The Physical Play and Motor Development of Young Children: A Review of Literature and Implications for Practice

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What you have to do is run real fast up the hill and then down the hill, and if you fall the wolves will eat you. But they aren't real wolves, it's just pretend, so don't be scared.

(A four-year-old child teaching a three-year-old peer how to play)

Decades of research have shown that play is an important mediator in the physical, social, cognitive, and language development of young children (Bergen, 2002; Garvey, 1993; Vygotsky, 1976). In spite of this, play faces threats from many directions in modern American life. The growing emphasis on standards, assessment, and accountability in schools has led to a reduction in outdoor and active physical play. In many schools and centers, play has been all but eliminated to make room for quieter, academic learning (Stipek, 2006). Preschools and kindergartens in public school settings have become particularly regimented and adult-directed, with teachers feeling compelled to increase literacy and numeracy instruction at the expense of play time (Golinkoff, Hirsh-Pasek, & Eyer, 2004). Passive television viewing and use of other media are also replacing active play, and have even been found to interrupt the play of young infants (Schmidt, Pempek, Kirkorian, Lund, & Anderson, 2008; Zimmerman, Christakis, & Meltzoff, 2007).

The purpose of this review is to describe and interpret research examining the effects of physical play, from birth to age five, at home and school, across all areas of development. The document is intended to inform the professional practice of teachers, caregivers, and policymakers who advocate for play or who are striving to include physical and outdoor play more often and more effectively in their schools and centers. It is also intended for parents who are trying to enhance the health and physical development of their own children. The review includes research-based guidance for professionals in inclusive classrooms and settings, and addresses adaptations in play environments and adult play interactions to meet the needs of children with disabilities.

The logical starting place for such a review is a summary of research on how play influences physical development. The first section of this document presents findings of studies from a variety of disciplines that examine the associations between motor development, play, and the physical health and abilities of young children. This review next examines the literature on play and young children's cognitive development. The studies cited in this section are important because they show that reducing play time in school to promote academic achievement is misguided. In fact, this research demonstrates that play has a positive impact on thinking and learning. A final section presents studies on the importance of play in young children's emotional and social development. These investigations demonstrate that play is an ideal context for learning how to form warm, trusting relationships with other people.

Motor Play and Physical Development

It has long been understood that motor play contributes to healthy physical development. However, a growing body of new research clarifies the ways this occurs. Recent investigations have identified specific motor skills that are enhanced through play. Other studies show how parents, teachers, and caregivers can enrich play to strengthen its effect on physical development.

Infants and Toddlers

Physical activity begins prior to birth. A traditional view has been that early infant movement is primarily reflexive, involuntary, and relatively unrelated to specific motor abilities later in life. New research challenges this notion (Rakison & Woodward, 2008). From the first minutes after birth (and likely before), children engage in significant motor activities that impact later development.

Infant and toddler motor skills. Research has indicated that the playful movements of very young infants can contribute to fundamental motor abilities. For example, children as young

as six months of age adapt their reaching and grasping to both the characteristics of particular objects they are playing with and the surfaces on which these objects lie (Bourgeois, Akhawar, Neal, & Lockman, 2005; de Campos, Rocha, Cicuto, & Savelsbergh, 2010). By 10 months of age, infants form preferences for certain objects and manipulate these in more complex ways than less-preferred play materials (Schneider, 2009). These playful manipulations of objects provide the basis for the later acquisition of object control skills, such as throwing, in the preschool years (Bourgeois et al., 2005).

As infants get older, they acquire locomotor skills when they play: sitting, crawling, standing, and eventually walking. Researchers have long documented such major motor milestones (Payne & Isaacs, 2008a); however, new investigations reveal smaller sub-steps toward achievement of these broader abilities. For example, after children begin to take their first steps, they gradually become more consistent in their stride length, thereby adopting a characteristic of adult walking (Looper, Wu, Barroso, Ulrich, & Ulrich, 2006). They also learn a variety of "braking behaviors" when they are walking down slopes (Gill, Adolph, & Vereijken, 2009). Mastery of these skills is directly related to the frequency and quality of experiences they have playing on playgrounds and in classrooms and homes (Adolph, Vereijken, & Shrout, 2003).

These findings on infant motor skills have implications for professional practice. In assessing and promoting infant play, adults need to attend to some of the subtler refinements in movement which are important indicators of motor ability. It may not be enough to simply determine if infants can reach for and grasp objects or cannot, or whether they have taken their first steps. Caregivers and teachers also need to assess and support children's abilities to *adapt* their reaching, grasping, and walking behaviors to meet the demands of a variety of different

objects and surfaces on which they play (DiCarlo, Reid, & Strickin, 2006). They must identify infants' toy preferences, which emerge remarkably early in life. In light of these recent studies, the task of facilitating and assessing play in infants and toddlers has become more complex and challenging.

Play and the infant brain. Stuart Brown, a renowned psychiatrist, notes that the human brain is "wired for play at birth" (Brown & Vaughan, 2009). Based on his own clinical interviews with adults and children and his review of both animal and human studies, he concludes that active play is required for healthy brain growth. In particular, play is essential for developing those parts of the brain required for regulating behavior and emotions. New research findings support his contention. Studies of young rats, whose brains resemble those of human infants, demonstrate the direct impact of active motor play on neurological development. (Rat studies are included here, since they yield more information on brain development than could be obtained from research on humans.) Rats who have been deprived of play in their infancy are found to have underdeveloped medial frontal lobes (MFL)—brain centers responsible for regulating emotions (Bell, Pellis, & Kolb, 2010; Panksepp, 2007). These play-deprived rats are found to be more aggressive and anti-social when placed in cages with other rats. In contrast, rats raised in play-rich environments that include objects to play with and opportunities for motor activity have particularly advanced MFLs. These rats show greater emotional control and more playful, prosocial interactions with others. Of course, rats are different from human children and their play and play environments are as well. Nonetheless, these animal studies hint at the power of play in promoting brain growth.

Research on human infants suggests one reason for this play-brain connection. A team of scientists studied the impact of child care and play on infants' brain health (Watamura, Donzella,

Alwin, & Gunnar, 2003). They measured the amount of cortisol produced in babies during a typical day. Cortisol is a hormone that is created in the body when animals are under stress. Chronically high levels of cortisol are considered a threat to brain development, because they have been found to damage neurons in the frontal lobe. A worrisome finding of these researchers was that cortisol levels of babies rose over the course of a day in child care. (When they were at home, the opposite was true: cortisol levels of these babies fell during the day.) However, children in child care who engaged in more active and social play were found to have significantly lower levels of this hormone at day's end. The implication is clear: caregivers need to engage children in active, social play throughout the day—particularly in the late afternoon, when cortisol levels rise in those in child care. Enhancing play not only promotes motor development, this research suggests, but also protects the infant brain.

Infants and toddlers with disabilities. Over the last decade a growing number of studies have been conducted on the physical development of infants and toddlers with disabilities. Studies have shown that babies and toddlers with Down syndrome, autism, and those who were born preterm or are living in poverty or stressful family situations, are at risk for poor motor development (Baranek, 2004; de Campos et al., 2010; Hemgren, & Persson, 2006; Looper et al., 2006). In particular, some children with these disabilities or challenges are less likely to learn skills that require leg strength and coordination (Lloyd, Burghardt, Ulrich, & Rosa, 2010). Because of this research, performance on specific motor tasks is now used regularly as a screening criteria for identifying infants with disabilities (Baranek, 2004; Hemgren & Persson, 2006).

