (Davidson, 1998), reading and literacy (Zigler, Singer & Bishop-Josef, 2004). More specifically, play contributes to the development of oral language (Bornstein, Vibbert, Tal & O'Donnel, 1992; Dickinson & Tabors,

2001; Johnson, Christie & Wardle, 2005, Tamis-LeMonda & Bornstein, 1993), phonological awareness (Fernandez-Fein & Baker, 1997; Snow, Burns & Griffin, 1998), print awareness (Neuman & Roskos, 1993; Vukelich, 1994), and general background knowledge required for literacy development (Gmitrova & Gmitrova, 2003; Singer & Singer, 2004)

As children learn and practice turn-taking, following rules, collaborating with peers, controlling their impulses and demonstrating confidence and empathy towards others, play strongly contributes to social development (Klugman & Smilansky, 1990; Krafft & Berk, 1998). Pretend play, again, is the major play form that promotes and supports the development of selfregulation, and resulting social competency (Elias & Berk, 2002).

Often overlooked is the role of play in supporting healthy physical development. Physical activity through play contributes to children's cognitive development and learning, as well to healthy psychological development overall (Pellegrini & Smith, 1998).

#### **Attitudes Towards Play**

Attitudes towards children's play vary widely across families, cultural groups, and historical periods. Various cultures have been studied for their approaches to children's play, with three broad attitudinal structures identified: culturally-cultivated play, culturally-accepted play, and culturally-curtailed play (Gaskins, Haight & Lancy, 2006). The first structure culturally cultivated play—represents the approach of western or developed societies. In such societies, play is considered the child's primary activity; is highly supported by adults; and emphasizes the development of individuality, independence, and expression. The role of parents as partners in their young children's play, also varies across cultures, with some, such as American and Turkish, considering parents as vital play partners while others, such as Mayan

Indians, seeing play as an exclusively children's activity (Göncü & Mosier, 1991). Societies characterized as culturally-accepting or culturally-curtailing play tend to be developing or undeveloped, where children's play is either tolerated or limited due to the necessities of community survival and where play resides in the world of children, quite distinct from the world of adults.

Where parents are active in children's play, cultural meaning is deeply embedded in how parents play with their infants, their goals in play, and the materials provided to facilitate play. For example, when a mother demonstrates to her infant how to play with a toy, she not only communicates the toy's features, but also the role of toys and how social partners co-construct knowledge, thereby imbuing cultural meaning into a simple interaction (Bornstein, Haynes, Pascual, Painter & Galperin, 1999).

Even when parents of different cultures consider their role as play partners crucial to their child's development, there are variations in the focus and goals of play, reflecting emphasis on particularly valued psychological and social qualities. For example, European American mothers interact with infants in ways that demonstrate the value of independence, creativity, and assertiveness whereas Latina mothers interact with infants in ways that communicate culturally ideal values such as obedience and respect for others (Harwood, Miller & Irizarry, 1995). A pair of studies by Marc Bornstein and colleagues (1990a; 1990b) compared mother-infant interactions in American and Japanese societies. American mothers were found to encourage and respond more to the objects to which their infants were oriented, with responses being more non-electronic in nature. In contrast, Japanese mothers responded more to their infant's bids for social

interaction with responses that encouraged more attention on the face-to-face relationship than to the object environment.

Even within North America, there are differences in attitudes about play between mothers and fathers, between socioeconomic groups, and between parents and academic professors. For example, a 2000 American survey yielded the following: most parents see play as important to their children's emotional, social, and intellectual development, but also considered play less important for children under ten months of age, were less likely to see the connection between play and healthy development when less educated, were far more likely than experts to agree that unstructured play was most conducive to learning, and far less likely to agree with professors that social and emotional preparation through play was important for school readiness (DYG, 2000).

Aside from adult attitudes towards children's play, cultural knowledge is also transmitted to children via the play materials to which they have access. In developing cultures, children naturally interact in playful ways with materials normally found in the environment—drawing in the sand with tree branches, stacking stones, or pouring water from a pail. In developed nations, children still engage with materials accessible in their environments, for example, exploring a keychain, opening and closing cupboard doors, or banging on a pot with a spoon. However, in developed societies, children are also deliberately provided with materials specifically for the purpose of play. Such toys are generally rough approximations of materials indigenous to the child's environment but scaled down in size, created to be safe for multi-sensory exploration, and/or as a springboard prop for exploration, interaction, and imagination. Regardless of whether a toy is readily available in a child's environment, or whether it has been designed specifically as

a child's play thing, a traditional measure of a "good" toy is one that is 90% child action and 10% the toy's attributes (eg. Hirsh-Pasek, 2006).

#### **Parent-Child Interaction**

Children need caring adults to support their overall development. Infants and toddlers are uniquely dependent on their parents for their earliest interactions and their experiences in the world. Specifically, before children can effectively play with peers and relate socially in the broader cultural context, infants and toddlers rely on their caregivers for experiences in play, and even for learning *how* to play. "Other people don't simply shape what children do; parents aren't the programmers. Instead, they seem designed to provide just the right sort of information at just the right time to help the children reprogram themselves" (Gopnik, Meltzoff & Kuhl, 1999, p. 169). Therefore, an infant's earliest play experiences are dyadic (and triadic) social experiences first and foremost with parents. "For play to flourish as a truly enjoyable, cognitive, and socially adaptive human ability, it requires the scaffolding support of one or more concerned adults" (Singer, 2006, p. 253).

The quality of parent-child interactions is influenced by several things, including: the particular capacities of the parent, contributions from normative developmental changes, and temperamental traits in both the child and parent (Bornstein & Tamis-LeMonda, 2004; Cipriano, Dollar & Stifter, 2008; Clark, Kochanska & Ready, 2000; Eisenberg & Valiente, 2004; Kochanska et al., 2005; Laible, Panfile & Makariev, 2008). For example, a milestone such as upright mobility can influence the nature of parent behaviour (Biringen, Emde, Campos & Appelbaum, 1995). Also, temperamentally irritable infants garner less physical contact and less visual attention from their mothers than less irritable infants (Van den Boom & Hoeksma, 1994).

Loving and consistent caregivers, as they relate to children through play, critically mediate children's developmental trajectories (Shonkoff & Phillips, 2000). Mutually responsive, emotionally connected, warm and non-intrusive characteristics of the parent, especially the mother, are predictive of various positive developmental outcomes at school age. For example, mutually responsive orientation between parent and child in the first two years is predictive of self-regulation and internalization by the child at five years (Kochanska, Aksan, Prisco & Adams, 2008; Kochanska et al., 2005). As well, maternal responsiveness at nine and thirteen months predicted the timing of five milestones in expressive language development (Tamis-LeMonda, Bornstein & Baumwell, 2001), while such responsiveness at nine months predicted language comprehension at thirteen months (Baumwell, Tamis-LeMonda & Bornstein, 1997). Finally, maternal intrusiveness at fifteen months predicted toddler negativity at twenty-five months across four different cultural groups (Ispa et al., 2004). Maternal sensitivity also predicted changes in infant mood during a series of play sessions with 10-12 month old infants (Malmberg et al., 2007).

How mothers respond to their child's emotional expressions along with their own emotional expressivity contributes to the development of social competence in their child at preschool age (Denham & Grout, 1993). The emotional displays by adults also guide infant behaviour at eleven and fourteen months (Hertenstein & Campos, 2004). A twin study found that parental warmth, along with socioeconomic status, mediated two-thirds of the shared environmental variance in general cognitive ability in early childhood (Petgill & Deater-Deckard, 2004).

At two years of age, connected conversations between parent and child, characterized by mental-state references, and in particular, talk about emotions by parents, is positively associated with verbal skills and social understanding of children at two, three, and four years (Esnor & Hughes, 2008). Specific ways in which mothers talk to toddlers contribute to the child's own mental state language later. Work by Taumeopeau and Ruffman (2008, 2006) found that mothers who talk to their children at fifteen months about their child's desires, and then at two years about other people's thoughts, make up a specific sequence of behaviour that scaffolds the child's social understanding by guiding the child within the Vygotskian "zone of proximal development." In terms of early literacy skills, the quality of parent-child interactions at three years relates strongly to receptive vocabulary, symbolic representation, and phoneme analysis skills at kindergarten entry (Dodici, Draper & Peterson, 2004).

## **Contemporary Threats to Play**

Despite the importance of play for developmental wellbeing, there is evidence that the amount of playtime allotted to children is on the decline: between 1981 and 1997, the amount of playtime for a school-aged child fell from 40% to 25% of a child's day (Hirsh-Pasek & Golinkoff, 2004, p. 8). Data from 2008 find the time kindergarten children spend in literacy and math instruction, or preparing for tests, is between two to three hours per day while less than 30 minutes per day is allotted to free play (Miller & Almon, 2009). Several factors likely contribute to the decline in play, and three contemporary, intertwined forces on early childhood are discussed in detail here: children's early experiences with digital technologies, a continually increasing focus on early cognitive learning, and the economic forces of a consumer-based society.

The digital world of infants. Infants and toddlers are fully immersed in the current massive cultural shift which is marked by dizzying changes in information technology, media exposure, and digitalized materials and processes (Rideout & Hamel, 2006). While a vast body of literature over several decades has documented positive and negative aspects of television viewing by preschoolers and school-aged children, there is a dearth of information about the impact of modern media and digitalized materials on the daily lives of infants and toddlers (e.g. Wartella, Vandewater & Rideout, 2005).

In 2001, the American Academy of Pediatrics issued a policy statement in which it was recommended that children under two years watch no television or videos, while those over two years be limited to a daily maximum of two hours of only high-quality, educational programming (AAP, 2001). A few years later, the AAP reaffirmed its position in light of what they considered an increase in behavioural problems associated with extensive screen viewing by children (AAP, 2007). Despite these recommendations, infants and toddlers are regular viewers of television and videos, as indicated by a 2004 report which found that infants were being shown videos at a mean age of 6.1 months and television at a mean age of 9.8 months for an average daily time of about two hours (Weber & Singer, 2004).

Similarly, a major report by the Kaiser Family Foundation, based on survey data of over 1,000 middle-income families, and focus group data from a subset of the same families in four American cities, found preschool (birth to six years) children's home environments to be saturated with screen media: 99% with television (a quarter with four or more sets); 93% with VCR/DVD players; 50% with video game consoles (more than a quarter with handheld versions); and 78% with computers (most with internet; Rideout & Hamel, 2006). The same

report found that even young children's own environments—their bedrooms—increasingly contained such technology: one in five bedrooms of infants (aged birth to one year) contained a television, rising to almost half in bedrooms of children four to six years old, many with cable or satellite service, as well as computers specific to children's use.

Regarding computers, a 2005 American survey of families with children from six months to six years found that almost a quarter of children under two years, and over half of children between three and four years, use computers, starting with parent assistance but become autonomous users by 3.5 years (Calvert, Rideout, Woolard, Barr & Strouse, 2005). The exposure to media technology is not limited to North America. Reviewing numerous research studies, conducted in a variety of fields of study from around the world, Sigman (2007) concluded that children now spend more time at home alone in front of screens than doing anything else.

The problem with screen technology for children under two years is that there is evidence that these materials are poor teaching tools (despite the claims of manufacturers and programmers). More specifically, it appears that children under 30 months suffer a 'video deficit', which means they learn easily from live human models, but not from videotapes, or even from tapes of the same human models (Anderson & Pempek, 2005; Barr & Hayne, 1999; Troseth & DeLoache, 1998). One study found that it took two weeks of daily 'training'—children watching themselves on video with an adult hiding an object—before they could retrieve the hidden object using video demonstration alone (Troseth, 2003). Neuropsychological research supports this. Brain-imaging studies have found that both adult and infant brains respond differently to live versus televised stimuli. It has been shown that two-dimensional images on a

screen present a "different reality in the observer's brain compared to the live setting and thus does not merely attenuate brain responses of visual stimuli" (Shimada & Hiraki, 2006, p. 937).

Garrison and Christakis (2005) extended the research beyond television to include all screen technology designed as learning tools for very young children, (e.g., *V.Smile, Leapster*, and the *Read With Me DVD system*). They concluded that "preliminary research indicates that the various media may be less effective in educating very young children than are other activities that they may well be displacing—such as one-on-one parental interaction" (p. 33). In addition, it appears that interactions with new technologies – be they video games, electronic storybooks, or computer-chip driven and 'responsive' stuffed animals – do not afford the child the opportunity to create, which is fundamental for learning to occur (Resnick, 2006).

