



# **The Effects of Physical and Outdoor Play on Young Children's Development:**

## **An Annotated Bibliography**

**Developed for Head Start Body Start**

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## Introduction

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 computer use 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 main concern about the disappearance of physical play in early childhood is the impact it will have on physical development. Childhood obesity and other health problems can result, particularly for those living in poverty (Olson & Strawderman, 2008). What may be less obvious to educators, policymakers, and parents is the impact a sedentary childhood will have on intellectual, social, and emotional development. The purpose of this annotated bibliography is to provide evidence of the interconnections between motor play, physical activity, and *all* areas of early childhood development (Smith & Thelen, 2003).

The bibliography is the result of a systematic review of the literature on early motor development. Because of the burgeoning number of studies in this area, we narrowed our search to research-based articles, books, and chapters that have been published after 2000 and that have clear implications for professional practice. This is not, then, an exhaustive summary of all work in the field, but a sampling of some of the most pertinent, informative, and well-designed research currently being conducted.

One section in this bibliography presents research on the ways that play can influence physical growth and motor development for infants, toddlers, and preschool-age children. Studies cited in these sections identify motor play skills that emerge in the early years, as well as home and school factors that influence their acquisition. Whether focused on very specific behaviors, such as walking down hills or engaging in playful music-making, or broader aspects of development, such as overall stature or activity level, these investigations provide guidance to practitioners striving to enhance the physical competence of their students. Some studies cited in this section are of particular importance to those working with children who have special needs. This research shows that those with physical, perceptual, and other impairments may require innovative and energetic adult intervention in order to engage in play.

Another section of the bibliography examines the effects of physical development and play on thinking, learning, and language. Research cited in these sections demonstrates that there is an intellectual component to movement. Every time young children adapt their actions to some aspect of the environment—a grassy field, a play bridge, a new toy, an energetic peer, or the encouragements of a caring teacher—they are thinking as they move. As they play with others,

children coordinate their vocalizations, gestures, and words with their movements. They solve problems, learn new concepts, and acquire an understanding of cause and effect as they interact on the playground or motor play area. Studies in this section should give pause to those who would reduce outdoor play time to promote learning. In fact, these studies show that the body and brain act in concert. Reducing play would actually undermine these academic goals, rather than promote them.

A final section presents studies on the contributions of play to social and emotional development. The overall message that comes through in this section is: Children need to play in order to form meaningful relationships with peers and adults. Some studies focus on parent-child play, others on play with peers. All of these demonstrate the ways play enhances social competence and attachment to others. Equally important are studies, cited here, that confirm the emotional importance of play. Through play, children can discharge feelings and cope with uncertainty or anxiety. The sheer pleasure of active movement is captured in almost every study cited. Play is what makes childhood joyful. What other justification for play is needed?

### References

- Bergen, D. (2002). The role of pretend play in children's cognitive development. *Early Childhood Research and Practice, 4*, 1-12.
- Garvey, C. (1993). *Play*. Cambridge, MA: Harvard University Press.
- Golinkoff, R., Hirsh-Pasek, K., & Eyer, D. (2004). *Einstein never used flashcards: How our children really learn—and why they need to play more and memorize less*. New York: Rodale Books.
- Olson, C. M., & Strawderman M. S. (2008). The relationship between food insecurity and obesity in rural childbearing women. *The Journal of Rural Health, 24*, 60–66.
- 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*, 1137-1151.
- Smith, L. B., & Thelen, E. (2003). Development as a dynamic system. *TRENDS in Cognitive Sciences, 7*, 343-348.
- Stipek, D. (2006). No Child Left Behind comes to preschool. *The Elementary School Journal, 106*, 455-467.
- Vygotsky, L. S. (1976). Play and its role in the mental development of the child. In J. Bruner, A. Jolly, & K. Sylva (Eds.), *Play: Its role in development and evolution* (pp. 536-552). New York: Basic Books.
- Zimmerman, F., Christakis, D., & Meltzoff, A. (2007). Television and DVD/video viewing in children under two years. *Archives of Pediatric and Adolescent Medicine, 161*, 473-479.