This research suggests the importance of observation and intervention, as soon after birth as possible, to promote motor development of children with disabilities. The motor play of

infants and toddlers—their manipulation of objects, reaching and grasping behaviors, and efforts at locomotion—serves as a window through which adults can observe overall development and spot potential developmental difficulties (Baranek, 2004; de Campos et al., 2010). Adult interventions to promote the motor abilities of those with disabilities are as important as those focused on cognitive development or language. For children older than 6 months, play experiences to strengthen and engage leg muscles are especially important. Floor games that require pushing and kicking of legs (e.g., the classic socks with jingle bells activity) are helpful for younger infants. Once ambulatory, toddlers can be provided with indoor and outdoor play surfaces of varying texture and slope to walk over. Adult warmth and encouragement will inspire more active play during these motor experiences (Tamis-LeMonda et al., 2008).

Positioning infants for play. Findings of recent studies have shown that positioning babies properly for play will improve motor abilities. Authors of this research have discovered that the "back-to-sleep" campaign, begun in 1992 to protect infants from SIDS and other threats to infant health, has led to an unfortunate trend: Some parents are placing their infants on their backs during waking periods as well. These researchers report that infants who are placed frequently in the prone position—that is, on their stomachs--score higher on measures of motor development (Kuo, Liao, Chen, Hsieh, & Hwang, 2008). This play position has its greatest effect on children between 6 and 12 months of age. A troubling finding from one investigation is that infants who spend more waking hours on their backs may actually experience motor delays (Pin, Eldridge, & Galea, 2007). Based on this research, play advocates have launched a "back-to-sleep/prone-to-play" campaign to educate parents about the importance of optimal positioning during both sleeping and waking periods.

Other play position studies have examined the effects of infant sitting and movement equipment commonly found in homes, such as walkers, infant seats, high chairs and stationary play seats with attached toys. These studies show that such devices can inhibit play movements of both arms and legs (Abbott, & Bartlett, 2002; Pin, Eldridge, & Galea, 2007). Not surprisingly, children who spend large amounts of time in such equipment show delays in motor development (Garrett, McElroy, & Staines, 2002).

It is important to note that certain types of equipment are not only helpful, but necessary for some infants. For example, a specially-designed foam contour seat, placed into a conventional high chair, was found to provide postural support so that children with neuromotor impairments could play in ways they could not without this device (Washington, Deitz, White, & Schwartz, 2002). As with all motor interventions, decisions about equipment use must be based on individual needs. When children have disabilities, guidance from specialists such as physical and occupational therapists is also important.

As a whole, these play positioning studies suggest that babies not yet crawling should spend most waking time on their stomachs or seated on the floor with enticing toys and people around them. Those who are walking should be provided with ramps, mats, pillows, and other surfaces to walk freely over or around, unrestricted by high chairs or walkers. For children who require special support to engage in active play, however, appropriate supportive devices should be provided to facilitate free movement.

Preschool Children

The preschool years, between ages 3 and 5, are marked by significant changes in height, muscle strength, and body mass and proportion that allow children to move in far more coordinated and complex ways (Casby, 2003; Payne & Isaacs, 2008a, 2008b; Williams, Pfeiffer,

Dowda, Jeter, Jones, & Pate, 2008). New research, to be cited in this section, suggests that motor coordination and play do not simply emerge in all children as part of maturation; healthy physical development is not a sure thing. The environment and the people within it play a major role in determining whether or not children will acquire important motor skills and maintain physical health.

Motor play and health. A major reason to include motor play experiences in preschools is to promote physical health. Low physical activity level in the early years predicts later health problems (Dehghan**,** Akhtar-Danesh, & Merchant, 2005). Young children who are sedentary as preschoolers are more likely to become obese in later childhood and as adults. Adult obesity is linked to diabetes, heart disease, and other medical conditions (Hassan, Joshi, Madhavan, & Amonkar, 2005). A sedentary play style in the early years is likely to become an overall sedentary lifestyle: inactive preschoolers are highly likely to become inactive adults (Reilly & Jackson, 2004). A startling new study has indicated that sedentary behavior may impact young children's health much earlier than originally believed (Saakslahti et al., 2004). In this investigation, preschool aged children who exhibited low levels of play activity were found already to have greater health risk factors, such as higher triglycerides, cholesterol levels, blood pressure, and body mass index. For some children, these risk indicators appeared as early as age 4.

Findings of the impact of physical activity on short- and long-term health of children should give policy makers and educators a sense of urgency about increasing motor play at home and school. Yet states remain slow in mandating changes needed to address the problem (Kaphingst & Story, 2009). National and state initiatives are underway to raise awareness of the issue. For example, First Lady Michelle Obama has launched a national campaign, "Let's

Move," to prevent childhood obesity. Professionals can strive to have their schools and centers recognized nationally through this program by taking specific steps to increase daily activity and to serve healthy foods.

Physical activity level. In order for preschool children to acquire motor skills and levels of fitness expected for their age, they need to be active. Despite the common belief that young children are always moving, research suggests that many young children are not. In fact, American preschoolers may be more sedentary than in past decades (Schneider & Lounsbery, 2008). In some schools and centers, recess and other opportunities for active play are being reduced or eliminated, leading to lower levels of daily physical activity (National Association of Early Childhood Specialists in State Departments of Education, 2001). Even when children have time to play outdoors, research shows that they do not engage in active play. In one troubling study, researchers found that children enrolled in urban preschools engaged in sedentary behavior on the playground almost 90% of the time (Brown et al., 2009).

Studies have shown that, even when children do engage in active play on the playground, the intensity and duration of their movement may not be sufficient to ensure health, fitness, and motor development (Timmons, Naylor, & Pfeiffer, 2007). Although some children engage in what researchers have called *vigorous physical activity* (VPA) or *moderate-to-vigorous physical activity* (MVPA), they do so only in short "bursts," followed by long periods of sedentary behavior. While such a pattern of activity—rest—activity is natural and to be expected, many children do not engage in enough vigorous activity over the course of a day to enjoy the full benefits of their physical play (Benham-Deal, 2005). These findings suggest that adults need to provide enticing self-directed play spaces and experiences and some structured activities to encourage children to move on the playground for more than just a few minutes a day. The

overall goal is to provide children with experiences that will provide them with the desire to continue participating in fun movement activities as they get older. As their body grows and matures, these active children will be able to sustain MVPA in longer durations, thus gaining more physiological benefits from the activity.

What factors determine children's physical activity level? Boys and African American children have been found to engage in more VPA and MVPA than girls and children of Euro-American background (Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004; Tucker, 2008). Children with timid temperaments, lower self-esteem, or challenging family lives engage in less vigorous play (Timmons, Naylor, P., & Pfeiffer, K. A. (2007). In contrast, children whose families watch less television and provide more opportunities for play at home are more active (Timmons et al., 2007). One study found a connection between the amount of time children play outdoors at home and MVPA (Benham-Deal, 2005.)

One of the best predictors of physical activity level in young children is the quality of the preschool or child care classroom in which they are enrolled. One investigation found vast differences in children's activity levels from one preschool program to another (Pate et al., 2004). Individual classroom practices—particularly the amount of outdoor play time provided and the size of the playground, factors which varied widely across programs studied—were strongly associated with the amount and vigor of children's active play. The type of playground equipment and space available to children in preschools and child care centers has also been linked to level of physical activity. Children in programs with larger playgrounds and greater numbers of moveable play equipment, such as riding toys and balls, were found to be more vigorously active than those whose preschools had small classrooms and more fixed playground equipment (Brown et al., 2009).