Young children's exposure to media goes beyond their active participation in viewing on-screen programmes. They are further exposed to an inordinate amount of background television in the home—eight hours per day in the average American home (Gertner, 2005). Previously considered innocuous, new studies are emerging which find background television to be quite disruptive to young children's play. For example, Evans (2003) and Kirkorian (2004) found that when the TV is on, children's play episodes are shorter, with less focused attention, and fewer parent-child exchanges (both as cited in Kaiser Family Foundation, 2005). A recent study showed that during a one hour home play session, where the television was on in the background for half the time, even with minimal and sporadic viewing by children aged 12, 24, and 36 months, play with toys was significantly reduced, as was focused attention during play (Schmidt, Pempek, Kirkorian, Lund & Anderson, 2008). A correlational study of children 11-18 months of age found that some of the infants were not used to the quiet when the television was

turned off, prompting the researchers to question whether parent-infant interactions in the absence of background television represents a "normal" play context in the home of today's infants (Masur & Flynn, 2008).

This evidence suggests that television, on its own, without addressing the addition of new technologies in the home, is impacting parent-child interaction. A report from the U.K. claims "television alone is displacing the parental role, eclipsing 'by a factor of five or ten the time parents spend actively engaging with children" (Sigman, 2009, p. 15). A Japanese study linked high amounts of television viewing with less talking by parents and delayed speech development in infants and young children (Tinamura, Okuma, & Kyoshima, 2007).

**Focus on early education and learning.** In an attempt to get a 'head start' on learning, many schools, including preschools, have been reducing or eliminating play time from children's schedules (e.g. Bodrova & Leong, 2003). While learning *through* play has long been considered the basis of early childhood education, it has been replaced by structured lessons focused on cognitive development, especially literacy initiatives (Zigler & Bishop-Josef, 2006). One of the reasons for the current focus on cognitive learning for pre-schoolers is that curriculum is being 'pushed-down'—skills once taught in first or second grade are being taught in kindergarten, with kindergarten skills now bumped down to preschool—as a consequence of the No Child Left Behind programme promoted during (U.S.) President Bush's regime (Golinkoff et al., 2006). In addition, it is suggested that early childhood education program quality is less play-based due to teachers relying on teaching strategies for older children when working with preschool-aged children (National Association for the Education of Young Children [NAEYC], 2009).

academic activities long considered inappropriate for preschool-aged children, such as pencil and paper tasks. "All parents want now are worksheets, and they want them in their babies' hands as early as possible" (Bodrova & Leong, 2003, p. 12). Many early childhood education programmes are pressured to adapt their programmes, even if in doing so, they devalue children's play and violate tenets of developmentally appropriate practice in early childhood education (NAEYC, 2009).

A vast industry--\$20 billion in 2006—of 'educational' materials for infants has spawned to gird the goals of promoting early cognitive development as somehow separate from play (Knowledge@Wharton, 2007). Such educational materials, increasingly technological in nature, or "edutainment," are promoted as capable of teaching very young children (including infants) the academic concepts they need in order to be successful in school (Resnick, 2006). According to Resnick (2006), both education and entertainment are seen in our society as services provided by others—entertainment by studios, actors, and directors, and education by schools and teachers—to a passive recipient. Yet as Jerome Bruner (1963), amongst other child development experts, reminds us, learning does not happen passively, but rather, learning occurs when one is an actively engaged participant in the construction of knowledge. In young children, this active engagement is play (e.g. Singer, Golinkoff & Hirsh-Pasek, 2006).

The enormous, growing market for 'educational' materials designed specifically for infants suggests that parents, families, and educators feel the need to give their children a cognitive advantage from day one, if not before (Hirsh-Pasek, Golinkoff, Berk & Singer, 2009; Rosen, 2006; Wall, 2006; Ward, 2006).

A classic example is the *Mozart Effect*: the belief that exposing pre-born infants to classical music will boost their intelligence and early music instruction will enhance their mathematical abilities (Leng & Shaw, 1991; Rauscher, Shaw & Ky, 1993, 1995; Rideout & Laubach, 1996; Rideout & Taylor, 1997). However, this belief is based on research that was never done with infants pre- or post-partum. The *Mozart Effect* remains controversial on many levels; studies both replicate (Nantais & Schellenberg, 1999; Rideout & Taylor, 1997) and fail to replicate (Steele, Ball & Runk, 1997) the original findings. Many criticize the methodologies used, the conclusions reached, or the misapplication of findings (e.g., Rauscher & Shaw, 1998).

Regarding misapplication of findings, further examples can be found in a 2005 report by the Kaiser Family Foundation: reviews of electronic products for children birth to six years from five major retailers; in-depth examination of 29 products; a review of research literature related to in-home screen media and computer programmes for this age group; and interviews with nine industry representatives (Garrison & Christakis, 2005). A *Baby Einstein* video aimed at infants as young as one month claims to create "learning opportunities" (p. 14). A *Nick Jr*. video for three-month olds claims to be "specifically designed for babies' social, emotional, cognitive and physical development" (p. 14). A *Brainy Baby* video for children six months and older states on its package that the video will "teach your child about language and logic, patterns and sequencing, analyzing details and more" (p. 14). Similar claims, but more skill-specific, are made for computer programs and hand-held video games designed for toddlers and preschoolers (Garrison & Christakis, 2005). Garrison and Christakis (2005) further report on parental feedback that suggests they believe the educational claims of such products: "[he]…is getting smarter as he watches" (p. 15); "there is so much education in this video" (p. 15); "he will come

away...with more synapses in his brain than had he not watched" (p. 15); and the television advertisement for *V.Smile* where the mother states, "You'll never get into college if you don't play your video games!" (p. 19).

A recent study found that parents do, indeed, believe the educational claims made on toy packaging (Wong et al., 2008). Certainly, many of the products state the expectation that parents engage with these materials together with their child. Magazine ads for various technological educational materials, such as electronic books, show the child sitting on the parents' lap engaged in happy play together. Infancy, it would seem, is now considered primarily a period for teaching in the academic sense. As the instruction booklet accompanying the *V.Smile* system states: "Many realistic and caring parents are partnering with television to create electronic classrooms—right in their own living rooms" (Garrison & Christakis, 2005, p. 20).

Research into the effects of television and videos on middle childhood and early childhood development has focused on the amount of viewing, and the programme content (e.g. Huesman et al., 2003; Vandewater et al., 2005). The passive nature of screen viewing has largely been contrasted with the value of children extensively engaged in active, exploratory, and social play with manipulative materials found in the environment or toys provided to them by adults (Pellegrini & Smith, 1998; Singer, 2006; Sommerville, Hildebrand, & Crane, 2008). In the last several years however, manipulative toys are being increasingly replaced as more shelf space is given over to electronic toys for children of all ages (Business Wire, 2007; Wall, 2006), and the most popular toys are electronic (Ritchel & Stone, 2007). For example, there are now laptop computers for infants and toddlers, electronic talking books, animated stuffed animals and dolls, digital cameras for little hands, and battery-driven materials of every kind, including infant

rattles, which form the mainstay of any toy catalogue or toy store shelf. Parents and early childhood educators must now actively search for toys and materials that do not flash lights, ping, ring, speak, or direct children's manipulations by pre-programmed, technical scripts.

To date, there is no empirical research into whether the nature of play has fundamentally changed or whether there are effects on early development or later learning as a result of the changed nature of play materials. However, Buckleitner (2006) conducted a study with three- to five-year-olds and found that computer-based learning was more successful when children had greater control over the software. After videotaping toddlers and their mothers using so-called 'interactive learning systems,' however, and seeing the children's general disinterest in meaningless button-pushing along with over-prompting by the parent, he concluded that "these are a state-of-the-art bad idea" (as cited in Guernsey, 2007, p. 195).

The business of babies. Children's worlds are annually saturated in new media products. For example, in 2007, there were 550 new software titles aimed at children (Buckleitner, 2008). The brand marketing of children's materials is deeply embedded in their life, as products, and characters, are now seen not just in the form of toys, but on children's clothes, accessories, foodstuffs, housewares, decorations, as well as in entertainment sponsorships and direct marketing campaigns (Linn, 2009). In 2006, educational products for *babies* alone represented a U.S. \$20 billion industry (Knowledge@Wharton, 2007). *Baby Einstein* videos alone, marketed specifically for infants under one year of age, earned \$250 million in annual revenue by 2006, ten years following its creation (Guernsey, 2007). Only recently has research considered the potential impact of screen technology—television and videos—on the development of children younger than two years. It is therefore noteworthy that as the modern play context has rapidly

shifted with the incorporation of computer-chip technology into the design of most toys, there has been no research published on the potential implications of these types of toys on development and learning. As such, it has not yet been determined whether concerns relating to screen media for very young children extend to electronic toys (e-toys). There is, however, emerging data identifying a significant decrease in live face-to-face interaction (Masur & Flynn, 2008; Sigman, 2009). Moreover, this decrease is paralleled by an increase in virtual social interactions using media technology, and the concomitant impact of this virtual communication on health outcomes for children and adults, including genetic alterations (Sigman, 2009).

Yet, the number one reason parents cite for why their very young children use screen media is to release them from minding the child in order to accomplish other tasks (Rideout & Hamel, 2006). The use of video media as child-minding is actually emphasized by a Nickelodeon representative as a "safe" alternative to television: "You can put them [our videos] in, walk out of the room, and there's nothing bad the kid is going to see" (Garrison & Christakis, 2005, p. 29). Some of these materials are designed to be played on a continuous loop, which facilitates independent viewing by the child rather than co-viewing by parent and child (Garrison & Christakis, 2005). They are further reported to relieve parental guilt for lack of face-to-face interaction: "Get this video if nobody around you house has time to actually tell your child what a 'ball' or 'cat' is..." (Garrison & Christakis, 2005, p. 15). Of course, without research, it is not yet known if providing children with a diet of electronic toys, with or without screens, has an impact on their developmental wellbeing.

## The Current Study

Play is a vital component of children's development, and serves a variety of developmental needs. Parent-child interaction in the early years mediates development and learning processes, with toys used as cultural tools in interaction with children. It is also becoming increasingly evident that as technological tools, in particular digital screen media, continue to be integrated into the daily lives of young children, that there is an increase in the potential for negative impacts on parent-child relations, and therefore, potential risks to healthy child development. Yet, these potential risks have not been studied.

The present study intends to rectify the lack of information about the impact of increasingly electronic toys on children's play experiences by exploring parent-child interaction when playing with electronic versus traditional manipulative toys. The specific research questions this study attempts to address are first, what is the play context for toddlers, and second, whether the use of electronic toys compromises the child's play experience by negatively affecting the quality of parent-child interaction. There is no previous empirical research that has explored this question, although we know that there is a decline in the quantity and quality of parent-child interaction with direct and indirect use of media technology (primarily television) in the home (Masur & Flynn, 2008; Mendelsohn et al., 2008; Schmidt et al., 2008; Tinamura et al., 2007). Given that electronic toys are an extension of such media technology (they increasingly incorporate screens, simple controls, voice commands, and interface with television and computer systems), it is likely that the increase in exposure to electronic toys will also have an impact on parent/child interactions.

## Method

#### **Participants**

**Recruitment.** Participants included mother-child dyads who responded to notices about the study, which were placed through the lower mainland of Vancouver in various places where toddlers congregate, such as in infant development programmes, family places, public libraries, coffee shops, and toy stores. The recruitment notice was also distributed electronically (e-mail and websites) to several community agencies in Greater Vancouver who provide services to toddlers and families. In addition, notices were distributed via friends, family, social networks and by word-of-mouth. Finally, recruitment notices were sent by mail to child-care providers specifically serving children under three years of age as listed on the Child Care Referrals and Licensing data-base.

Eligibility for the study, on the mother's part, required she be the child's primary caregiver, that she be willing to be videotaped playing with her toddler in her home, and that her English language ability was sufficient to give informed consent and to complete the questionnaire. Toddlers were eligible if they were between the ages of 16-24 months.