## Effects of Motor/Outdoor Play on Physical Development and Brain Growth

### Infant/Toddler Play and Physical Development/Brain Growth

#### Positioning Babies for Motor Play

This section reviews research on how parents and caregivers physically position infants for play. Studies in this section suggest that babies should be placed on their backs during sleep for safety, but on their stomachs, in the “prone position,” during waking periods to promote motor development. Such studies have inspired the “back-to-sleep/prone to play” campaign. Implications for parents and caregivers are presented.

Kuo, Y., Liao, H., Chen, P., Hsieh, W., & Hwang, A. (2008). The influence of wakeful prone positioning on motor development during the early life. *Journal of Developmental and Behavioral Pediatrics, 29*, 367-376.

**Method:** These researchers examined the relationship between motor development and the amount of time infants spend on their stomachs (the *prone* position) during play. They also compared developmental differences between infants who appeared to prefer this prone position and those who did not. In addition, they studied the specific motor skills that appear to be most affected by prone play positioning. To gather this information, 288 infants were observed and assessed at ages 4, 6, 12, and 24 months in home free play settings.

**Findings and Conclusions:** The researchers found that the greater the amount of time infants spent in prone position, the more advanced were their motor abilities. They found that these developmental benefits were related primarily to prone-specific milestones (rolling, crawling-on-the-abdomen, crawling-on-all-fours) and sitting. Infants with a prone play preference were found to be more advanced in achieving these milestones than non-prone-preference children. Prone position in play was not related to walking or transferring objects from hand to hand in play. The authors conclude that prone positioning is most important in periods of development when prone-specific abilities are learned—between the ages of 4 and 12 months.

**Implications:** Caregivers should create highly engaging floor spaces for babies, particularly during the first year of life. It is important for teachers, caregivers, and parents to assess the play interests of babies and identify those who show resistance to the prone position. Creating interesting floor textures or providing engaging toys and horizontal mirrors might entice non-prone-preference infants to spend more time playing on their stomachs.

Pin, T., Eldridge, B., & Galea, M. P. (2007). A review of the effects of sleep position, play position, and equipment use on motor development in infants. *Developmental Medicine & Child Neurology, 49*, 858-867.

**Method:** The authors conducted a systematic review of research on home infant care practices, including play and sleep positions and the use of infant motor equipment, such as walkers. From a larger collection of investigations, the 19 highest quality studies were examined in depth.

**Findings and Conclusions:** Based on the findings of these studies, the authors conclude that babies who spend less time in a prone position during play and other waking periods of the day

show a delay in motor development. Babies who are positioned in motor equipment, such as walkers, are also somewhat delayed. These trends are found for both full and preterm infants. Highly vulnerable infants—those who are very preterm or have other developmental or health difficulties after birth—do not appear to be affected as much by play position or the use of motor equipment. Poor outcomes are likely regardless of how they play. Authors raise a concern that the “back-to-sleep” movement, begun in 1992 to protect infants from SIDS and other threats to infant health, may have led some parents to place their infants on their backs during waking play periods, as well. These findings suggest that such positioning might actually delay motor development.

**Implications:** Parents and caregivers should create soft, safe spaces on the floor on which infants can spend time on their stomachs. Placing interesting objects, mirrors, and even peers and siblings in front of infants as they lie in this position will prompt head and chest-raising, attempts at locomotion, and other movements that promote muscle strength and coordination.

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### Play and the Development of Motor Skills

This section reviews studies on infant motor abilities and development that have implications for promoting physical play in classrooms and homes. In some of these studies, open-ended motor play is observed; in others, researchers structure motor tasks for babies in laboratory settings. All of these studies demonstrate the importance of play environments and adult play involvement in promoting early motor skills.

Abbott, A. L., & Bartlett, D. J. (2002). Infant motor development and equipment use in the home. *Child: Care, Health and Development*, 27, 295-306.

**Method:** Forty-three 8-month-olds were assessed on their motor development, using the Alberta Infant Motor Scale. A survey was then administered to their mothers to determine the amount of time infants spent with three different pieces of infant equipment: an excersaucer (a stationary seat with a variety of toys attached), a high chair, and an infant seat. The relationship between use of these pieces of equipment and motor development was examined.