Findings that classrooms and teachers can have such an impact on children's daily activity levels suggest that legislators should mandate physical play in state licensed early childhood programs. Less than half of U.S. states require outdoor play in public schools, however, with only 8 states providing guidelines for the amount of MVPA children should engage in each day (Centers for Disease Control and Prevention, 2010). The National Association for Sport and Physical Education (NASPE) (2009) provides such guidelines and suggests teaching strategies for meeting them. This group recommends several hours of unstructured, active, outside and indoor play time per day for preschool children, including at least one hour of moderate to vigorous physical activity. This may be accomplished by providing several long play periods or more frequent, but shorter ones. Thirty minutes of this time, the organization recommends, should involve structured activities guided by a teacher. Some researchers recommend two or three times this amount of daily active play to ensure the physical health of all children (Tucker, 2008). Professionals in states that do not provide outdoor play guidelines should adhere to the recommendations of NASPE in scheduling active play periods and planning adult-guided experiences to increase MVPA. The message from this research to teachers and parents is clear: Inspire children to move, to move with vigor, and to keep moving for significant periods of time each day.

Promoting movement and play. A wide range of motor play and physical education programs for preschool-age children have been developed over the last decade. The most well-designed of these programs reveal the great potential of classroom- and home-based strategies to promote young children's motor development and health (Goodway & Branta, 2003). Recent studies not only demonstrate the positive effects of such programs, but pinpoint specific elements of planning and teaching that contribute to these outcomes. For example, research has shown that

programs that integrate movement experiences within enjoyable, play-oriented activities, such as games, are more effective in enhancing motor skills than traditional direct instruction (Apache, 2005). Similarly, a program incorporating pretend play into dance activities of young children was found to be superior in enhancing the learning and retention of specific dance skills, compared to traditional dance lessons (Sacha, & Russ, 2006). Planning movement activities around the unique pastimes and interests of diverse cultural groups and families has been found to enhance motor development. For example, a motor play program created for preschoolers in Croatia reflected the games and sports valued by that culture—gymnastics, racing on a track, dancing, wrestling, and badminton (Živčić, Trajkovski-Višić, & Sentderd, 2008). Children participating in this program showed significant gains in specific motor skills. Incorporating movement activities into a program's academic curriculum was also discovered to increase VPA and MVPA levels of preschoolers (Trost, Fees, & Dzewaltowski, 2008). Taken together, these studies suggest that motor development approaches may be most powerful when movement is integrated into all aspects of children's play and learning.

Other approaches described in the literature are based on previous research on motor play and learning, though their effects on children's development have yet to be directly, empirically tested. One model, for example, focuses on guiding children to reflect on their own movements and the feelings these elicit, based on broader psychological research on body awareness and self-reflection (Carson, 2001). Another model, based on previous research, offers techniques parents can use to increase their children's activity levels and perform specific motor behaviors at home (Robert, 2001). Several programs emphasize the selection of certain types of motor play equipment, based on previous observational studies of children's outdoor play (Martin, 2000; McCall & Craft, 2004). These authors argue that equipment should be chosen to carry out

specific activities that meet motor learning goals. Too often, they suggest, movement activities are planned around expensive pieces of playground equipment that pose few challenges, fail to capture children's interests, and do not promote the acquisition of important skills.

Research has also identified specific teaching practices that promote young children's motor play and development. The modeling of motor behaviors by caring, encouraging adults appears to be one of the most effective ways to inspire the practice and learning of basic motor behaviors (Labiadh & Golomer, 2010). More complex movements, however, may require direct guidance and instruction, particularly for children with disabilities (Martin, 2006). As with all learning, a blend of instruction, indirect guidance, modeling, and child-centered play appear to be optimal.

One of the most important teaching practices in promoting motor development is the adaptation of play activities to meet the needs of children with disabilities. Numerous strategies have been studied or recommended; these can be divided into three categories: supportive teacher interactions, modification of play materials and equipment, and redesign of play environments (Doctoroff, 2001). Supportive interactions—including modeling, encouraging, posing challenges, and providing just the right amount of assistance in completing difficult tasks—have been found to promote object control, locomotion, social competence, and cognitive abilities in children with various disabilities (Apache, 2005; Martin, 2006; Menear & Davis, 2007).

Modifying materials and equipment to meet individual motor play needs has been associated with a wide range of developmental benefits. Adding playground equipment that can be used by more than one child—a rocking boat, a tire swing, or a tube that several children can crawl through, for example—can enhance social development of children with intellectual

disabilities, visual impairments, autism, and attention deficit hyperactivity disorder (Doctoroff, 2001). Blending realistic props (e.g., a replica of a gas pump to fill up a "car") and non-realistic materials (e.g., large hollow blocks, ramps, pillows) will increase the diversity and complexity of play behaviors of children with developmental delays. Special devices that support the posture and movement of children with neurological disorders can increase their participation in play (Martin, 2006). Techniques such as adjusting the size of play objects (e.g., larger balls or beanbags) and offering materials with a wide range of textures have also been found to enhance physical activities of children with disabilities (Menear & Davis, 2007).

A final way to support the play of children with disabilities is through careful arrangement of the overall play environment. Teachers and caregivers should modify play spaces to ensure that all children have access to motor activities. This includes widening pathways and creating larger indoor and outdoor areas to allow full movement of children with varying disabilities (Doctoroff, 2001). Such adaptations of space have clear benefits for children with physical disabilities; these changes also enhance the play of those with neurological impairments. For example, children with autism have been found to participate more fully in play on larger, more open playgrounds with accessible climbing equipment (Menear, Smith, & Lanier, 2006).

More inventive environmental arrangements have also been explored. In one unique study, the play of a child with a visual impairment was greatly enhanced by using music to help him identify his location and that of peers on the playground (Kern & Wolery, 2002). By encouraging children to sing as they play or placing CD players with different kinds of music in different parts of the playground, teachers can help a child who is blind to fully participate in activities with peers.

Studies on promoting motor development of young children with special needs have several important implications for teachers and parents. First, adults must recognize that all children, regardless of disability, can acquire motor skills and use their bodies in play. This is true for a child with the most severe physical disability or one who has autism and avoids contact with peers. Second, children with special needs require teachers, caregivers, and parents who are energetic and creative in supporting play. Research suggests that the motor interventions that are most effective are those that are planned with each individual child's needs in mind.

Taken together, the studies cited here suggest that motor play is vital for the physical health of all young children. Findings indicate that children with and without disabilities need support from adults in order to engage in adequate exercise and to acquire important motor abilities. This support may come in the form of planned activities, safe and engaging play environments and materials, involvement in children's activities, and basic warmth and encouragement.

Motor Play and Cognitive and Language Development

Play time has been reduced or even eliminated in some kindergartens and preschools because of a new emphasis on academic learning. Research presented in this section indicates that removing play from early childhood classrooms may actually undermine intended achievement-oriented outcomes. Play enhances attention, memory, self-regulation, and overall academic achievement throughout childhood (Castelli, Hillman, Buck, & Erwin, 2007; Pellegrini, & Bohn, 2005). In short, physical play is necessary for learning. Studies cited here illuminate the ways that play contributes to cognitive, perceptual, and language development.

Infants and Toddlers

When do children first think about their movement? When do they interpret what they see, hear, and touch in their play? Early researchers have argued that infants act reflexively and with little intellectual activity. Recent findings suggest that there is a great deal more mental action that occurs in infant and toddler motor play than was once believed. When infants engage in motor play, which includes moving arms, legs, and whole bodies, as well as banging, squeezing, shaking, and exploring of objects—they do more than simply move. They think.

Moving and Thinking. One of the most important intellectual accomplishments of the first two years of life is learning about cause and effect. Very young babies have trouble determining causality; as they develop, however, they increasingly differentiate between actions and consequences and intentionally make desired results occur. Research suggests that motor play contributes to this kind of causal thinking. For example, one study found that the longer seven-month-olds played with a toy that produced an interesting result, the better they were able to cause that result to occur again in later play (Hauf & Aschersleben, 2008). The babies were provided with a toy which made a noise when they pushed a button. When presented with the toy again after a period of time, the infants immediately and repeatedly pushed the button, suggesting that they had learned how to perform an action to *cause* the sound.