In total, 32 potential participants expressed interest in the study and data were collected from 25 mother/child dyads between October 1, 2009 and January 31, 2010. Two families who volunteered did not qualify because the child's age was outside the study's parameters. One family who volunteered was not home upon arrival for their scheduled visit. An additional two mothers changed their minds about participating and withdrew. Finally, two mothers were unable to participate due to unexpected family matters.

## Procedures

This study measured parent-child interaction behaviour under two conditions: playing with electronic (e-toys) and with non-electronic toys. Participants used two sets of play materials. Each set of toys was collated to facilitate language play (books), cognitive play (problem-solving), and pretend play (animal figures).

One set consisted of three non-electronic toys for toddlers 18-24 months old. Item one was a board book suitable for toddlers: *Stop, Look & Learn, First Words* by *Brendon Publishing International, 2003*. The second item was a shape-sorter recommended for children over twelve months of age, with the caption that the toy supported "creative development, language and communication, mathematical development, and logical thinking:" *Shape & Sort it Out* by *Plan Toys*. The third toy was a farm set by *Playmobil 1•2•3*. The set consisted of a plastic barn façade with doors, five animals, a person figure, and accessories rated for children one-and-a-half years of age.

The second set consisted of three electronic toys designed for toddlers. The first item was an electronic book: *Touch & Teach Busy Books*<sup>TM</sup> by *V-Tech* for children over twelve months of age, with the promise that it "teaches letters, shapes, colors, sounds, numbers, animals, objects." The second item was an electronic shape sorter: *Cookie Shape Surprise*<sup>TM</sup> by *Fisher-Price*, with a designated age of 6-36 months with claims that it teaches "numbers, shapes, sorting, cause & effect" and that it "magically knows what baby has sorted." The last item was a set of three plastic animals on wheels: *Funderful*<sup>TM</sup> *Roll Along Safari*, targeted at children from eighteen months, with the statement that the benefit of the toy is "to teach simple letters & colors, hear tunes." The duck has one button that makes a "quack" sound when activated. The tiger has

several buttons that play a selection of classical music passages. The giraffe has several buttons in a variety of shapes and colours that both play music and identify colours and shapes when activated.

Play sessions were videotaped in the family's home at a time and day chosen by the family. Each mother-child dyad participated in two, sequential, 10-15 minute play sessions. Half the sample (13 of 25) used the non-electronic toys in the first session, followed by electronic toys in the second session. The other half of the sample used the play materials in reverse order. Mothers chose the space in their homes for the recording to take place but were encouraged to play where they normally would. Prior to recording, the study was reviewed, and the consent form was read and signed by the mothers. The recording procedure was outlined as two sessions, each to last ten to fifteen minutes, with a stop in the middle to switch the bag of toys. Mothers were told that one set of toys consisted of "traditional" or "manipulative" and the other "batteryoperated" or "electronic." Prior to commencement of recording, any questions raised were answered. An example was: "What if my child wanders off to other toys?" Reassurances were provided that toddlers frequently move about the environment and might interact with other objects or the person doing the recording and that would not be problematic. Lastly, mothers were instructed to "try to explore all the toys and play with your child as you normally would." At the end of the first session, the recording stopped briefly, while the first bag of toys was removed and the second bag of toys was presented. Recording recommenced at that point. Following the recorded sessions, several mothers reflected on their experiences or observations or asked questions of a general nature while the materials were packed and mothers and children were thanked for their participation.

#### Measures

**Demographics.** Demographic information and information about the child's play context was collected by self-report questionnaire (see Appendix A). Specifically, data collected included: a) child's date of birth, age and gender; b) primary, secondary, and other language(s) used in the home; c) ethnicity; d) family composition—number or adults, children, and age/gender or children living in the home; e) maternal education level.

The participants included 10 girls and 15 boys. The average age of the child was 19.75 months (range 16-24.5 months). Regarding ethnicity, most families (92%) indicated English as their first language, with Mandarin identified as the first language in two families (8%). The majority (72%) indicated no second language while 28% indicated the use of at least one language in addition to English. A majority of families (76%) identified their ethnicity as exclusively Caucasian/European. Three families (12%) were of exclusively East Asian ethnicity, while three families (12%) identified their child as of mixed ethnicity.

For this sample, the level of maternal education was moderately high (mean level on a five-point scale, where a five represents postgraduate work, M = 3.56; SD = .87) and 88% of the children live in two-parent homes. The remaining 12% live with more than two adults in the home.

**Play patterns.** Several questions gathered information about the family's typical play context (Appendix A). These questions identified the child's normal play partner(s), the proportion of toys that are battery-operated/electronic, parents' perception of the value of play, and the frequency and duration of engagement in seven play contexts. The most commonly

identified play partner was the mother, in 11 families, while parents equally were identified in eight families. Only one family identified someone other than one or both parents as the child's primary play partner. Secondary play partners consisted of siblings, other relatives, paid caregivers, and unrelated adults and children. Regarding the proportion of their child's toys that were battery-operated, on a five-point scale where zero represented "none" and four represented "almost all," the mean was M = 1.36, SD = .81, which was somewhere between "a few" and "half."

**PICCOLO.** Parent-child interaction was coded using the Parenting Interactions with Children: Checklist of Observation Linked to Outcomes (PICCOLO) (Roggman et al., 2009). This measure, while newly-developed, was compared to existing popular measures of parentchild interaction such as the *Eyberg Child Behavior Inventory (ECBI)* (Eyberg & Pincus, 1999), the *Dyadic Parent-Child Interaction Scales (DPICS)* (Eyberg, Nelson, Duke, & Boggs, 2005), the *Parent-Child Interaction Assessment II (PCIA-II)* (Holigrocki, Kaminski & Frieswyk, 2002), the *Child Rearing Inventory (CRI)* (Brestan, Eyberg, Algina, Johnson & Boggs, 2003), and the *Behavior Coding Scheme (BCS)* (Forehand & McMahon, as cited in Aspland & Gardner, 1981) along with the 1999 revision, *FAST Track.* These measures were rejected as they primarily measure problem behaviour and/or parent perception and management of problem behaviour in children over two years (*ECBI, DPICS, CRI*), or are for use with older children (*PCIA-II*), and are used for therapeutic purposes.

The PICCOLO is a measure of positive parent-child interaction behaviours specific to children birth to three years of age. The PICCOLO was developed for home-visiting practitioners who support children's development by supporting the parenting of the child. It is based on a

"mutual competence" approach to intervention and service provision (e.g. Goldberg, 1977) with roots in attachment theory (e.g. Zeanah, 1993, Zeanah & Barton, 1989), relational intervention practices (e.g. Bernstein, Campbell & Akers, 2001), and positive psychology (e.g. Kalmanson & Seligman, 1992). The PICCOLO codes 29 parent-child interaction behaviours using a three-point scale, grouped in four domains: Affection, Responsiveness, Encouragement, and Teaching. The domain of Affection consists of seven behaviours that demonstrate warmth, physical closeness, and positive expressions toward the child. An example is praise: parent says something positive about child or about what child is doing. Responsiveness includes seven behaviours that demonstrate responding to the child's cues, emotions, words, interests, and behaviour. An example is flexibility about the child's change of activities or interests. Seven behaviours observed within the Encouragement sub-domain demonstrate active support of exploration, effort, skills, initiative, curiosity, creativity, and play. An example of supporting the child to do things on his/her own is allowing the child to choose activities and attempt them alone before offering help or suggestions. There are eight behaviours in the Teaching sub-domain that demonstrate shared conversation and play, cognitive stimulation, explanations, and questions. An example is "parent plays make-believe in any way-for example, by 'eating' pretend food." The complete PICCOLO scales may be found in Appendix D.

Established by coding 4,500 video clips by two or more observers from three major ethnic groups, the overall inter-rater reliability is reported as 85% on average (range 81%-92%) across the four domains (Cook & Roggman, 2009). According to the technical report, PICCOLO has good internal consistency with Cronbach's alphas between .75 and .80 among the four domains (Cook & Roggman, 2009). The four domain scales for this study yielded Cronbach's

alphas between .47 and .65. However, as sample size has a significant deleterious effect on the precision of alpha estimates, supplemental reporting of standard error is considered best practice, and is provided in Table 1 below (Duhachek, Coughlan & Iacobucci, 2005). Further information on construct validity and predictive validity of the PICCOLO may be found in Appendix C. Table 1

PICCOLO Sub-Domain	М	Variance	SD	Cronbach's Alpha α	Number of Items
Affect (0-14)	12.9	2.07	1.44	.49	7
Responsiveness (0-14)	12.2	2.45	1.57	.48	7
Encouragement (0-14)	12.6	2.08	1.44	.47	7
Teaching (0-16)	10.3	7.60	2.76	.65	8

Internal reliability by standard error measures and Cronbach's alpha (N=100)

## Coding and Analyzing the Observational Data

Descriptive statistics were used to summarize questionnaire data where scales were employed. Responses to the questionnaire's section on the perceived benefits of play were compiled and organized into conceptual themes. Each videotaped play session was coded independently by two persons trained in the use of the PICCOLO, with the exception of the two sessions for one dyad where the coders jointly viewed and coded the recordings. In order to be considered competent and reliable coders, the authors of the PICCOLO suggest that coders engage in approximately eight hours of training, under their tutelage, to practice coding videotaped parent-child play interactions. Both coders had undergone such training in 2008 and 2009, with extensive joint practice following their respective training sessions.

The overall inter-rater reliability for the current study, with two observers of different ethnic backgrounds, was 96% (range 87-98% across domains). This is an exceptionally high inter-rater reliability that likely reflects extensive joint coding practice and related discussions in professional practice. The coders work with the same population of families in the community and have had previous opportunities to agree on coding practices for questionable behaviour items observed, as per the intent of the PICCOLO.

For each observation checklist, each of the four sub-domains—Affect, Responsiveness, Encouragement, and Teaching—results in a score between 0-14 (or 0-16) in each of two toy conditions. A total score from 0-58 was summed from the four sub-domain scores. The scores provided by the coders were first compared for purposes of inter-rater reliability. The scores of the two coders were then averaged. The averaged total scores, the averaged sub-domain scores, and the averaged individual item scores within the teaching sub-domain, were statistically compared by condition with paired-samples t-tests, as noted in the Results section below.

#### Results

#### **Play Patterns**

As noted above, mothers reported on how frequently and for how long their child typically engaged in seven modes of play. Frequency was reported on a six-point scale where zero represented "never" and six represented more than once per day. Duration per play session was reported on a five-point scale where one represented less than five minutes and five

represented more than 30 minutes. Means and standard deviations for frequency and duration of typical play are summarized in Figures 1 and 2 below.



Figure 1: Average reported frequency of play modes



Figure 2: Average reported duration of play sessions

Most of the children in this sample were afforded experiences in all seven modes of play. Toys, books, vocal play, and physical play were experienced daily, on average. One exception was exposure to screens (television, videos, computers) where almost a third (32%) of children had less than weekly exposure, with 16% having no exposure whatsoever. Parents who permitted their toddlers to view screens did so frequently with 52% of children engaged in this activity daily or more often. This apparent split in the approach to toddlers' use of screen technology explains the high variability in scores.

Children engaged in all play modes for at least five-to-ten minutes per session. As might be expected in urban and suburban living, excursions had the longest duration at close to 30 minutes on average. Time spent viewing screens was over 20 minutes per session for 44% of toddlers. At the same time, 16% of toddlers were reported to engage with screens for less than five minutes per session, with 12% reporting no time at all in this activity. In general, variability in scores for duration in modes of play was notably higher than for frequency.

## Parents' Perceptions of the Benefits of Play

An open-ended question on the survey asked parents to answer "how does your child benefit from play?" Specific answer options were purposively omitted so as not to lead to particular responses. Mothers' answers were grouped into conceptual themes, as seen in Figure 3 below.



Figure 3: Mothers' responses to the benefits of play for their toddlers, by theme.

An overwhelming majority of mothers (88%) listed cognitive benefits (learning, cognition, problem-solving) as the primary benefit of play for their toddlers. Almost half (48%) of families identified the development of social skills or relationships as a benefit of play. Slightly fewer (44%) considered play to benefit the development of motor skills, perceptual skills, and/or coordination. A little over a third (36%) of families saw play as beneficial to their child's development of imagination and/or creativity. A quarter of mothers (24%) specified play to contribute to language development. Lastly, 20% of families considered play to teach their child "proper behaviour" or to develop self-esteem.