**Findings and Conclusions:** The researchers found the frequency of use of these pieces of equipment was negatively related to motor development. Children who spent less time in such devices scored higher in all motor areas tested.

**Implications:** This study indicates that babies need to play on the floor, with free range of motion, in order to acquire important motor skills. Equipment intended to keep babies stationary may actually impede development. Although teachers and caregivers are generally knowledgeable of the negative effects of these devices, they should educate parents about these findings as well. Encouraging families to restrict the use of such equipment will contribute to children’s positive motor development.

Adolph, K. E., Vereijken, B., & Shrout, P. E. (2003). What changes in infant walking and why. *Child Development*, 74, 475-497.

**Method:** Over 200 infants, between the ages of 10 months and two years, were observed and assessed in regard to their walking abilities. They were evaluated every 10 days during the course of the study. Changes in their abilities were systematically measured. Parents were asked to keep a record of their infants' daily play and walking experiences during the study. Physical information on the babies was also gathered, such as health, body weight and height.

**Findings and Conclusions:** Participants were found to vary on several dimensions of walking ability over the course of the study, including balance and the ability to control their walking behavior as they moved from one place to another. The amount of experience participants had in walking during play at home was found to be the most powerful predictor of advancement in walking ability. Walking experience had a stronger relationship with walking ability than did body dimensions or general maturation. The authors conclude that daily experiences in locomotion are highly influential in helping infants learn to walk. In the authors' words, "the thousands of walking steps, each step different from the last because of variations in terrain," (p. 495) promote walking competence.

**Implications:** These findings suggest that learning to walk with control and balance is as much a function of experience as maturation. When infants walk on diverse surfaces or up and down a slope, they strengthen muscles and acquire greater coordination to carry out this critical skill. Teachers, caregivers, and parents can create special walking paths or simple obstacle courses for babies once they are able to walk. These might include grassy surfaces, hills, wedge cushions and small pillows to step over or around to challenge early walkers.

\*Baranek<sup>1</sup>, G. T. (2004). Autism during infancy: A retrospective video analysis of sensory-motor and social behaviors at 9–12 months of age. *Journal of Autism and Developmental Disorders*, 29, 213-224.

**Method:** Home video of children's play in infancy was studied for 33 children, some of whom were subsequently identified as having special needs. Eleven were identified with autism and 10 with developmental disabilities. The remaining 12 infants were developing typically. Researchers viewed video that captured children's play in home events that occurred between 9 and 12 months. They rated infants' sensori-motor and social behaviors, such as quality of motor and object play, posture, responses to visual and auditory stimuli, responses to touch, and looking at objects and people. They then compared these three groups of children—now older and with or without challenging conditions—on these early measures of infant behavior.

**Findings and Conclusions:** The authors note that social behaviors have often served as the basis for early identification of children with special needs—particularly those with autism. Their findings indicate that unique sensory-motor behaviors can also indicate developmental delays. Poor sensori-processing items, such as under- or over-reacting to touch, sound, and auditory stimuli, were more likely to be observed in the autism group, less often in the developmental delays group, and rarely in the typically developing group. The researchers also observed on the video that parents performed certain behaviors in play that could assist in the identification of children with autism. For example, parents of those later diagnosed with autism showed greater

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<sup>1</sup> Throughout this document, an asterisk (\*) at the beginning of a citation indicates that the article discusses children with special needs.

frequency of attempts to make contact with their children and offered more pronounced auditory and visual stimuli (e.g., shaking a rattle excessively to get a child's attention).

**Implications:** Teachers, caregivers, and parents should study carefully the play behaviors of young infants and note sensory-motor and social indicators of developmental delays. In particular they should observe children's responses to auditory, visual, and tactile stimuli. Do children show typical and expected reactions to sound, sights, or touch? Do they over or under-react to these? Professionals might also observe the interactions of parents and babies, watching for signs of overly-energetic efforts to prompt their babies to respond.

Bourgeois, K. S., Akhwar, A. W., Neal, S. A., & Lockman, J. J. (2005). Infant manual exploration of objects, surfaces, and their interrelations. *Infancy*, 8, 233–252.