Other investigations find relationships between causal thinking and play style even earlier in life. Eight- and eleven-week-olds were found to perform better on cause-and-effect assessments after engaging with their mothers in active object play (Lobo & Galloway, 2008). These results were not found for babies who engaged in purely social interactions with their mothers without toys. Play with objects—particularly those that produce interesting results—appears to be important for early cognitive development.

What other things do babies and toddlers think about and learn as they engage in motor activities? Some studies suggest they solve simple problems in play using available "tools" to achieve their goals. For example, one study found that 16-month-olds used handrails in different ways—with two hands, one hand, or not at all—depending on the width of a bridge they were trying to cross (Berger & Adolph, 2003). They also altered their stride according to bridge width. Although this appears a simple behavior from an adult perspective, it suggests that toddlers contemplate the characteristics of a physical challenge and adapt their movements accordingly. In another investigation, 10-month-olds were found to adjust their reaching and grasping behaviors depending on the play task they were about to perform (Claxton, Keen, & McCarty, 2003). When babies would make physical modifications to their movements *in anticipation of* which task they would perform—stuffing a ball in a tube or tossing it in a bin, for example—they were engaging in "motor planning"—a complex cognitive process for children of this age. It is important to note that when babies modify their movements based on their understanding of task demands—the width of a bridge or the type of play action to be performed with a ball—they are engaging in a *tacit* form of thinking. They may not be conscious of their decisions about their actions and certainly can't talk about these. Still, this research demonstrates that there is a significant cognitive component to the play actions of infants and toddlers.

As children enter toddlerhood—at around 18 months of age—they they acquire play abilities that reflect and promote their intellectual development. Their play progresses from simple motor actions to more complex and symbolic behaviors that reflect their growing understanding of the world. For example, they engage in more functional play—play in which they carry out imitative, conventional enactments with toys, such as pushing a toy truck while making engine noises, or striking a ball with a bat (Laplante, Zelazo, Brunet, & King, 2007).

Such play is considered intellectually advanced, since it requires children to reflect on the common uses of objects and actions they have observed others perform with them.

Play may also lead toddlers to differentiate between real and pretend, an understanding that had previously been considered too advanced for this age group (Bosco, Friedman, & Leslie, 2006). In one investigation, two-year olds were found to be able to imitate both real-life and pretend actions of adults in play situations. For example, they could pretend to drink from both a make believe empty cup and a real one filled with water. One-year-olds were only able to imitate real adult actions—drinking actual water, for example—indicating that they were not yet able to engage in imaginary behavior. These advances in play ability are influenced by both home and school environments. Toddlers whose families are under great stress may experience delays in acquiring these cognitively advanced play behaviors (Laplante et al., 2007). Those in classrooms with responsive teachers and a challenging, engaging play environment will acquire more intellectually advanced and varied play abilities (Doctoroff, 2001).

Moving and communicating. Motor play has long been valued as a language-rich context in which children can learn to communicate with others (Iverson, 2010). New research suggests that the communicative benefits of play may be observed in the earliest days and weeks of life. For example, advanced motor skills in infancy and toddlerhood have been found to be related to greater language fluency in later childhood and even adolescence—a finding that researchers speculate may be due in part to the connections among motor coordination, brain development, and the physical actions required for fluent speech (Gernsbacher, Sauer, Geye, Schweigert, & Goldsmith, 2008). There is evidence, however, that the motor play setting itself may provide a scaffold for learning word meaning, syntax, and the social uses of language. For example, when parents play with their babies they frequently comment on actions,

verbalizations, and facial expressions (Widerstrom, 2006). Through these interactions, they scaffold their children's understanding of nouns (objects), verbs (play actions and vocalizations), and adjectives (emotional states).

Play appears naturally to elicit more of this kind of language from parents. In one investigation, parents were found to use twice as many verbalizations and 10 times as many communicative gestures when playing with their one-year-olds than when they were reading stories to them (Namy, Acredolo, & Goodwyn, 2000). Children may also learn the social conventions of conversation when they play. Fifteen-month-olds and their parents were found to regularly establish "synchronicity" in their play interactions—sharing the same focus of attention, taking turns, and in other ways coordinating their behaviors (Lindsey, Cremeens, Colwell, & Caldera, 2009). The authors of this study compare this coordination of behaviors to a conversation. For example, turn taking in play, they contend, is similar to taking turns when conversing. As they predicted, children whose play synchronicity with parents was highest scored higher on measures of expressive language and language comprehension in the preschool years.

Infants and toddlers with disabilities or family stressors. Children with disabilities or whose families suffer the stress of poverty or crisis are at risk of both poor play development and intellectual delays. In one study, infants whose mothers suffered severe stress when their children were in utero were found more often to engage in cognitively-less-advanced forms of play, such as simple banging of objects or hand flapping (Laplante et al., 2007). These researchers conclude that challenging circumstances in utero affect play by threatening prenatal brain development. An implication is that caregivers and parents should provide vigorous,

meaningful play intervention to stimulate the brain and enhance more advanced play for children whose families are in crisis.

Children with other disabilities may also require such intervention in order to play in ways that support their intellectual development. Research suggests that interactions to support language in play may be especially important. In a recent investigation, adolescents with autism were found to score higher on language and communication measures if they were advanced in motor development in infancy and the toddler years (Gernsbacher et al., 2008).

There are important implications of research on physical play and intellectual development of infants and toddlers. Motor play does not automatically lead to cognitive growth, these studies suggest; adults must plan and intervene in ways that strengthen the thinking and learning that occurs at home, on the playground, or in motor play centers in the classroom. Creating challenges that cause babies to think about and adapt their movements are important. Periodically varying just one aspect of a motor play activity—e.g. changing the play object or the task while keeping other aspects of the activity the same—will prompt deeper thinking. These studies also suggest that teachers, caregivers, and parents should use rich language to describe children's play objects, actions, and emotional states. Just as important, caregivers should strive to establish synchronicity with babies when playing with them. This often involves careful observation and understanding of infants' play activities and joining these, rather than initiating new actions. Matching interactions to children's play needs is critical. If a child is highly engaged in play, an adult might simply observe. If the child needs only a little support to continue playing, the adult might model a new movement or make an encouraging comment, then withdraw. Only if a child is frustrated or completely unengaged should an adult play a more directive role.

Preschool Children

Research shows that the trend of reducing play time in preschool and kindergarten to increase learning is counterproductive (Blakemore, 2003). Studies cited in this section confirm that active play is vital to cognitive development in preschool aged children, and that poor motor development can actually inhibit academic learning.

Moving and thinking. Young children's motor development has been found to be a powerful predictor of cognitive abilities in the elementary years (Piek, Dawson, Smith, & Gasson, 2008). Early gross motor abilities (but not fine motor skills) have been associated with several cognitive processes that are fundamental for academic learning—processing speed and memory. Why? The most prevalent theory is that movement facilitates the development of new connections (synapses) among brain cells and the overall organization of the brain (Gabbard, 1998; Rakison, & Woodward, 2008).

Studies on both humans and animals support this view. Neuroscientists have found that active, social play in rats facilitates the development of the frontal lobe, the part of the brain responsible for regulating thinking and emotions (Panksepp, 2007).[1] If this play-brain connection also exists for humans, it may explain why motor activity is linked to processing information and remembering it: active play stimulates cognitive self-regulation. To remember a story at group time, for example, children must maintain attention to the teacher's story reading, inhibit impulses to think about other things, selectively store in memory those stimuli that are important, but not clutter this storage with inconsequential data—the color of the teacher's sweater or the child sitting nearby who is opening and closing the Velcro of her shoes. A well-developed frontal lobe, enhanced through active play, aids these processes.