## **Parent-Child Interaction - Overall**

To evaluate differences in parent-child interaction for the electronic versus non-electronic play conditions, a paired-samples two-tailed t-test was conducted to evaluate the impact of toy type on parent-child interaction (PICCOLO). For the total PICCOLO score, the mean was significantly lower in the electronic toys condition (M = 45.50, SD = 5.09), compared with the non-electronic toys condition (M = 50.34, SD = 4.86), t(24) = 5.12, p < .001. The mean difference
in total PICCOLO scores was 4.84, 95% CI [2.89, 6.79]. Cohen's D statistic, at .97, indicates a large effect size.

#### **PICCOLO Sub-domain Analyses**

Paired-samples two-tailed t-tests were also conducted to evaluate the effect of toy type on the various PICCOLO sub-domains, including: affect, responsiveness, encouragement, and teaching. As described below, all means were lower in the electronic toy condition, although only significantly so for three of the four outcomes.

For affection, although not significant, mean affect scores were lower in the electronic toys (M = 12.64, SD = 1.30) versus the non-electronic toys condition (M = 13.06, SD = 1.53), t(24) = 1.31, p = .203. For responsiveness, the mean was significantly lower in the electronic toys condition (M = 11.66, SD = 1.59) as compared to the non-electronic toys condition (M = 12.64, SD = 1.12), t(24) = 3.72, p = .001. The mean difference in responsiveness scores was .98, 95% CI [.44, 1.52]. Cohen's D statistic at .71 indicated a medium effect size. For encouragement, the mean was also significantly lower in the electronic toys condition (M = 12.24, SD = 1.51) when compared to the non-electronic toys condition (M = 13.00, SD = 1.03), t(24) = 2.70, p = .013. The mean difference in encouragement scores was .76, 95% CI [.18, 1.34]. Cohen's D statistic at .59 indicated a medium effect size. Finally, for the domain of teaching, the mean was significantly lower in the electronic toys condition (M = 8.98, SD = 2.28) compared to the non-electronic toys condition (M = 8.98, SD = 2.28) compared to the non-electronic toys condition (M = 8.98, SD = 2.28) compared to the non-electronic toys condition (M = 8.98, SD = 2.28) compared to the non-electronic toys condition (M = 8.98, SD = 2.28) compared to the non-electronic toys condition (M = 8.98, SD = 2.28) compared to the non-electronic toys condition (M = 8.98, SD = 2.28) compared to the non-electronic toys condition (M = 11.60, SD = 2.49), t(24) = 5.52, p < .001. The mean difference in teaching scores was 2.62, 95% CI [1.64, 3.60]. Cohen's D statistic at 1.10 indicated a large effect size.



Figure 4: PICCOLO subdomain mean scores by condition

**Teaching sub-domain.** Given that the teaching scale yielded the largest mean difference between the two conditions, with the largest effect size, further analyses were conducted within this domain. Paired samples two-tailed t-tests were conducted to evaluate the effect of toy condition on scores for *each* of the eight behaviours within the teaching domain of the PICCOLO. The means scores were significantly lower for five of the eight items on the teaching sub-scale in the electronics condition, as noted in Table 2 below. Where significant, effect sizes were medium and large, using Cohen's D measure for effect size.

## Table 2

## Analyses of items comprising the teaching scale of the PICCOLO

Item			Ν	4 (SD)
Electronic	t	df	Non-electron	nic
1. Explains reasons for something to	3.06**	24	.82	.34
child			(.63)	(.43)
2. Suggests activities to extend child's	1.90	24	1.34	1.06
actions			(.61)	(.58)
3. Repeats/expands child's words or	2.63*	24	1.74	1.32
sounds			(.54)	(.76)
4. Labels objects or actions for child	1.37	24	2.00	1.94
			(.00)	(.22)
5. Engages in pretend play with child	4.10***	24	1.44	.68
			(.74)	(.69)
6. Does activities in a sequence of steps	.78	24	.58	.46
			(.57)	(.58)
7. Talks to child about characteristics	2.32*	24	1.80	1.54
of objects			(.35)	(.66)
8. Asks child for information	2.60*	24	1.88	1.64
			(.30)	(.57)

## Discussion

It seems clear from the play questionnaire that a strong majority of parents consider early learning as the primary purpose of their child's play. It appears that today's parents have fully

absorbed a decade or more of emphasis on the importance of the early years in general, and in particular children's cognitive development and learning. Yet, for toddlers at least, the results of this study show that using electronic toys may be detrimental to the quality of parent-child interaction, and hence fail to assist the early learning goals that parents may have for their children. These results support the hypothesis of the main research question. In three of the four domains of parent-child interaction as measured by the PICCOLO, mother's behaviours were significantly less positive—less responsive, less encouraging, and less instructive.

The results of this study lend support to the claim that today's toys often have "only 10% input from a passive child who does little more than turn on a video or respond to a computerized gadget" (Hirsh-Pasek, 2006, p. 2). Leaving aside the question of whether structured learning environments are important for toddlers, it is nonetheless ironic that the use of materials specifically marketed, promoted, and provided to children as 'educational' was shown to be detrimental to the process of early learning—the primary perceived benefit of play for most parents.

The largest mean differences were in the teaching domain, with mothers significantly more instructive with traditional toys than with electronic toys. The eight items on the teaching sub-scale are behaviours that reflect shared conversation and play between child and parent, and cognitive stimulation, explanations, and questions on the part of the parent. In this sample, the largest difference in a single behaviour was the lack of engagement in pretend play with the child (Item 5) when using e-toys. Given the weight of evidence about the critical value of pretend play in children's healthy development (Berk, 2010; Berk et al., 2006; Elias & Berk, 2002; Howes, 1992; Howes & Matheson, 1992; Singer & Singer, 2005; Singer et al., 2003), it is important that

parents be informed that traditional, non-electronic toys are more likely to inspire engagement and instruction in pretend play. It is the adult, in relationship with their child, who models and mediates the symbolic use of toys and actions in pretend scenarios. The toddler period is particularly critical as "make-believe starts in the second year in rich parent-toddler interaction" (Berk, 2010). It appears that the technological sophistication of electronic toys may be failing to replicate the parents' role in the development of make-believe play, and likely, the child's overall development.

Three items on the teaching subscale—repeating/expanding the child's words or sounds, asking the child for information, and explaining the reasons for something to the child—also showed significant differences with medium or large effect sizes. These three items involve language and conversation between parent and child, and all resulted in lower average scores in the e-toys condition. From anecdotal observations of watching the parents and children with these materials it was clear that the parents were trying to follow the dictates of the toy, from how it worked, to responding to a narrow range of possible responses. For example, with the electronic book, the software asked the child to "find" an item in its pages by touching the "bee" onto a particular object based on the object's name, shape, or numeral. Apart from the child often finding it physically challenging to carry out such an action, any off-task initiations by the child as they looked at or touched the pictures, either failed to yield any response, or a non-contingent response. Also, if the child's (or parent's) response was less than immediate, the toy moved on to ask another question making the toy non-synchronous with the child's focus. It is interesting that on a very few occasions, children pointed to a picture in the book in response to their mother asking them "where is...?" questions, but not one child responded to the toy's request to do so.

One mother commented, in relation to the electronic book: "Well, this isn't teaching us anything." Additionally, children almost never repeated any of the words spoken by the electronic book, but some children did repeat the same word(s) after their mother said the words.

An interesting anecdotal (non-measured) difference observed by the coders was the almost total lack of language by the child when playing with e-toys. The children almost never responded to the toys with language, and rarely responded to their mothers' language when she attempted to engage them verbally. The predominant sounds were the electronic voices and noises coming from often several toys at once. The toddlers seemed less bothered by the cacophony than did their mothers. Based on this, it seems that electronic toys might actually interfere with children's language development as they reduce parent-child communication. Future work in this area should formally investigate the specific impact of electronic toys on language development.

This study's sample was high functioning and involved mothers who were educated, in two-parent families, and who provided a healthy array of play opportunities for their toddlers with a variety of play partners. In fact, the parent-child interaction scores for the non-electronic toy period were very high and provided evidence that this was a group of highly competent mothers. Indeed, they were interested enough in this topic to volunteer for the study. This makes the findings even more powerful—that even highly competent mothers cannot compensate for the deficits in parent-child interactions that are associated with playing with electronic toys. Although the decrease in scores in the e-toys condition was not of such as a nature as to place their scores in the high-risk ranges as per the PICCOLO, the impact of electronic toys may be more pronounced and/or have more of an impact on children already at risk for poor

developmental outcomes due to a variety of socio-economic, mental health, or developmental factors.

#### **Limitations and Strengths**

Limitations of this study largely stem from its exploratory mandate, including a small sample size. A larger sample would have afforded the opportunity to explore other explanatory factors, including moderating effect. However, it is notable that despite the small sample size, the effect sizes for this study were moderate to large. As the sample involved volunteer participants, it was not possible to ensure a heterogeneous sample, and certainly, this sample was less diverse, in terms of both socioeconomics and ethnicity, than would be reflective of the population of Greater Vancouver or British Columbia. Future work should include more diverse participants. Exploring cultural differences will also be important.

A second limitation involved the challenges of using a new measurement tool. While the PICCOLO is based on easily-observed behaviours, even trained coders must make decisions when observing nebulous behaviours, to produce the most reliable results. In service provision practices, such decisions can be made jointly, through discussion with other trained observers. In research, when coding independently, one of the challenges was the need to review recordings where doubt existed, however, this only applied to distinguishing between the degree to which a behaviour was observed (a score of 1 or 2), rather than *if* the behaviour was observed. Also, observed behaviours were not required to be coded in mutually exclusive sub-domains—indeed, some parent behaviours met the definitions of items on more than one sub-scale on the PICCOLO.

A possible further limitation was the inability to guarantee that videotaped parent-child interactions were accurate representations of typical behaviour for the dyad. However, given the ubiquitous nature of video cameras in the lives of modern families, along with mothers giving their consent to be videotaped themselves, it is unlikely that this study failed to capture natural parent-child interaction in any way that would diminish the results.

Lastly, while results were significant, and supported the general hypothesis that electronic toys have a negative impact on parent-child interactions, data collected from a sample of convenience limits generalization of the results. Parents interact in many different ways with their children, and interactions occur throughout the day and vary from day to day. This study isolated particular parent-child interactions for a brief period of time, with a very specific manipulation of materials.

A strength of this study was its design. By collecting data in the child's natural environment, with the child's primary caregiver, and recording sequential play sessions where the only manipulation was the toys used, many potentially confounding variables were avoided. Specifically, the potential effects of an unfamiliar environment, interacting with an unfamiliar person, and the potential variances in parent-child interaction based on different days or times, were avoided.

Further, utilizing a measure of positive parent-child interaction is a departure from many studies on play and/or development that focus on measuring the child's developmental skills or from studies on parent-child interaction in a clinical population. As discussed earlier, a focus on positive behaviours has been shown to enhance service provision to families by building on strengths (Bernstein, 2003). Measuring the interactions between parent and child is consistent

with Bronfenbrenner's (2005) bioecological model of development in that parents playing with young children represents a proximal process that when enduring, forms the basic context for human development (Lerner, Theokas & Bobek, 2005). Measuring positive parent-child behaviours is appropriate for a community sample where no assumption is made about maladaptive functioning in the mother-child dyad, and rather, allows for measurement of differences in positive, developmentally-promoting behaviours among normally-occurring changes in context.

#### **Implications for Practice**

This study has provided evidence that parent-child interactions are compromised when playing with battery-operated toys. It appears that the embedded technology somehow gives parents the message that it is the object that creates the play rather than the child's interaction with it. If it is believed that the toy can direct the play interaction, then it is not surprising that parents might feel unneeded and perhaps expect the child to be entertained by the toy on his or her own. Parents might further believe that the toy's programme has the power to teach the child through simple exposure to its data. Implications for practitioners are manifold.