**Method:** Sixty infants of three different age groups (6-, 8-, and 10-month-olds) were observed sitting in a special chair as they played with objects of varying characteristics on different kinds of surfaces. Each infant was first provided with hard or soft objects to play with on a smooth, nondescript ("neutral") surface. Next, each infant was presented with surfaces of varying quality—liquid, taut/netted, sponge-like, and rigid—but with no toys. Finally, babies were given varying objects to play with on these diverse surfaces. The authors hypothesized that babies would adapt their actions not only to the characteristics of the object, but also the surface on which they played with it.

**Findings and Conclusions:** When playing with the objects on a neutral surface, babies performed different actions depending on each object's qualities. For example, they would squeeze soft objects or scratch at hard cubes. When presented with surfaces alone, they slapped liquid surfaces, pressed down on flexible ones, pounded on rigid surfaces, and picked at the netted ones. When provided with both diverse objects and surfaces, infants altered their play actions depending on the characteristics of both. For example, they would press firm objects down into the liquid or sponge-like surfaces. They would more often bang the hard objects on firm surfaces. These actions were most varied among the oldest subjects in the study. Findings led researchers to conclude that, with age, children are able to coordinate both objects and surfaces in their play, adapting their actions to both simultaneously.

**Implications:** Teachers, caregivers, and parents often give careful consideration to the properties of toys they provide to infants. This study suggests that equal attention should be given to the surfaces on which children play with these. Objects of different properties, both rigid and flexible, might be provided to babies on various surfaces—firm, textured, soft, or flexible. Such surfaces might be created on the floor with blankets, firm mats, smooth hardwood floors, or grassy surfaces when playing outdoors. This study suggests that infants will play with objects in more diverse ways when both objects and surfaces are varied.

\*de Campos, A. C., Rocha, N. A., Cicuto F., & Savelsbergh, G. (2010). Development of reaching and grasping skills in infants with Down syndrome. *Research in Developmental Disabilities: A Multidisciplinary Journal*, 31, 70-80.

**Method:** Fourteen infants, seven with Down syndrome and seven who were developing typically, were assessed on their large motor abilities and their reaching and grasping skills. Subjects were evaluated in a laboratory setting in these skill areas at four, five, and six months of



age. The performances of children with and without Down syndrome were compared. Growth in these motor abilities was measured across the age range studied.

**Finding and Conclusions:** Infants with Down syndrome were found to perform less well on both large motor development and specific aspects of reaching and grasping. For all children, poor large motor development was related to poor reaching and grasping skills. The authors conclude that for children with Down syndrome, there may be a direct and indirect effect of Down syndrome on reaching and grasping abilities. The disability itself may directly influence the acquisition of these skills. However, some of the poor performance of children with Down syndrome on reaching and grasping may be the result of poor large motor development.

**Implications:** When working with infants who have special needs, teachers, caregivers, and parents might begin with motor development interventions focused on large muscles. They might entice children to raise their heads from the prone position by presenting toys, provide interesting surfaces for babies to crawl on, and play sitting-up games with clapping and vocalizing. Supporting large motor play in these ways will, in turn, provide a foundation for later, more refined skills such as reaching and grasping.

Eckerdal, P., & Merker, B. (2009). Music and the “action song” in infant development: An interpretation. In S. Malloch & C. Trevarthen (Eds.), *Communicative musicality: Exploring the basis of human companionship* (pp. 241-262). New York: Oxford University Press.

**Method:** This study concerns infant motor responses to music. Twenty-five infants and their mothers were videotaped in their homes as they engaged in natural play and other daily routines when they were 6, 9, and 12 months of age. The video was then studied, frame-by-frame, to describe the music- and rhythm-related experiences that occurred and infants’ responses to these.