[1] These researchers, who argue that animal data is a valid guide for understanding human development, posit that pro-social play leads to the development of "frontal lobe regulatory functions that allow children…to inhibit impulsive urges" (Panksepp, 2007, p. 58).

There are other possible explanations for why movement supports learning. One study found that, when children move while they are learning, they activate more parts of the brain than when they are sitting still in a teacher-directed lesson (James, 2010). In particular, movement was found to activate the *visual association cortex*—the part of the brain that allows the processing of visual information. Simply put, movement appears to allow children who are learning to use more parts of their brain. These authors conclude that the philosophy of "learning by doing" has never been better supported by science.

Yet another explanation of the movement-learning connection is that physical action promotes sensory integration (the ability to accurately interpret information being received by several different senses simultaneously) (Greenspan & Brazleton, 2000; Schaaf & Miller, 2005). This theory holds that when children engage in physical play, their brains develop the ability to coordinate the different neurological regions responsible for sensory-based learning. When a child plays a racing game, for example, separate auditory and visual centers of the brain must interact to simultaneously interpret sound (e.g., "On your mark, get set, go!") and visual stimuli (e.g., seeing peers begin running, figuring out which direction to go). This ability to coordinate different parts of the brain emerges rapidly in the early years for most children (Molholm et al., 2002; Sober & Sabes, 2005). It is easy to see how this connectivity of the brain—its ability to coordinate visual, auditory, tactile, and other stimuli, all at once—is crucial to learning. In listening to a story, for example, children need to coordinate auditory stimuli (e.g., hearing the adult reading) with visual images (e.g., looking at illustrations and the adult's expressions and gestures).

Some children have difficulty integrating their senses in this way. A little-understood neurological condition, sensory processing disorder, is sometimes suspected as the cause (Isbell

& Isbell, 2007). Children with autism also can have sensory processing problems. Engaging children in multisensory motor play has been recommended as a way to address these challenges. Encouraging children to toss bean bags of different sizes and textures through targets of different shapes, for example, causes children to integrate the visual and tactile centers in their brains.

Moving and communicating. Preschool motor play requires a great deal of communication with peers. Children use more words and complex sentences during play than they do in other types of classroom activities (Cohen & Uhry, 2007; Fekonja, Marjanovič Umek, & Kranjc, 2005). The sheer practice of language in play is likely to promote communicative competence. Another theory to explain the contributions of movement to language is more basic (Iverson, 2010). When children move, according to this perspective, they act out, with their bodies, the structure and meaning words and sentences. Children who are throwing a ball are essentially making physical statements that include all the grammatical parts of a sentence—an agent (the child), an action (throw), and an object (the ball). When they intentionally cause an event to occur with their movements, they are physically making a causal statement: "When you throw the ball hard, it goes really far." When children move through a tunnel, under a climber, or over a bridge, they are physically expressing prepositions. In other words, movement may lay the foundation for understanding of word meaning and syntax. The relationship between language and physical action can be strengthened, from this view, when adults overlay words and phrases across children's activities ("When you threw the ball harder, look how far it went.").

Studies on movement and cognition suggest several ways that teachers and parents can maximize the intellectual benefits of play. They can provide play experiences that encourage children to solve problems with their bodies. For example, teachers might encourage children to reflect on their own physical behavior by asking them to move across the playground with three

parts of their bodies touching the ground. Simple movement games may stimulate the frontal lobe of the brain, which is responsible for self-regulation: “Red light, green light,” “Simon says,” “Captain May I?” and other activities that require inhibiting impulses and regulating attention might be initiated. (Such traditional games must sometimes be modified to avoid inactivity or elimination.) Adults can periodically narrate children’s actions, so that their movements and the words that describe them are connected: “You’re crawling all the way under that cushion.”

Motor Play and Social and Emotional Development

What do children do when released to the playground after a long morning of sitting and listening in an academic kindergarten? How do they respond when they are first allowed to go out into the yard or a neighborhood playground after many rainy days indoors? They run. They jump, twirl, roll, kick, throw, and shout. They wrestle, chase, and race with their friends. They laugh. There is no greater testament to the effects of motor play on young children’s emotional well-being than such a scene. There is an urge to play in the early years, and playing provokes a broad range of emotions. This section examines research and theory on the interrelationships between play and emotional and social development.

Infants and Toddlers

Why does a dangling pair of keys, a squeak from a toy bear, or a silly behavior performed by an adult distract even the most distraught infant or toddler from a skinned knee or an angry tantrum? Why do infants and toddlers, who are generally wary of strangers, readily join other children they don’t know in an interesting play setting? Play elicits powerful, positive emotions that can overcome real-life anxieties and motivate children to take risks. This is especially evident in the first two years of life, as this section of the review will demonstrate.

Moving and feeling. Infant and toddler emotions have long been misunderstood. Emotional states in the first two years of life have traditionally been viewed as primitive and confined to a narrow range of feelings—anger, surprise, or contentment. Newer research has challenged this idea. Babies as young as a few days old have been found to express a wide range of complex emotions and even to recognize these in other people (Vaish & Striano, 2004). Babies can regulate negative emotions, when they are upset, by attending to objects or people unrelated to their bad feelings (Rothbart & Bates, 2006).

Infants and toddlers often learn about and control emotions by playing with parents and peers (Feldman, 2007; Nichols, Svetlova, & Brownell, 2010). Children in play are not only influenced by what their playmates are doing, but also by the emotions these peers exhibit. They display concern and avoidance when a peer displays fear, upset, or anger. Conversely, they participate more actively in play when they see a peer's delight in using a particular toy (Nichols et al., 2010). They similarly read their parents' faces in play: Parents' looks of worry, or even a touch that urges caution, cause a baby to be more hesitant in play. Positive parental expressions, on the other hand, elicit more active play and exploration (Stenberg, 2003; Tamis-LeMonda et al., 2008). An important implication is that professionals should use facial expressions and body language, along with words, to convey both positive and negative emotions when interacting with infants and toddlers.

Another emotional state that is influenced by play is attachment—the secure bond a child forms with a caregiver. During play, infants establish "playful relationships" with their parents or caregivers; they come to know that these adults are enjoyable, responsive, and warm in play situations (Comfort, 2005). In one study, the complexity of motor play and the frequency and level of pretend enactments between mothers and their toddlers was found to be related to the

strength of children's attachment (Naber et al., 2008). This play-attachment association was found for typically developing children as well as those who had autism or other developmental delays. Unfortunately, some infants and toddlers do not interact playfully with caregivers. Children who have been raised in multiple foster care placements, for example, show signs of play deprivation (Comfort, 2005). Such children often have difficulty forming bonds with caregivers and peers.

Mastery motivation. One of the most widely-studied emotions related to infant and toddler play is mastery motivation—the internal drive to master motor skills or successfully complete tasks. Researchers measure the degree of this motivation by observing a range of mastery behaviors exhibited by infants—task persistence, facial expressions of excitement and pride after an accomplishment, or laughter and smiling when completing a motor challenge. There is evidence that even very young infants demonstrate these behaviors in play (Mayes & Zigler, 2006). They struggle to crawl all the way across a room, to climb up onto a couch on their own, or to stand and take steps without any external reward. It is in play that children may acquire the wish to achieve motor competence. This is partly because play is positive and enjoyable; children smile, laugh, and show other signs of positive affect when they perform play tasks (Mayes & Zigler, 2006). In this context, children are more willing to try out new motor abilities or take risks; there is little chance of failure in play. An implication of this research is that motor experiences for infants and toddlers should be made fun, relaxed, and internally-motivated, rather than overly-directed or evaluated.