First, practitioners are advised to educate parents and caregivers about the broad spectrum of children's play, and to help them ensure that children engage in a healthy "diet" of play that includes activities from all forms of play on a regular basis. Second, practitioners can help parents and caregivers become critical consumers of play materials. Only some forms of play involve toys, and a wide variety of mostly open-ended, non-electronic toys will maximize a broad spectrum of children's play. While electronic toys may seem modern, amusing, or sophisticated, they are best provided very occasionally, if at all. If parents do choose to provide

children with electronic toys, it is vital that they know they must still mediate the interaction and search for ways to look for play opportunities beyond the toy's design limitations (easier done with some electronic toys than others). Thirdly, practitioners can help parents understand the various ways children learn by experiencing play as self-expression, and in interaction with people, rather than narrow responses to pre-programmed stimuli. Creating play materials, and recombining play materials in imaginative ways helps children move beyond simple stimulus-response patterns of activity. Fourthly, practitioners may want to be mindful of their own clinical skills in order to best model play interactions and to support and, indeed, encourage parents to play *with* their children. In particular, educating parents and caregivers about the true value of social interaction and pretend play, for enjoyment and without pre-determined outcomes, could form the cornerstone of service provision in early childhood development and family support programmes.

#### **Future Research Directions**

Future work in this area should explore interactions occurring at different times of the day. Event sampling methods (beeper studies), which randomize the schedule of observation, combined with the ubiquity of video recording devices (e.g, on cell phones) might be one possible way to explore this. It would also be advisable to incorporate measures of parental language use and/or child language development.

In general, future directions in research should involve both a broader, more comprehensive assessment of children's opportunities for various types of play, as well as a more in-depth evaluation of the how digital media in children's lives relate to family and community factors. Further research may also attempt to analyze parents' real experiences—both

challenges and opportunities—in managing the task of raising their children in a world marked by breathtaking changes in digital technologies. Certainly, many researchers and advocates are sounding the alarm bells regarding technology's potential role in the decline in children's play, with concomitant concerns about children' developmental wellbeing (Azar, 2002; Berk, 2010; Hirsh-Pasek et al., 2009; Sigman, 2009; Winerman, 2009)

#### Conclusion

The major result of this study suggests that it is not just infant and toddler use of screen media (television, video, computers) or background television in the home (Garrison & Christakis, 2005; Kirkorian et al., 2009; Masur & Flynn, 2008; Mendelsohn et al., 2008, Rideout & Hamel, 2006) that is compromising rich parent-child interaction, but that electronic toys provided for young children may have a similarly negative impact. While an exploratory study, evidence has been provided that extends the concerns associated with screen technology to include the increasing portability of such technologies as they become ever more integrated into the materials in children's daily lives, and throughout their daily experiences. Berk (2010) well encapsulates the current challenge to children's play:

Despite overwhelming evidence to support play as a child's basic right, skepticism about its value is widespread, fueled by a marketplace of developmentally inappropriate 'educational' toys, by heavily test-oriented elementary school curricula that have transformed preschools and kindergartens into academic 'boot camps,' and by similar pressures that have spilled over into children's homes. The result is a demise of unstructured playtime—a trend that is not just a North American phenomenon but that is spreading across the globe. (p. 239)

The results of this study would be of concern to researchers and practitioners who subscribe to different theoretical viewpoints regarding the role of play in early development. From a Piagetian perspective, children construct knowledge when engaged in play with the objects in their environment (Piaget, 1932). Therefore, the objects found in children's environments represent the potential source of what is deemed important knowledge for the child to acquire. Extensive play with electronic objects may allow the child to become very competent at the mechanics of operating technological materials but may over-emphasize the mechanistic aspects of the tool. Under-emphasized, or even missing, may be the conceptual elements that are the product of engaging with objects in the environment, in particular, the development of executive functions in higher-order thinking.

From a Vygotskian perspective, children create knowledge within the 'zone of proximal development (ZPD),' guided to mastery by more capable human partners (Vygotsky, 1978). When parent-child interaction during play is diminished, as the results of this study indicate, then it is likely that children are not developing mastery, and are instead, operating outside the ZPD. Moreover, this perspective of early development relies on the child's development and early learning being mediated by more competent partners. Objects or tools, electronic or otherwise, cannot *be* such a partner. Children's learning cannot be mediated by the tool, but requires the facilitation of competent persons, preferably those to whom the child has an affective relationship. Manipulative objects are more likely to lead to joint attention and mutual play while highly-technical objects are more likely to leave children to their own devices, or lead to lower quality interactions marked by frustration, intrusiveness, negativity, and less enjoyment as the toy's design dictates which responses are required for 'success.' In general, any theory of play as the context for children's healthy development, and as the essential activity of childhood, might find that increased digital technologies, rather than expand the play context for children, rather

restrict it, and therefore potentially limit the breadth and depth of the child's potential for development and learning.

A triplet of forces—digital technology, academic focus, and the marketing of early development and learning, is creating a 'perfect storm' for the devaluation of play as a fundamental right of childhood. Electronic toys for infants and toddlers may well epitomize these forces as they market early academic learning via digital technology. Will infants born today have any experiences that do not involve a computer chip? As young children spend more time in adult-directed activities designed to promote specific, measureable, and often isolated cognitive skills, along with increased use of media, they are experiencing a serious decline in play, in particular, play characterized by imagination and rich social interactions (Golinkoff et al., 2006). It is live humans, in particular those with whom the child has an affective relationship, who mediate development, learning, and health. The most sophisticated object, platform, virtual world, or interface, even if dubbed 'interactive,' simply cannot replace the human touch so necessary for desired developmental outcomes.

#### References

- American Academy of Pediatrics, Committee on Public Education. (2001). Children, adolescents, and television, policy statement. *Pediatrics*, 107 (2), 423. doi:10.1542/peds.107.2.423
- American Academy of Pediatrics. (2007). Consistent frequent TV viewing causes behavior problems. Retrieved from http://www.aap.org/advocacy/releases/oct07studies.htm
- Anderson, D. R., & Pempek, T. A. (2005). Television and very young children. American Behavioral Scientist, 48 (5), 505-522. doi:10.1177/0002764204271506
- Aspland, H. & Gardner, F. (2003). Observational measures of parent-child interaction:
  An introductory review. *Child and Adolescent Mental Health*, 8 (3), 136-143.
  doi:10.1111/1475-3588.00061
- Azar, B. (2002). It's more than fun and games. *Monitor on Psychology*, 30 (3), 50-51.
- Barr, R., & Hayne, H. (1999). Developmental changes in imitation from television during infancy. *Child Development*, 70 (5), 1067-1081. doi:10.1111/1467-8624.00079
- Baumwell, L., Tamis-LeMonda, C. S., & Bornstein, M.H. (1997). Maternal verbal sensitivity and child language comprehension. *Infant Behavior and Development 20* (2), 247-258. doi:10.1016/S0163-6383(97)90026-6
- Berk, L. E. (2010). "Make-believe play: Wellspring for development of self-regulation." *The Early Years Conference: The Rights of the Child*, Plenary Presentation. Victoria, B.C. 6 Feb.
- Berk, L. E., Mann, T. D., & Ogan, A. T. (2006). Make-believe play: Wellspring for development of self-regulation. In D.G. Singer, R.M. Golinkoff & K. Hirsh-Pasek (Eds.), *Play = Learning* (pp. 74-100). New York: Oxford University Press.

- Bernstein, V. (2003). Standing firm against the forces of risk: Supporting home visiting and early intervention workers through reflective supervision. *IMPrint*, *35*, 2-5.
- Bernstein, V. J., Campbell, S., & Akers, A. (2001). Caring for the caregivers: Supporting the well-being of at-risk parents and children through supporting the well-being of programs that serve them. In J. Hughes, J. Close, & A. La Greca (Eds.), *Handbook of psychological services for children and adolescents* (pp. 107-131). New York, NY: Oxford University Press.
- Biringen, A., Emde, R. N., Campos, J.J, & Appelbaum, M. I. (1995). Affective reorganization in the infant, the mother, and the dyad: The role of upright locomotion and its timing. *Child Development*, 66 (2), 499-514. doi:10.1111/j.1467-8624.1995.tb00886.x
- Bodrova, E., & Leong, D. J. (2003). Chopsticks and counting chips : Do play and foundational skills need to compete for the teacher's attention in an early childhood classroom? *Young Children, 58*, 10-17. [electronic version] Retrieved February 1, 2010 from http://www.naeyc.org/yc/pastissues/2003/may
- Bornstein, M. H., Azuma, H., Tamis-LeMonda, C. S., & Ogino, M. (1990a). Mother and infant mother activity and interaction in Japan and in the United States: I.A. comparative macroanalysis of naturalistic exchanges. *International Journal of Behavioural Development, 13* (3), 267-287. doi:10.1177/016502549001300302
- Bornstein, M. H., Toda, S., Azuma, H., Tamis-LeMonda, C. S., & Ogino, M. (1990b). Mothers and infant activity and interaction in Japan and in the Unites States: II. A comparative micro-analysis of naturalistic interactions focused on the organization of infant attention. *International Journal of Behavioural Development, 13* (3), 289-308.

doi:10.1177/016502549001300303

- Bornstein, M. H., Haynes, O. M., Pascual, L., Painter, K. M., & Galperin, C. (1999). Play in two societies: Pervasiveness of process, specificity of structure. *Child Development*, 70 (2), 317-331. doi:10.1111/1467-8624.00024
- Bornstein, M. H., & Tamis-LeMonda, C. S. (2004). Mother-infant interaction. In G. Bremner & A. Fogel (Eds.), *Blackwell Handbook of Infant Development* (pp. 269-295). Malden, MA: Blackwell.
- Bornstein, M., Vibbert, M., Tal, J., & O'Donnel, K. (1992). Toddler language and play in the second year: Stability, covariation, and influences of parenting. *First Language*, *12*, 323-338. doi:10.1177/014272379201203607
- Bremner, G., & Fogel, A. (Eds.), (2004). Blackwell Handbook of Infant Development.Malden, MA: Blackwell.
- Brestan, E. V., Eyberg, S. M., Algina, J., Johnson, S. D., & Boggs, S. R. (2003). How annoying Is it? Development and validation of a scale of parent tolerance for child misbehavior. *Child* and Family Behavior Therapy, 25 (2), 1-15. doi:10.1300VJ019v25n02\_01
- Bronson, M.B. (2001). *Self-regulation in early childhood: Nature and nurture*. New York, NY: Guilford.
- Bruner, J. (1963). The process of education. Cambridge, MA: Harvard University Press.
- Buckleitner, W. (2008, Jan/Feb). The state of children's interactive media. *Exchange*, pp. 62-65. Retrieved February 1, 2010 from www.ChildCareExchange.com
- Buckleitner, W. (2006). The relationship between software design and children's engagement. *Early Education & Development, 17* (3), 489-505. doi:10.1207/s15566935eed1703\_8

- Business Wire (2007, May 2). The worldwide market for edutainment toys is predicted to reach \$7.3 billion by 2011. Author. Retrieved March 7, 2010 from www.allbusiness.com/services/business-services/4330080=1.html
- Calvert, S. L., Rideout, V. J., Woolard, J. L., Barr, R. F., & Strouse, G. A. (2005). Age, ethnicity, and socioeconomic patterns in early computer use. *American Behavioral Scientist* 48 (5), 590-607. doi:10.1177/0002764204271508
- Christie, J. F., & Roskos, K. A. (2006). Standards, science, and the role of play in early literacy education. In D.G. Singer, R.M. Golinkoff, & K. Hirsh-Pasek (Eds.), *Play =Learning* (pp. 57-73). New York, NY: Oxford University Press.
- Cipriano, E. A., Dollar, J. M., & Stifter, C. A. (2008, March). The relationship between toddler temperament and emotion regulation in preschool: The moderating role of mother and father behavior. *The XVIth International Conference on Infant Studies*, Poster, Vancouver, B.C.
- Clark, L. A., Kochanska, G., & Ready, R. (2000). Mothers' personality and its interaction with child temperament as predictors of parenting behavior. Journal of Personality and Social Psychology, 79 (2), 274-285. doi :10.1037//0022-3514.79.2.279
- Cook, G., & Roggman, L. (2009). Parenting interactions with children: Checklist of observations linked to outcomes, Technical Report. Logan, UT: Early Intervention Research Institute and Family, Consumers, & Human Development Department, Utah State University.
- Davidson, J. L. F. (1998). Language and play: Natural partners. In E.P. Fromberg & D. Bergen (Eds.), *Play from birth to twelve and beyond: Contexts, perspectives, and meaning* (pp. 175-183). New York, NY: Garland.