**Findings and Conclusions:** Mothers in the study were found to use music often in their natural interactions with children. The authors note that they appeared to have an “intuitive sense” of the impact that various kinds of singing or rhythmic activities had on infant behavior. Infants responded to songs and rhythmic activities differently, depending on the type of music used. Some music caused quick, rhythmic movements by babies. Other types of music prompted unique gestures, vocalizations, changes in posture, and whole-body actions. Some types of music had the effect of calming, soothing, and distracting infants, and were most often sung or played by mothers when infants were upset. The authors conclude that very young infants are highly receptive to music and respond to it in a different way than they do to other forms of stimuli or interactions.

**Implications:** These findings suggest that music may be a powerful stimulus for prompting babies to move in infancy. Teachers, parents, and caregivers should provide diverse musical experiences for babies, even right after birth. Recorded music will inspire motor responses, but singing with one’s own voice appears to have the greatest impact on infant behavior. This study also shows that different types of music will have different effects on infants. Teachers, caregivers, and parents should experiment with alternative types of music and observe how they impact the actions and play of very young children.

Garrett, M., McElroy, A. M., & Staines, A. (2002). Locomotor milestones and babywalkers: A cross sectional study. *British Medical Journal*, *324*, 1494.

**Method:** These researchers studied 109 infants between the ages of eight and fourteen months who had varying experiences using infant walkers in their homes. Parents kept records of the frequency of infant walker use and the dates at which motor milestones—sitting with support, sitting alone, standing with support, standing alone, and walking—were achieved.

**Findings and Conclusions:** The findings indicated that there was no relationship between the frequency of walker use and sitting milestones. However, walker use was found to be associated with delays in standing alone and walking alone. Authors conclude that walker use, while intended to promote locomotion, actually constrains some movements, resulting in developmental delays in the areas of standing and walking.

**Implications:** Teachers, caregivers, and parents should provide active, engaging play spaces that allow free movement at a child's current level of mastery. Babies not yet crawling should spend time on their stomachs on the floor with enticing toys and peers around them. Those who are walking should be provided with ramps, mats, pillows, and other surfaces and objects to walk over or around. Trying to rush locomotion with equipment contributes little to children's motor development and may even inhibit movement and the acquisition of important motor skills.

Gill, S. V., Adolph, K. E., Vereijken, B. (2009). Change in action: How infants learn to walk down slopes. *Developmental Science*, *12*, 888-902.

**Method:** Twenty-five infants between the ages of 15 and 17 months were observed walking down ramps with varying degrees of slope. Half of the infants were observed two or three times per week, walking down these carpeted, sloping walkways toward their parents. The walkway's slope was adjusted to become more challenging as children repeated this task. Half the group was only tested at the beginning and end of the study, and thus had far less experience walking on the ramps. The two groups were compared on their "braking strategies"—their efforts to slow themselves down by adjusting their step length, step time, or both.

**Findings and Conclusions:** All infants were observed using a range of braking behaviors, depending on the steepness of the slope. In some cases, infants simply ran down the walkway; in others, they inched slowly along, pausing between steps. On extremely steep slopes, some babies would slide down; others would turn away and refuse to walk down at all. Even during the pretest, both groups of children showed a rapid increase in their ability to adapt their walking and braking behaviors to the various types of slopes. By the end of this first session, in which babies walked down the slope several times, both groups became "impressively savvy" in these adaptations. Surprisingly, both groups performed equally well at the end of the study. Authors conclude that the very first attempts at slope walking led both groups to acquire new motor and perceptual abilities. They also suggest that walking experiences at home, outside of the study, accounted for some of the growth in the abilities of both groups.

**Implications:** Opportunities to walk up and down ramps, hills, foam wedges, or other inclines may help infants quickly acquire the physical, perceptual, and cognitive skills required for slope-walking. The findings of this study suggest even a single classroom or home activity with sloping spaces can lead to rapid motor learning.

\*Hemgren, E., & Persson, K. (2006). Associations of motor co-ordination and attention with motor-perceptual development in 3-year-old preterm and full-term children who needed neonatal intensive care. *Child: Care, Health and Development*, 33, 1, 11–21.

**Method:** These authors assessed the motor coordination and attention of 245 three-year-old children who were categorized as very preterm, moderately preterm, or full term when born. This assessment was done by asking parents to administer both the Motor Perceptual Development Scale and the Combined Assessment of Motor Performance and Behavior as children interacted in playful, non-test settings. Performance by these three groups of infants was compared.