Another step adults can take to promote mastery motivation is to provide challenging and varied motor play experiences for infants and toddlers. In one study, infants were found to exhibit more mastery motivation behaviors—smiling and persistence, for example—when they

engaged in new, challenging motor tasks, rather than when they were using familiar, previously-learned abilities (Mayes & Zigler, 2006). Another investigation demonstrated that two types of play may have differential effects on the types of mastery motivation behavior shown (Smidt & Cress, 2007). Positive affective behaviors, such as smiling, were more common in play that was highly social. This suggests that a child's eagerness for, or enjoyment of, motor accomplishments may be enhanced by the presence of enthusiastic playmates. Play that mainly involved objects was likely to elicit other mastery motivation behaviors, such as attention to tasks and persistence. This suggests that objects may help infants maintain focus on and engagement in tasks. These findings suggest that a balance of different types of play—some with objects, other more people-oriented—are helpful for promoting different types of mastery motivation.

Most infants and toddlers with disabilities show the same strong mastery motivation as do typically developing children. For example, one investigation found that toddlers with physical disabilities exhibited mastery motivation behaviors, such as persistence and attention to task, when engaged in play activities that were commensurate with their levels of ability (Smidt & Cress, 2007). Interestingly, other research suggests that some parents assume children with disabilities do not possess this internal drive to learn new skills. Why is this a concern? A study of infants with and without Down syndrome illustrates the problem (Glenn, Dayus, Cunningham, & Horgan, 2001). Although the children with Down syndrome in the study demonstrated high levels of mastery motivation, their parents rated them very low in this area. They erroneously assumed that their children would not have the same urge to succeed at tasks as typically developing children. Not surprisingly, these parents were more directive in their play interactions than parents with typically developing infants. It is likely that they were striving to externally motivate their children to play and learn skills, believing their children lacked an internal desire

to do this. This research suggests that caregivers should be cautious not to overly praise, reward, direct, or manage the play of children with disabilities, when they don't really need this kind of support. Over-directing children's play may reduce their desire to play and acquire skills independently.

They should carefully observe infants and toddlers for signs of mastery motivation—smiling, persisting at play, showing concentration, and overall positive affect—prior to intervening. This research suggests that most children want to master motor abilities.

Playing with parents. Infants' first playmates are often their parents. Research suggests that parent-child play interactions are exceedingly important for later play and social development. The findings of these studies hold practical implications for parenting. Because many American babies spend time in child care outside the home, this research should guide the interactions of caregivers as well. One of the most important ideas from the literature is that adult guidance should match children's play needs. One study found that when parents established *joint attention* with their child in play—focusing on the same object or play action and even engaging in the same type of play as their baby—the child's play became more complex and intellectually valuable (Bigelow, Maclean, & Proctor, 2004). In order to establish this joint attention, parents must understand what it is their children are currently doing and join that play in progress. Initiating a new action or object that interrupts the child's current play creates a mismatch that will not as fully support play development.

Another example of the importance of a *good fit* between parent and child interactions relates to play guidance. Numerous studies have found that many (but not all) parents naturally provide more guidance in play to children who have a variety of special needs and give less

support to typically developing children who may not need it. For example, parents have been found to provide additional support in motor play when their children have physical disabilities; the greater the child's delays, the more assistance parents give (Cress, Moskal, & Hoffmann, 2008).

This increased support may be critical for play development. One-year-olds with developmental delays were found to be more engaged in play when they received "structured guidance" from their parents (Cress, Arens, & Zajicek, 2007). It is important to note that this structured guidance is very different from overly-directive parenting—too much carrying, holding, or imposing new play activities—that can impede motor development. Structure, in this study, was defined as planful, intentional support of what children are currently doing. Parents watched for moments in play when they could enhance specific, predetermined motor skills, but they almost always responded to the child's own play interests and activities.

These studies show that some children need extra support in play—but just the right amount of support. Parents and teachers need to watch for behaviors that indicate a child's need for more or less guidance. Children who are engaged in meaningful play need very little adult involvement. Those who are frustrated, upset, or simply "can't get started" in a play activity may need more guidance. Often, children show a need for a quick suggestion, demonstration, question in order to play in a more complex play.

Several studies raise concerns that, in an effort to increase guidance, adults manage play very directly. One investigation found that parents of children who were unhealthy and born preterm were more likely to hold and touch their babies in play. They more frequently initiated play themes, showed and demonstrated materials, and in other ways actively managed play activities. The mothers of full term healthy babies in this study were less directive and more

responsive in their play interactions. The most important finding of this research was that the preterm and full term babies were matched to be of identical developmental levels; the maturity level of their play was also found to be the same. Yet mothers of the preterm children were still more directive. Why? They likely assumed their children needed more guidance, even when they did not. As a whole, the research on parent-infant interactions suggests that caregivers use great caution in interacting with children at play. Facilitating play may be critical for some children, but should always be based on careful observation and a determination of play needs. Caregivers should never assume that because children have disabilities they will need continual direction in play. When giving guidance, adults should support play in progress rather than overtake or disrupt it.

Playing with peers. A growing body of research suggests that infants and toddlers can enjoy a rich social life with peers in child care. Positive peer contact in infancy has been found to predict later social competence (Howes & Phillipsen, 1998). Infant and toddler peer interactions almost always occur in play settings (Deynoot-Schaub & Riksen-Walraven, 2006). Even infants under a year of age can acquire specific social skills that allow them to be more effective in making positive contact with peers in play (Williams, Ontai, & Mastergeorge, 2010). They may offer peers objects, explore one another's faces and bodies, sit very close to one another, and study each other's interactions and activities. There does not appear to be a single set of strategies that work for an infant to capture peers' attention or elicit their positive responses. Each infant appears to learn a unique collection of strategies that are successful for that child. These strategies are influenced by the child's temperament and play experiences with parents (Williams et al., 2010).

In one study, one- and two-year-olds were found to adopt distinct "toddling styles"—overall approaches for using motor actions to connect with peers (Løkken, 2000). Some children would begin pounding or bouncing to capture peers' attention. One of the most common styles was a musical approach: many of the infants studied used simple singing and dancing movements to engage others. A strategy for peer contact discovered in another study involved motor play humor (Loizou, 2007). Toddlers in this investigation were found to engage in such silly movements as pretending to fall down, bending over and peering at other children through their legs, walking with boxes on their feet for shoes, or rubbing yogurt in their hair as if shampooing. Although these are not always found to be humorous behaviors to an adult, these actions were discovered to engage peers in on-going silliness and interaction.

Much infant social contact involves parallel play. Children often crawl, run, or climb near one another, even though they don't always interact or coordinate their activities. This does not mean they don't influence one another's play activities. Babies have been found to observe one another's actions and imitate what their peers are doing, particularly if the peers are older and more mobile (Clearfield, Osborne, & Mullen, 2008). This suggests that mixed age grouping for motor play experiences might elicit more elaborate movement in younger babies. Infants also interpret the facial expressions and other signs of emotion in peers and use this information to determine if play activities are enjoyable and safe or risky and frightening (Nichols et al., 2010). If they see a peer engaged in running down a hill while smiling and laughing, for example, they are more likely to engage in the same activity.

One study found that children in the second year of life could be quite collaborative in their motor activities when using the right kinds of equipment (Brownell, Ramani, & Zerwas, 2006). In this investigation pairs of toddlers were given a single toy that would play music if

two handles were pulled. The challenge was that both handles needed to be pulled simultaneously to produce the desired effect, and a single child could not pull both handles at once. By 19 months, many pairs of toddlers learned to pull the handles together. By two years of age, all participants were able to collaborate with their partner on this task.