- Denham, S. A. & Grout, L. (1993). Socialization of emotion: Pathway to preschoolers' emotional and social competence. *Journal of Nonverbal Behavior 17* (3), 205-227.
- Dickinson, D., & Tabors, P. (2001). *Beginning literacy with language: Young children learning at home and school.* Baltimore: Paul H. Brookes.
- Dodici, B. J., Draper, D. C., & Peterson, C. A. (2003). Early parent-child interactions and early literacy development. *Topics in Early Childhood Special Education 23* (3), 124-136.
  doi:10.1177/02711214030230030301
- Duhachek, A., Coughlan, A. T., & Iacobucci, D. (2005). Results on the standard error of the coefficient alpha index of reliability. *Marketing Science*, *24* (2), 294-301.
  doi:10.1287/mksc.1040.0097
- Duncan, R. M., & Tarulli, D. (2003). Play as the leading activity of the preschool period:
  Insights from Vygotsky, Leont'ev, and Bakhtin. *Early Education and Development, 14* (3), 271-292. doi:10.1207/S15566935eed1403\_2
- DYG. (2000). What grown-ups understand about child development: A national benchmark survey. In D.G. Singer, R. M. Golinkoff & K. Hirsh-Pasek (Eds.), *Play = Learning* (pp.192-206). New York, NY: Oxford University Press.
- Eisenberg, N., Smith, C. L., Sadovsky, A., & Spinrad, T. L. (2004). Effortful control:
  Relations with emotion regulation, adjustment, and socialization in childhood. In R.
  Baumeister & K.D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 259-282). New York, NY: Guilford.
- Eisenberg, N., & Valiente, C. (2004). Elaborations on a theme: Beyond main effects in relations of parenting to children's coping and regulation. *Parenting*, *4* (4), 319-323.

doi:10.1207/s15327922para04-04\_2

- Elias, C., & Berk, L. E. (2002). Self-regulation in young children: Is there a role for sociodramatic play? *Early Childhood Research Quarterly*, *17* (2), 216-238. doi:10.1016/S0885-2006(02)00146-1
- Esnor R. & Hughes, C. (2008). Content or connectedness? Mother-child talk and early social understanding. *Child Development 79* (1), 201-216. doi:10.1111/j.1467-8624.2007.01120.x

Evans, M. K. (2003). The effects of background television on very young children's play with Toys [unpublished doctoral dissertation]. University of Massachusetts, Amherst. Cited in KFF Issue Brief (2005, January), The effects of electronic media on children ages zero to six: A history of research. Menlo Park, CA: The Henry J. Kaiser Family Foundation.

- Eyberg, S., & Pincus, D. (1999). Eyberg Child Behavior Inventory & Sutter-Eyberg Student Behavior Inventory-Revised. Odessa, FL: Psychological Assessment Resources.
- Eyberg, S. M., Nelson, M. M., Duke, M., & Boggs, S. R. (2005). Manual for dyadic parentchild interaction coding system (3<sup>rd</sup> edition). University of Florida Department of Clinical and Health Psychology. Retrieved from http://www.phhp.ufl.edu/~eyberg /NewTemplateFolder/Measures.htm
- Fernandez-Fein, S., & Baker, L. (1997). Rhyme and alliteration sensitivity and relevant experiences among preschoolers from diverse backgrounds. *Journal of Literacy Research*, 29, 433, 459.
- Garrison, M. M., & Christakis, D. A. (2005). A teacher in the living room? Educational media for babies, toddlers, and preschoolers. Menlo Park, CA: Henry J. Kaiser Family Foundation. Retrieved from http://www.kff.org/entmedia/upload.7427.pdf

- Gaskins, S., Haight, W., & Lancy, D. F. (2006). The cultural construction of play. In A.
  Göncü & S. Gaskins (Eds.), *Play and development: Evolutionary, sociocultural and functional perspectives*, pp. 179-202. Mahwah, NJ: Lawrence Erlbaum Associates.
- Gertner, J. (2005, April 10). Our ratings, ourselves. *The New York Times Magazine*, pp. 34-41.
- Gmitrova, V., & Gmitrova, J. (2003). The impact of teacher-directed and child-directed pretend play on cognitive competence in kindergarten children. *Early Childhood Education Journal*, 30 (4), 241-255. doi:1082-3301/02/0600-0241/0
- Goldberg, S. (1977). Social competence in infancy: A model of parent-infant interaction. *Merrill-Palmer Quarterly*, 23, 163-177.
- Golinkoff, R. M., Hirsh-Pasek, K., & Singer, D. (2006). Why play = learning: A challenge for parents and educators. In D.G. Singer, R. M. Golinkoff & K. Hirsh-Pasek (Eds.), *Play = Learning* (pp. 192-206). New York, NY: Oxford University Press.
- Göncü, A., & Mosier, C. (1991). *Cultural variations in the play of toddlers*. Paper presented at the Biennial Meetings of the Society for Research in Child Development, Seattle, WA. In M.H. Bornstein & C.S. Tamis-LeMonda (2004), Mother-infant interaction (pp. 269-295), In G. Bremner & A. Fogel (Eds.), *Blackwell Handbook of Infant Development*. Malden, MA: Blackwell.
- Gopnik, A., Meltzoff, A. N., & Kuhl, P. K. (1999). *The scientist in the crib*. New York, NY: William Morrow.
- Groos, K. (1898). *The play of animals* (E.L. Baldwin, Trans.). New York: Appleton. Retrieved from http://www.brocku.ca/MeadProject

Guernsey, L. (2007). Into the minds of babes. New York, NY: Basic Books.

- Hall, G. S. (1907). Youth: Its education, regimen, and hygiene. New York, NY: Appleton. Retrieved from http://www.gutenberg.org
- Harwood, R. L., Miller, J. G., & Irizarry, N. L. (1995). *Culture and attachment: Perceptions of the child in context*. New York, NY: Guildford Press.
- Hertenstein, M., & Campos, J. J. (2004). The retention effects of an adult's emotional displays on infant behavior. *Child Development* 75 (2), 595-613. doi:10.1111/j.1467-8624.2004.00695.x
- Hirsh-Pasek, K. & Golinkoff, R. M. (2004). Einstein never used flashcards. New York, NY: Rodale.
- Hirsh-Pasek, K. (2006). How to choose toys for your baby. In S. Ettus (Ed.), *The experts' guide to the baby years*. New York: Crown Publishing Group. Retrieved March 5, 2010 from http://astro.temple.edu/~khirshpa/download/PLAY\_toys\_for\_your\_baby.pdf
- Hirsh-Pasek, K., Golinkoff, R. M., Berk, L. E., & Singer, D. (2009). A mandate for playful learning in preschool: Applying the scientific evidence. New York, NY: Oxford University Press.

Holigrocki, R. J., Kaminski, P. L., & Frieswyk, S. H. (2002). PCIA-II: Parent-Child Interaction Assessment Version II. Unpublished manuscript. University of Indianapolis. (Update of PCIA Tech. Rep. No. 99-1046. Topeka, KS: Child and Family Center, The Menninger Clinic.) Retrieved February 20, 2009 from http://pages.uindy.edu/~rholigrocki/Downloads/pciaadministration.pdf

- Howes, C. (1992). *The collaborative construction of pretend: Social pretend play functions*. Albany, NY: State University of New York Press.
- Howes, C. & Matheson, C. (1992). Sequences in the development of competent play with peers: Social and social pretend play. *Developmental Psychology*, 28, 961-974. doi:10.1037/0012-1649.28.5.961
- Huesmann, L. R., Moise-Titus, J., Podolski, C-L., & Eron, L. D. (2003). Longitudinal relations between children's exposure to TV violence and their aggressive and violent behavior in young adulthood: 1977-1992. *Developmental Psychology*, *39* (2), 201-221. doi:10.1037/0012-1649.39.2.201
- Ispa, J. M., Fine, M. A., Halgunseth, L. D., Harper, S., Robinson, J., Boyce, L., Brooks-Gunn, J., & Brady-Smith, C. (2004). Maternal intrusiveness, maternal warmth, and mother-toddler relationship outcomes: Variations across low-income ethnic and acculturation groups. *Child Development 75* (6), 1613-1631. doi:10.1111/j.1467-8624.2004.00806.x
- Johnson, J., Christie, J., & Wardle, F. (2005). *Play, development, and early education*. New York, NY: Allyn & Bacon.
- Kaiser Family Foundation [KFF], (2005, January). *Issue brief: The effects of electronic media* on children ages zero to six: A history of research. Menlo Park, CA: The Henry J. Kaiser
  Family Foundation. Retrieved from <u>http://www.kff.org/entmedia/upload/The-Effects-of-</u> Electronic-Media-on-Children-Ages-Zero-to-Six-A-History-of-Research-Issue-Brief.pdf
- Kalmanson, B., & Seligman, S. (1992). Family-provider relationships: The basis of all interventions. *Infants and Young Children*, *4* (4), 46-52.

- Kirkorian, H. L. (2004). The influence of background television on parent-child interaction
  [unpublished master's thesis]. University of Massachusetts, Amherst. Cited in KFF Issue
  Brief (2005, January), *The effects of electronic media on children ages zero to six: A history of research*. Menlo Park, CA: The Henry J. Kaiser Family Foundation.
- Kirkorian, H. L., Pempek, T. A., Murphy, L. A., Schmidt, M. E., & Anderson, D. R. (2009). The impact of background television on parent-child interaction. *Child Development*, 80 (5), 1350-1359. doi:10.1111/j.1467-8624.2009.01337.x
- Klugman, E., & Smilansky, S. (1990). *Children's play and learning: Perspectives and policy implications*. New York, NY: Teachers College Press.
- Knowledge@Wharton (2007). Robbing the cradle? If marketers get their way that bundle of joy can cost a bundle. University of Pennsylvania: Research at Penn: Business. Retrieved from http://knowledge.wharton.upenn.edu/article.cfm?articleid=1778
- Kochanska, G., Aksan, N., Prisco, T. R., & Adams, E. E. (2008). Mother-child and father-child mutually responsive orientation in the first two years and children's outcomes at preschool age: Mechanisms of influence. *Child Development 79*, 30-44. doi:10.1111/j.1467-8624.2007.01109.x
- Kochanska, G., Forman, D. R., Aksan, N., & Dunbar, S. B. (2005). Pathways to conscience:
  Early mother-child mutually-responsive orientation and children's moral emotion, conduct, and cognition. *Journal of Child Psychology and Psychiatry*,46 (1), 19-34. doi:10.1111/j.1469-7610.2004.00348.x
- Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective.*Developmental Psychology*, 18 (2), 199-214. doi:10.1037/0012-1649.18.2.199

- Kopp, C. B. (1991). Young children's progression to self-regulation. In M. Bullock (Ed.), Contributions to human development: Vol. 22. The development of intentional action: Cognitive, motivational, and interactive processes (pp. 38-54). Basel, Switzerland: Karger.
- Krafft, K. C., & Berk, L. E. (1998). Private speech in two preschools: Significance of open-ended activities and make-believe play for verbal self-regulation. *Early Childhood Research Quarterly*, 13, 637-58. doi:10.1016/S0885-2006(99)80065-9
- Laible, D., Panfile, T., & Makariev, D. (2008). The quality and frequency of mother-toddler conflict: Links with attachment and temperament. *Child Development*, *79*, 426-443. doi:10.1111/j.1467-8624.2007.01134.x
- Leng, X., & Shaw, G. L. (1991). Toward a neural theory of higher brain function using music as a window. *Concepts in Neuroscience*, *2*, 229-258.
- Lerner, R. M., Theokas, C., & Bobek, D. L. (2005). Concepts and theories of development:
  Historical and contemporary dimensions. In M.H. Bornstein & M.E. Lamb (Eds.).
  Developmental Science: An Advanced Textbook (pp. 3-43). Mahwah, NJ: Lawrence Erlbaum
- Lindsey, E. W., & Colwell, M. J. (2003). Preschoolers' emotional competence: Links to pretend and physical play. *Child Study Journal, 33* (12), 39-52.
- Linn, S. (2009, Mar/Apr). Too much and too many: How commercialism and screen technology combine to rob children of creative play. Exchange, pp. 45-48. Retrieved February 1, 2010 from www.ChildCareExchange.com
- Malmberg, L-E., Stein, A., West, A., Lewis, S., Barnes, J., Leach, P., & Sylva, K. (2007). Parent-child interaction: A growth model approach. *Infant Behavior and Development 30*,

615-630. doi:10.1016/j.infbeh.2007.03.007

- Masur, E. F., & Flynn, V. (2008). Infant and mother-infant play and the presence of television. *Journal of Applied Developmental Psychology, 29*, 76-83. doi:10.1016/j.appdev.2007.10.001
- Mendelsohn, A. L., Berkule, S. G., Tomopoulis, S., Tamis-LeMonda, C. S., Huberman, H. S., Alvir, J., & Dreyer, B. P. (2008). Infant television and video exposure associâtes with limited parent-child verbal interactions in low socioeconomic status households. *Archives of Pediatric and Adolescent Medicine, 162* (5), 411-417. Retrieved April 24, 2009 from www.archpediatrics.com
- Miller, E., & Almon, J. (2009). Crisis in the kindergarten : Why children need play in school. *Alliance for Childhood*. Retrieved from www.allianceforchildhood.org/publications
- Nantais, K. M., & Schellenberg, E. G. (1999). The Mozart Effect: An artifact of preference. *Psychological Science*, *10* (4), 370-373. doi:10.1111/1467-9280.00170
- National Association for the Education of Young Children (NAEYC), Position Statement (2009). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8*. Retrieved November 5, 2009 from www.naeyc.org/DAP
- Neuman, S., & Roskos, K. (1993). Access to print for children of poverty: Differential effects of adult mediation and literacy-enriched play settings on environmental and functional print tasks. *American Educational Research Journal, 30*, 95-122. Retrieved from http://www.jstor.org/stable/1163191
- Pellegrini, A. D. (1995). School recess and playground behavior. Albany, NY: State University of New York Press.

- Pellegrini, A. D., & Smith, P. K. (1998). Physical activity play: The nature and function of a neglected aspect of play. *Child Development*, 69, 577-598.
- Petgill, S. A., & Deater-Deckard, K. (2004). Task orientation, parental warmth and SES account for a significant portion of the shared environmental variance in general cognitive ability in early childhood: Evidence from a twin study. *Developmental Science* 7, 25-32. doi:10.1111/j.1467-7687.2004.00319.x
- Piaget, J. (1932). Play, dreams, and imitation. New York, NY: Norton.
- Rauscher, F. H., Shaw, G. L., & Ky, K. N. (1993). Music and spatial task performance. *Nature*, *365* (6447), 611. doi:10.1038/365611a0
- Rauscher, F. H., Shaw, G. L., & Ky, K. N. (1995). Listening to Mozart enhances spatialtemporal reasoning: toward a neurophysiological basis. *Neuroscience Letters*, 185, 44-47. doi:10.1016/0304-3941(94)1221-4
- Rauscher, F. H., & Shaw, G. L. (1998). Key components of the Mozart Effect. *Perceptual* and Motor Skills, 86, 535-541.
- Raver, C. (2002). *Emotions matter: Making the case for the role of young children's emotional development for early school readiness* (No. XVI). Ann Arbor, MI: Society for Research in Child Development.
- Resnick, M. (2006). Computer as paintbrush: Technology, play, and the creative society. In D.G.
  Singer, R. M. Golinkoff & K. Hirsh-Pasek (Eds.), *Play = Learning* (pp. 192-206). New York, NY: Oxford University Press.
- Rideout, B. E., & Laubach, C. M. (1996). EEG correlates of enhanced spatial performance following exposure to music. *Perceptual and Motor Skills*, 82, 427-432.

- Rideout, B. E., & Taylor, J. (1997). Enhanced spatial performance following exposure to music: A replication. *Perceptual and Motor Skills*, 82, 427-432.
- Rideout, V., & Hamel, E. (2006). The media family: Electronic media in the lives of infants, toddlers, preschoolers and their families. Kaiser Family Foundation. Menlo Park, CA: Henry J. Kaiser Family Foundation. Retrieved from http://www.kff.org/entmedia/upload/7500.pdf
- Ritchel, M., & Stone, B. (2007, November 29). For toddlers, toy of choice is a tech device. *The New York Times*. Retrieved March 8, 2010 from www.nytimes.com/2007/11/29/technology/29techtoys.html
- Roggman, L., Cook, G. A., Jump, V. K., Innocenti, M. S., & Christiansen, K. (2009, in press). Parenting interactions with Children: Checklist of observations linked to outcomes (PICCOLO). Baltimore, MD: Brookes Publishing.
- Rosen, C. (2006, December 22). Too many batteries included. *The Wall Street Journal*. Retrieved March 8, 2010 from www.WSJ.com/article/SB116676314278657638.html
- Russ, S. W. (2004). Play in child development and psychotherapy. Mahwah, NJ: Erlbaum.
- Schmidt, M. E., Pempek, T. A., Kirkorian, H. L., Lund, A. F., & Anderson, D. R. (2008). The effects of background television on the toy play behavior of very young children. *Child Development*, 79 (4), 1137-1151. doi:10.1111/j.1467-8624.2008.01180.x
- Shimada, S., & Hiraki, K. (2006). Infant's brain responses to live and televised action. *Neuroimage*, *32* (2), 930-939. doi:10.1016/j.neuroimage.2006.03.044
- Shonkoff, J. P., & Phillips, D. A. (Eds.) (2000). From neurons to neighborhoods: The science of early childhood development. Washington, DC: National Academy Press.

- Sigman, A. (2007). Visual voodoo: The biological impact of watching television. *Biologist, 54*, 14-19.
- Sigman, A. (2009). Well connected? The biological implications of 'social networking.' *Biologist*, 56, 14-20.
- Singer, J. (2006). Learning to play and learning through play. In D.G. Singer, R.M. Golinkoff & K. Hirsh-Pasek (Eds.), *Play = Learning* (pp. 251-262). New York, NY: Oxford University Press.
- Singer, D. G., Golinkoff, R. M., & Hirsh-Pasek, K. (2006). Play = Learning: How play motivates and enhances children's cognitive and social-emotional growth. New York, NY: Oxford University Press.
- Singer, D., & Singer, J. (2004). Encouraging school readiness through guided pretend games. In
  E. Zigler, D. Singer, & S. Bishop-Josef (Eds.), *Children's play: The roots of reading* (pp. 175-187). Washington, DC: Zero to Three.
- Singer, D., & Singer, J. L. (2005). *Imagination and play in the electronic age*. Cambridge,MA: Harvard University Press.
- Singer, D. G., Singer, J. L., Plaskon, S. L., & Schweder, A. E. (2003). Encouraging school readiness through guided pretend games. In S. Olfman (Ed.), *All work and no play: How educational reforms are harming our preschoolers* (pp. 59-101). Westport, CT: Greenwood.
- Sommerville, J. A., Hildebrand, E. A., & Crane, C. C. (2008). Experience matters: The impact of doing versus watching on infants' subsequent perception of tool-use events. *Developmental Psychology*, 44, 1249-1256. doi:10.1037/a0012296

- Snow, C., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children*.Washington, DC: National Academy Press.
- Steele, K. M., Ball, T. N., & Runk, R. (1997). Listening to Mozart does not enhance Backwards Digit Span performance. *Perceptual and Motor Skills*, 84, 1179-1184.
- Tamis-LeMonda, C., & Bornstein, M. (1993). Play and its relations to other mental functions in the child. In M. Bornstein & A. O'Reilly (Eds.), *The role of play in the development of thought: New directions in child development* (Vol. 59, pp. 17-27). San Francisco, CA: Jossey-Bass.
- Tamis-LeMonda, C.S., Bornstein, M. H., & Baumwell, L. (2001). Maternal responsiveness and children's achievement of language milestones. *Child Development* 72, 748-767. doi:10.1111/1467-8624.00313
- Taumeopeau, M. & Ruffman, T. (2006). Mother and infant talk about mental states relates to desire language and emotion understanding. *Child Development* 77, 465-481.
  doi:10.1111/j.1467-8624.2006.00882.x
- Taumeopeau, M. & Ruffman, T. (2008). Stepping stones to others' minds: Maternal talk relates to child mental state language and emotion understanding at 15, 24, and 33 months. *Child Development 79*, 284-302. doi:10.1111/j.1467-8624.2007.01126.x
- Tinamura, M., Okuma, K., & Kyoshima, K. (2007). Television viewing, reduced parental utterances, and delayed speech development in infants and young children. *Archives of Pediatric and Adolescent Medicine*, 161, 618-619.
- Troseth, G. L., & DeLoache, J. S. (1998). The medium can obscure the message: Young children's understanding of video. *Child Development 69*, 950-965. doi:

10.1111/j.1467-8624.1998.tb06153.x

- Troseth, G. L. (2003). TV guide: Two-year old children learn to use video as a source of information. *Developmental Psychology*, 39, 140-150. doi:10.1037/0012-1649.39.1.140
- Van den Boom, D., & Hoeksma, J. (1994). The effect of infant irritability on mother-infant interactions: A growth curve analysis. *Developmental Psychology*, *30*, 581-590. doi:10.1037/0012-1649.30.4.581
- Vandewater, E. A., Bickham, D. S., Lee, J. H., Cummings, H. M., Wartella, E. A., & Rideout, V. J. (2005). When the television is always on: Heavy television exposure and young children's development. *American Behavioral Scientist, 48*, 562-577. doi: 10.1177/0002764204271496
- Vukelich, C. (1994). Effects of play interventions on young children's reading of environmental print. *Early Childhood Research Quarterly*, 9, 153-170. doi:10.1016 /0885-2006(94)90003-5
- Vygotsky, L. (1978). Mind in Society. Cambridge, MA: Harvard University Press.
- Wall, B. (2006, November 24). Ambitious parents spend on educational toys for toddlers
  - Your Money International Herald Tribune. *The New York Times*. Retrieved March 7, 2010 from www.nytimes/com/2006/11/24/your-money/24intmtoys.3654661.html?pagewanted=1&\_r=1
- Ward, L. (2006, November 14). Hi-tech toys offer no educational gain, say researchers.*The Guardian*. Retrieved March 7, 2010 from

www.guardian.co.uk/uk/2006/nov/14/schools.earlyyearseducation

- Wartella, E. A., Vandewater, E. A., & Rideout, V. J. (2005). Introduction: Electronic media use in the lives of infants, toddlers, and preschoolers. *American Behavioral Scientist*, 48, 501. doi:10.1177/0002764204271511
- Weber, D. S. & Singer, D. G. (2004). The media habits of infants and toddlers: Findings from a parent survey. *Zero to Three, 25*, 30-36.
- Winerman, L. (2009). Playtime in peril. APA Monitor, 40 (8), 50. Retrieved September 19, 2009 from http://www.apa.org/monitor/2009/09/child-play.html
- Wong, W., Uribe-Zarain, X., Ma, W., Golinkoff, R. M., Fisher, K., & Hirsh-Pasek, K. (2008, March). "Educational toys": Do parents believe the hype? *The XVIth International Conference on Infant Studies*, Poster. Vancouver, B.C.
- Zeanah, C. H. (1993)(Ed.), Handbook of infant mental health. New York, NY: Guilford Press.
- Zeanah, C. H., & Barton, M. L. (1989). Introduction: Internal representations and parentinfant relationships. *Infant Mental Health Journal*, *10* (3), 135-141.
- Zigler, E. F., & Bishop-Josef, S. J. (2006). The cognitive child versus the whole child:
  Lessons from 40 years of Head Start. In D.G. Singer, R.M. Golinkoff & K. Hirsh-Pasek
  (Eds.), *Play = Learning* (pp. 251-262). New York, NY: Oxford University Press.
- Zigler, E. F., Singer, D. G., & Bishop-Josef, S. J. (Eds.) (2004). *Children's play: The roots of reading*. Washington, D.C.: Zero to Three.