This research highlights the importance of active play with other children, even in infancy. Parents and professionals should create opportunities for peer interactions early in life. These experiences may provide the groundwork for later social abilities such as cooperating, getting a peer's attention, entering another child's play, and understanding emotions.

Preschool Children

The motor play of preschool children is rich in emotional expression and social interaction. It may be the single best context for learning about other people—their feelings, temperament, and abilities. It is on the playground that children often learn about making friends, being accepted or rejected by peers, resolving conflicts, and expressing feelings. This section presents research on how motor play influences and is influenced by preschool children's social and emotional development.

Moving and feeling. Motor ability is related to a variety of indicators of emotional well-being. Children whose motor development is delayed may be at risk of having social and emotional problems. For example, children in the preschool or elementary years who have poor motor skills are more often identified as having emotional and behavioral difficulties in school (Emck, Bosscher, Beek, & Doreleijers, 2009) and are more likely to experience depression and anxiety (Piek, Bradbury, Elsley, & Tate, 2008). There may be a circular relationship between poor motor abilities and these emotional difficulties. Children who are anxious or fearful, for example, may be hesitant and less competent on the playground. This inability to play in a

confident, competent way might contribute further to emotional difficulties. For example, rejection or neglect by peers could threaten the self-esteem of less social children.

This relationship between poor motor performance and emotional difficulties may be particularly strong for children with certain disabilities. For example, those with autism and developmental coordination disorder, disabilities which are characterized by poor motor development, show signs of negative affect and anxiety, particularly in motor play situations (Bieberich & Morgan, 2004; Piek et al., 2008). In contrast, preschoolers with Down syndrome, who also often have motor delays, exhibit consistently positive affect in play interactions. It appears that the nature of a child's disabilities, along with temperament, play experiences within the family, and social abilities affect the impact of motor delays on emotional development (Emck, 2009).

Mastery motivation. Like infants and toddlers, preschool aged children vary in their level of mastery motivation—the degree to which they show a drive to master motor tasks. Many young children are internally motivated to acquire motor abilities and to overcome movement challenges on the playground. Even children with disabilities, who have been reported to be "less successful" in motor tasks by their teachers, can acquire a strong mastery motivation (Vlachou & Farrell, 2000). There are other children, however, who are less determined when facing motor tasks or challenges. What influences the mastery motivation in the preschool years?

A series of investigations of the mastery motivation, motor abilities, and developmental characteristics of five-year-olds addresses this question (Valentini & Rudisill, 2004). These researchers initiated two distinctly different 12-week motor programs to groups of kindergarten children with developmental delays. One program was designed to be "high mastery:" play and learning activities were planned to encourage children to be autonomous in solving motor

problems and testing their bodies. The other program was designed to be "low autonomy:" its experiences were relatively adult-directed and included external motivation techniques; self-motivation and self-regulation were not emphasized. The high mastery program was found to produce higher scores on mastery motivation and motor skills measures. Programs with low autonomy were less successful in achieving these mastery- and motor-related goals. An important finding of the study was that gains in these areas persisted for at least six months, suggesting that even a brief intervention may have a lasting impact on young children's desires and abilities to achieve motor competence.

There are important implications of these findings for teachers and caregivers. Activities and interactions to promote motor abilities should strike an ideal balance between adult encouragement and involvement and autonomous play. Experiences should be designed to promote self-motivation, rather than always including external rewards and praise. For example, motor activities should be enjoyable and match children's play interests, so they will want to engage in them, without a need for adult prompting. More important, motor activities should be challenging enough that children can experience motor accomplishments congruent with their abilities.This is challenging for teachers who work in mixed-age and mixed-ability groups. It is important to plan activities that pose varying levels of challenge to meet diverse needs. This can be accomplished through spontaneous adaptations within a single activity (e.g., "Why don't move a little closer to throw the beanbag"). It is not uncommon to see a variety of different activities—representing different levels of difficulty—occurring on a preschool playground.

Playing with peers. Positive peer relationships in the preschool years are a good predictor of long range mental health and satisfaction in later life (Ladd, 2005). Research suggests that motor play and motor abilities contribute to establishing such relationships in the

early years. Children with poor motor skills are found to engage in fewer social interactions and to exhibit withdrawn and reticent behavior on the playground (Bar-Haim & Bart, 2006). These traits have been associated with peer rejection for children with and without disabilities (Odom, et al., 2006). Children who are less talkative, social, and active in play are less likely to be noticed and are more often ignored by peers. Children who lack motor skills may possess other characteristics that make them vulnerable to peer rejection or neglect. Preschoolers who are obese may be less likely to be chosen by peers as preferred playmates and are more often described as having negative social attributes (Musher-Eizenman, Houlub, Miller, Goldstein, & Edwards-Leeper, 2004).

Physical abilities are an important determinant of whether preschoolers will choose to play with peers who have disabilities. In one study, preschoolers were asked to identify which fictional children with special needs they would like to play with in a variety of different settings (Diamond & Hong, 2008). Their choices appeared to depend on what they perceived these children's physical abilities to be and whether these abilities allowed them to engage in different kinds of play. For example, they rarely chose to play with children with disabilities if the play activity was physical or was to be performed outdoors on the playground. Simply, they did not believe children with obvious physical challenges—such as needing a wheelchair—possessed the skills to play with them in enjoyable ways in these settings.

The implications of these studies for professional practice are important. Promoting motor abilities and the frequency of social interactions on the playground can facilitate positive peer relationships and acceptance, especially if teachers ensure that adaptations are made for children with physical disabilities. One important way to achieve this is to increase outdoor play time. Research suggests that, in general, more frequent social interaction occurs on the

playground than in indoor classroom settings (Bar-Haim & Bart, 2006). Adult interactions can promote more positive social interactions in play. High quality play activities with parents and adults have been associated with greater peer acceptance in preschool classrooms (Lindsey & Mize, 2000). Teachers and caregivers can facilitate positive peer interactions, with a focus on helping withdrawn or socially anxious children to make contact with others and on helping children to see how children with disabilities can be included. One study has found that, for some children with disabilities, easier-to-perform motor tasks led to more conversation and social contact than highly challenging ones (Pierce-Jordan & Lifter, 2005). Professionals might balance challenging motor activities to promote mastery motivation and skill with simpler, more open-ended play activities when trying to increase social participation of all children.

Implications for Professionals and Parents

What major conclusions can be drawn from this extensive and varied body of research? What are the most significant and practical implications for teachers, caregivers, and parents, suggested by such complex empirical and theoretical work? Seven overarching principles are offered as a conclusion to this review:

Principle 1: Begin Motor Play Early

The foundation for a healthy, active life begins at birth (and likely before). Movement in early infancy is no longer believed to be entirely involuntary and reflexive. Every kick, grasp, and wiggle is a remarkably complex action that involves the application of both obvious and more subtle physical skills, intellectual and perceptual processes, neurological organization, and an internal motivation to grow and develop. This integrated nature of movement suggests new goals and strategies for promoting infant motor development. Motor play activities should be planned to support some of the newly-discovered sub-skills that have been found in recent

research to have an impact on development: “braking behaviors” when walking down slopes or step consistency when traversing varying surfaces, for example. Motor experiences should also address the cognitive and neurological aspects of movement in babies. Challenges can be posed that require infants to interpret the demands of their immediate environment—a highly cognitive process. Varying just one aspect of a motor task—the size of an object, the height, slope, or texture of a surface—requires adaptation of movements to conform to new environmental conditions. Offering play experiences that require the coordination of two or more senses will promote the integration of diverse brain centers responsible for perception. Providing activities that match the play preferences of infants (which emerge at a surprisingly early age) will inspire children to learn new skills and address emotional components of play such as the motivation to move. A child emerging from infancy having experienced these multi-dimensional play activities will be better prepared to meet the new physical, cognitive, and social demands of the preschool years.

Principle 2: Make Movement Enjoyable

Research demonstrates the importance of mastery motivation in motor development. Most children from birth to age five show behavioral signs of this drive to accomplish motor tasks and to learn skills: persistence at tasks, facial expressions of determination and delight at accomplishment, or repeated attempts to solve a motor problem, even in the face of failure and frustration. Such signs are exhibited by most young children in play.

Some infants, toddlers, and preschoolers do not acquire this internally motivated desire for mastery. Parents and professionals sometimes erroneously assume that external rewards and adult direction are the solution. In fact, research suggests that poor mastery motivation may stem from a mismatch between a child’s play interests and activities provided. Studies suggest that

altering experiences to be more engaging and fun is a better approach. Variation and novelty in motor experiences and equipment may also spark internal motivation. Providing socially-oriented games and experiences will address some aspects of mastery motivation; object-oriented activities will support others. A balance between types of play, materials and equipment, and settings will inspire motivation to learn. Regardless of the types of activities provided, research suggests they should be challenging. Mastery motivation is highest when children tackle and overcome motor tasks and challenges that are just above their current level of mastery.

Principle 3: Attend to Intensity

It is well documented in the literature that children do not spend enough time playing, either indoors or outside. Merely increasing time on the playground, while extremely important, will not ensure that children get the level of exercise they need for healthy development. Studies of both infants and toddlers suggest that movement activities need to be sufficiently intense to promote physical health, greater connections among neurons in the brain, and other developmental benefits. Researchers and professional organizations recommend that young children spend several hours in active play each day, and that at least an hour of this time be spent in moderate to vigorous physical activity (MVPA). This is activity that involves sustained movement and an increase in heart rate. To achieve this MVPA goal for preschoolers, researchers suggest at least a half an hour per day of structured, adult-guided motor activity to keep children moving. For infants, researchers suggest creating enticing play environments in the home and center, in which children can lie on their stomachs and move freely without the restriction of high chairs and playpens. Toddlers need space to walk and run, unencumbered by walkers and or other unnecessary equipment that restricts locomotion.

Adult engagement in the play of children of all ages is critical to achieving motor intensity. Teachers and caregivers should be as active on the playground as they are indoors in teaching skills and guiding play. One important role is to identify children who are sedentary and encourage them to move. Providing new equipment, suggesting games, and asking peers to invite quieter children to play are all important strategies to increase MVPA.

Principle 4: Integrate Movement Throughout the Day

Research has found that if children move throughout the day, not just during playground time or in physical education, they are more likely to meet recommendations for daily MVPA. Studies show that including movement in all activities of an infant or preschool classroom will not only promote motor skills and fitness, but will contribute to academic achievement and important learning processes. Movement can be included in a toddler story time by encouraging children to enact simple movements of animals in a children's book. Preschoolers can move while learning about numbers by playing a game at group time that requires them to jump in and out of a circle the number of times indicated by a teacher. During transition times, children can be encouraged to hop, crab-walk, or walk backwards to lunch or balance blocks on their heads to put away at clean up time. These experiences will activate parts of the brain that would not have been used in quieter math or literacy lessons. Too, such integration of motor activity would significantly increase the number of minutes of MVPA over the course of a day.

Principle 5: Help All Children Play

Research on infants and preschoolers suggests that all children, regardless of disabilities, family stressors, or other challenges, want and need to move and play. Girls and boys are equally motivated to learn motor skills, as are most children with special needs. Every child will benefit from active, indoor and outdoor motor play. The key to engaging all children in movement is

careful observation of individual needs and tailoring activities and interactions to address these. Research shows, for example, that children with a wide variety of disabilities are able to engage in active play when parents, teachers, and caregivers provide the right kinds of materials and equipment and give just the amount of support needed—no more and no less. Even children who have disabilities that can interfere with social processes, such as autism, are able to interact with peers in play if guided by adults.

To engage all children, adults should: a.) Study the play interests of individual children and families and design motor activities around these. b.) Observe and learn about the characteristics of children with disabilities or those whose families are in crisis and adapt environments and materials accordingly. c.) Determine the motor skills of individuals and plan experiences that address specific deficits. d.) Note the peer relationships of individuals—even toddlers—and facilitate greater social participation and conversation in motor play. e.) Scaffold play—that is, provide much guidance when children are in great need of support and little or no guidance when they are achieving motor abilities or actively moving on their own. Most important, when children need only a little guidance—just a question, a hint, a prompt, modeling of a new skill, or simply close proximity—provide indirect support that enhances, but not interrupts, play.

Principle 6: Send Play Outdoors

Countless studies have shown that outdoor play from birth to age 5 produces developmental outcomes that simply can't be achieved indoors. Not only does outdoor play foster more active movement, but also more frequent and coordinated peer interactions than play in indoor spaces. Is this because playground spaces tend to be larger and more open? Does the role of the teacher or the nature of peer relationships change on the playground? Is it simply

exposure to sunlight and fresh air that leads to these positive results? Whatever the reason, the research is clear: Children should play outdoors for at least an hour each day.

Adults can enhance the effects of outdoor play in several ways. They can increase the number of moveable pieces of playground equipment and reduce (if possible) fixed play structures. Studies show this will increase motor activity and enhance motor skills. Spaces can be made completely safe so teachers are not required to interrupt play with countless warnings to "Be careful!" or "Stop climbing so high!" Children should be encouraged to engage in active pretend play when outdoors, but the common practice of providing books, art materials, and dramatic play props during outdoor play time should be reconsidered. Although mandated by some state accrediting agencies, such practices could slow children's activity level. Outdoor play should be active play time. For children with some disabilities, wider open spaces are likely to encourage more active play. One way to increase movement is to include elements from nature on the playground. One study found a strong association between the number of natural features in a play environment—e.g., grass, trees, hills, running water, and sand—and the activity level of children (Fjørtoft, 2004).

Principle 7: Advocate for Play to Support Learning

Child development professionals advocate for active motor play for physical and emotional reasons. That play enhances fitness, health, and emotional well-being should be enough to convince policy makers and school administrators that sit-still-and-listen programs are ill-advised. These arguments should induce legislators and other community leaders to commit to the creation of neighborhood playgrounds and community centers that promote motor activity, beginning in infancy. Sadly, not all educators and legislators are convinced. However, what may win over the skeptics is the irrefutable research finding that motor play enhances learning and

student achievement. Even the most academic-oriented principal or parent may champion play if they come to understand this powerful body-mind connection.

Studies have demonstrated conclusively that cognitive abilities have their roots in the motor actions of babies. It is through active play with objects and people that infants acquire basic cognitive understandings, such as cause-and-effect and symbolic representation, which are necessary for later academic learning. In motor play they acquire communicative competence and language. Most important, play may lead to the organization and integration of parts of the brain required for perception, social understanding, and self-regulation. Preschool play, likewise, promotes brain growth and intellectual ability. Children who engage in frequent and high quality play—including active motor play on the playground—have been found to be advanced in memory, information processing, and other cognitive abilities necessary for learning (Piek, Dawson, Smith, Gasson, 2008; Pellegrini & Bohn, 2005). Some research shows a direct connection between play and achievement in mathematics and reading in the elementary years (Castelli, Hillman, Buck, & Erwin, 2007). Such an argument should cause school personnel to rethink the strategy of reducing play to increase passive learning.

The argument that play enhances learning is a politically powerful one. How sad it is, however, that motor play must always be justified in this way. Play keeps children healthy and makes childhood joyful. These facts alone should inspire parents, educators, and policy makers to embrace and defend play as a crucial part of children's daily lives, in and out of school.

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