# Appendix A

## Playing with Technology: Parent-Toddler Play Study

Today's Date:		File	e No:			
Child's Name:		Gender:	М	F		
Child's Date of Birth:		Age toda	y:			
Language(s) spoken in the home: first	second		0	ther		
What is your cultural background (check all the	nat apply):					
First Nations / Native Caucasian / European Latino / Hispanic African	Middle Eastern (e South Asian (eg. I East Asian (eg. Cl South East Asian	g. Israel, S India, Pakis hina, Japan (eg. Philip)	audi A stan, S , Kore pines,	Arabia, Iran) Sri Lanka) ea) Indonesia, T	haila	nd)
Mother's level of education:						
Primary Secondary (graduated high school) Post-secondary vocational training/diplo Undergraduate degree (Bachelor) Graduate degree (Masters/Doctorate)	ma					
Family composition:						
a. number of adults living in the home:						
b. relationship to child:						
c. other children living in the home:	age M age M age M	F F F	;	age age age	M M M	F F F
Play Information						
1. Who <b>mostly</b> plays with your child?						
2. Who else plays with your child? (list all)						
3. How does your child benefit from play?						
4. What proportion of your home's toy's have	batteries or computed	iter chips (	electro	onic)?		

5. Play has many forms. How often and how much time do you spend with your child doing the following activities?

Toys (eg. Blocks, puzzles, dolls, cars, drawing)

How often?							
	> 1/day	1/day	3or4/week	1/week	<1/week	sporadic	never
How long (min	utes)?						
		< 5	5-10	10-20	20-30	>30	
Books (incl. magaz	zines, photo	albums)					
How often?							
	> 1/day	1/day	3or4/week	1/week	<1/week	sporadic	never
How long (min	utes)?						
		< 5	5-10	10-20	20-30	>30	
Singing (incl. talki	ng, rhymes)	)					
How often?							
	> 1/day	1/day	3or4/wee	k 1/wee	k <1/week	sporadic	never
How long (min	utes)?						
		< 5	5-10	10-20	20-30	>30	
Household Activit	ies (eg. Bat	h games, he	lping with lau	Indry, dishes	, sweeping)		
How often?							
	> 1/day	1/day	3or4/week	1/week	<1/week	sporadic	never
How long (min	utes)?		Π				
		< 5	5-10	10-20	20-30	>30	
TV/videos/compute	er games						
How often?							
	> 1/day	1/day	3or4/weel	k 1/week	<1/week	sporadic	never
How long (min	utes)?						
now long (iiiii	utes):	< 5	5-10	10-20	20-30	>30	
Physical play (eg.	chase game	s, wrestling	, ball play, rid	ling toys)?			
How often?							
	> 1/day	1/day	3or4/week	1/week	<1/week	sporadic	never
How long (mini	ites)?						
fiew long (inite		< 5	5-10	10-20	20-30	>30	
Excursions (eg. Go	oing for wa	lks, to parks	, community	programmes,	shopping, vis	iting)	
How often?	often?				-		
	= 1/day	1/day	3or4/week	1/week	<1/week	sporadic	never
How long (min	ites)?						
now long (initia		< 5	5-10	10-20	20-30	>30	

# Appendix B

Parent Questionnaire: Question #5

Questionnaire: duration and frequency of					
family play formats	Ν	Min.	Max.	Mean	SD
time in excursions	25	4	6	4.9	.44
frequency of excursions	25	1	6	4.7	1.17
time in physical play	24	1	5	3.3	1.13
frequency physical play	24	4	6	5.5	.72
time with tv/screens	23	0	5	3.0	1.52
frequency tv/screens	25	0	6	3.7	2.17
time in household tasks	25	1	5	3.1	1.33
frequency household tasks	25	1	6	4.8	1.26
time singing/vocal	24	1	5	2.8	1.37
frequency singing/vocal	25	1	6	5.4	1.19
time with books	25	1	5	2.7	1.07
frequency books	25	3	6	5.4	.87
time with toys	25	2	5	2.9	1.00
frequency toys	25	1	6	5.0	1.50

Figure 5: Time and frequency in seven forms of parent-child play interactions

#### Appendix C

Excerpt from PICCOLO Technical Report (Cook and Roggman, 2009)

Construct validity measures correlated the PICCOLO domains of responsiveness with established measures of sensitivity, teaching with measures of cognitive stimulation, and affection with measures of positive regard. At 14 months, correlations between responsiveness items on the PICCOLO and measures of sensitivity ranged for .31-.43. Teaching items correlated to measures of cognitive stimulation from .28-.55. Affection items correlated with measures of positive regard from .31-.55. At 24 months, responsiveness-sensitivity correlations were .40-.50; teaching-cognitive stimulation correlations were .32-.56; and affection-positive regard correlations were .34-.54. At 36 months, responsiveness-sensitivity correlations range from .34-.48; teaching-cognitive stimulation correlations were .25-.50; and affection-positive regard correlations were .34-.64.

Predictive validity analysis shows the ability of PICCOLO scores to predict: cognitive development as measured by the Bayley MDI at 14, 24, and 36 months; vocabulary production as per the Communication Development Index at 14 and 24 months; emotion regulation via the Behavior Rating Scale of the Bayley Scales of Infant Development at 14, 24, and 36 months; aggression scores on the Child Behavior Checklist at 24 and 36 months; receptive vocabulary as per the Peabody Picture Vocabulary Test at 36 months and pre-kindergarten; emergent literacy scores on the Woodcock-Johnson Letter-Word measure at pre-kindergarten; and problem-solving scores on the Woodcock-Johnson Applied Problems at pre-kindergarten.

#### **Appendix D**

Roggman, L., Cook, G. A., Jump, V. K., Innocenti, M. S., & Christiansen, K., 2009 (in press; used with permission)

### PICCOLO—Parenting Interactions with Children: **Checklist of Observations Linked to Outcomes**

INSTRUCTIONS: Look closely to see behaviors in a quiet parent! Frequency is more important than complexity, but complexity often includes several examples.

SCORING: 0 - "None" - Absent; didn't see, not observed at all.

1 - "Some" - Barely there; sometimes seen but not often.

2 - "Lots" - Consistently there; seen often.

	Warr	<i>Affection</i> nth. physical closeness, and positive expressi	ons towar	d child	
#	Parent	Observation Guidelines	None	Some	Lots
1	speaks in a warm tone of voice	Parent's voice is positive in tone, and may show enthusiasm or tenderness. A parent who speaks little but warmly should be coded highly.	0	1	2
2	smiles at child	Parent directs smiles toward child, but they do not need to be looking at each other when smile occurs. Includes small smiles.	0	1	2
3	praises child	Parent says something positive about child or about what child is doing. A "thank you" can be coded as praise.	0	1	2
4	is physically close to child	Parent is within arm's reach of child. Consider context: expect more closeness for book reading than for playing house.	0	1	2
5	uses positive expressions with child	Parent laughs, smiles, says positive things, praises, or uses words like "honey," "sweetie," or an affectionate nickname.	0	1	2
6	is engaged in interacting with child	Parent is actively involved together <i>with</i> child, not just with activities or with another adult.	0	1	2
7	shows emotional support	Parent expresses enthusiasm, interest, sympathy, enjoyment, or other positive emotion directed to child.	0	1	2
			Affection	ı total =	

Circle total score in the row closest to child's age:

Circle total score in the row closest to child's age:															
1 yr	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2 yr	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
3 yr	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Red area indicates high risk (lowest 5% of scores); gray area indicates moderate risk (11% of scores); pink area and any high items indicate strengths to emphasize with parents.
	<b>Responsiveness</b> Responding to child's cues, emotions, words, interests, and behaviors											
#	Parent	Observation Guidelines	None	Some	Lots							
1	pays attention to what child is doing	Parent looks at and reacts to what child is doing by making comments, showing interest, helping, or otherwise attending to child's actions.	0	1	2							
2	changes pace or activity to meet child's interests or needs	Parent tries a new activity or speeds up or slows down an activity in response to where child looks, what child reaches for, what child says, or emotions child shows.	0	1	2							
3	is flexible about child's change of activities or interests	Parent accepts a child's choice of a new activity or toy, shows enthusiasm about child's choices, or allows child to play in unusual ways with or without toys.	0	1	2							
4	follows what child is trying to do	Parent both responds to and gets involved with child's activities.	0	1	2							
5	responds to child's emotions	Parent reacts to child's positive or negative feelings by showing understanding or acceptance, suggesting a solution, re- engaging the child, labeling or describing the feeling, showing a similar feeling, or providing sympathy for negative feelings.	0	1	2							
6	looks at child when child talks or makes sounds	When child makes sounds, parent's eyes focus on child's face or (if eyes or child's face are not visible) parent's position and head movement face toward child.	0	1	2							
7	replies to child's words or sounds	Parent repeats what child says or sounds child makes, talks about what child says or could be saying, or answers child's questions.	0	1	2							
		Responsi	veness total	=								

Circle total score in the row closest to child's age:

1 yr	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2 yr	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
3 vr	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Red area indicates high risk (lowest 5% of scores); gray area indicates moderate risk (11% of scores); yellow area and any high items indicate strengths to emphasize with parents.

	<i>Encouragement</i> Active support of exploration, effort, skills, initiative, curiosity, creativity, and play												
#	Parent	Observation Guidelines	None	Some	Lots								
1	waits for child's response after making a suggestion	Parent pauses after saying something the child could do and waits for child to answer or do something, whether child actually responds or not.	0	1	2								
2	encourages child to handle toys	Parent offers toys or says positive things when child shows obvious interest in toys. (Does not include preventing children from mouthing toys.)	0	1	2								
3	supports child's choices or activity changes	Parent offers choices, helps, agrees, or gets involved with activity or toys child chooses at the time.	0	1	2								
4	supports child in doing things on his/her own	Parent shows enthusiasm for things child tries to do without help, lets child choose how things are done, and lets child try to do things before offering help or suggestions. Parent can be engaged in activities child does "on his/her own".	0	1	2								
5	verbally encourages child's efforts	Parent shows verbal enthusiasm, offers positive comments, or makes suggestions about child's activity.	0	1	2								
6	offers suggestions to help child	Parent makes comments to make things easier for child or to add to child's play activities without interfering with child's play.	0	1	2								
7	shows enthusiasm about what child is doing	Parent makes positive statements, claps hands, or shows other clear positive response to what child is doing, including quiet enthusiasm such as patting child, nodding, smiling, or asking child questions about activities.	0	1	2								
			Encourag	<i>gement</i> tota	al =								

## Circle total score in the row closest to child's age:

1 yr	0	1	2	3	4	-5	6	7	8	9	10	11	12	13	14
2 yr	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
3 yr	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Red area indicates high risk (lowest 5% of scores); gray area indicates moderate risk (11% of scores); blue area and any high items indicate strengths to emphasize with parents.

	Shared conv	<i>Teaching</i> versation and play, cognitive stimulation,	explanatio	ons, and qu	uestions
#	Parent	Observation Guidelines	None	Some	Lots
1	explains reasons for something to child	Parent says something that could answer a "why" question, whether child asks a question or not.	0	1	2
2	suggests activities to extend what child is doing	Parent says something child could do to add to what child is already doing, but does not interrupt child's interests, actions, or play.	0	1	2
3	repeats or expands child's words or sounds	Parent says the same words or makes the same sounds the child makes or repeats what child says while adding something that adds to the idea.	0	1	2
4	labels objects or actions for child	Parent names what child is doing, playing with, or looking at.	0	1	2
5	engages in pretend play with child	Parent plays make believe in any way – for example, by "eating" pretend food.	0	1	2
6	does activities in a sequence of steps	Parent does an activity in a way that steps can be seen even if parent does not say exactly what the steps are.	0	1	2
7	talks to child about characteristics of objects	Parent uses words or phrases that describe features such as color, shape, texture, movement, function, or other characteristics.	0	1	2
8	asks child for information	Parent asks any kind of question or says, "tell me," "show me," or other command that may require a yes/no response, short answer, or longer answer—whether or not child replies.	0	1	2
		Teaching	total =		

Circle total score here in the row closest to child's age:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Red area indicates high risk (lowest 5% of scores); gray area indicates moderate risk (11% of scores); green area and any high items indicate strengths to emphasize with parents