**Findings and Conclusions:** No differences were found between the full term and moderately preterm infants on assessment scores. However, there were significantly lower levels of performance for the very preterm group in motor performance. The authors conclude that caregivers and other professionals should conduct regular motor assessments on infants who are born prematurely. They suggest that earlier identification of and intervention for motor difficulties might offset some of the negative outcomes expected for preterm children who exhibit poor play skills.

**Implications:** These findings suggest that professionals interview families to learn the birth histories of infants enrolled in child development programs. The study also highlights the importance of observation and intervention in the motor development of very low birth weight infants. Teachers, caregivers, and parents should carefully assess high risk infants in play settings. Those who are found to have motor delays should be provided with special support to acquire skills necessary for later play ability and social competence. Interacting with children in play may be the ideal method for offsetting some of the negative developmental effects of low birth weight.

\*Looper, J., Wu, J., Barroso, R. A., Ulrich, D., & Ulrich, B. D. (2006). Changes in step variability of new walkers with typical development and with Down syndrome. *Journal of Motor Behavior*, 38, 367-372.

**Method:** The authors studied toddlers, 9 whom were typically developing and 6 with Down syndrome. The study began at the age when they could take three steps and continued for the next 6 months. Each toddler's strides were measured as he or she walked across a computerized mat. Variability in the length and width of babies' strides were recorded. Ten of these toddlers had also participated in a treadmill training program, in which they were encouraged to walk at varying speeds up and down slopes.

**Findings and Conclusions:** In the first month of the study, all toddlers' stride lengths were highly variable; in a single walk across the mat, a child might use both long and short strides. The width of their gaits, in contrast, was very consistent. This pattern is the exact opposite of what would be observed in adult walkers, who walk with relatively uniform stride lengths and variable stride widths. These findings suggest a lack of control in infants taking steps at this early stage. Over the six months of the study, the toddlers' stride lengths became more consistent while their stride widths became less so, approaching more adult-like walking patterns. Children with Down syndrome did not progress as quickly toward these patterns, however. The children who had participated in the treadmill training study—both those with this disability and without— showed walking patterns that were more advanced than those without this experience.

The authors conclude that walking experiences are an important intervention to support the motor development of toddlers with Down syndrome.

**Implications:** Teachers, caregivers, and parents should provide as much independent walking experience as they can for all toddlers, but particularly for those with Down syndrome. Such experience will assist children with this condition in literally keeping pace with their typically developing peers. Adults should provide varied surfaces, paces, and challenges when creating play spaces and activities for newly-walking toddlers.

\*Lloyd, M., Burghardt, A., Ulrich, D. A., & Rosa, A. (2010). Physical activity and walking onset in infants with Down syndrome. *Adapted Physical Activity Quarterly*, 27, 1-16.

**Method:** These researchers sought to determine if motor activity in early infancy is related to the onset of independent walking for children with Down syndrome. To investigate this, they attached “actiwatches” to 30 babies between the ages of 6 and 12 months. These are small devices worn on the ankle and trunk to measure activity level in those two areas of the body. The actiwatches were attached to the infants for a 24-hour period every other month until they started walking. Separate scores for activity levels of the leg and trunk were obtained.

**Findings and Conclusions:** Researchers found that frequent activity of the leg was related to early onset of walking. They concluded that the amount of movement of the legs predicts advanced motor development in children with Down syndrome. They recommend that activities to increase the strength and movement of the legs be implemented with infants who have this challenging condition.

**Implications:** Parents and caregivers can engage infants with Down syndrome in a variety of play activities to encourage leg movements. Attaching jingle bells or a string connected to a mobile will prompt babies to kick their legs to produce an effect. Adults can hold babies in a standing position, lower them until their feet are flat on the ground and their legs bent, then encourage them to push off from the floor in a mock jump. Similarly, adults can press forward against babies’ feet while diapering them and encourage them to push back (causing the adult to fly back in pretend surprise).

Schneider, E. (2009). Longitudinal observations of infants' object play behavior in the home context. *OTJR: Occupation, Participation and Health*, 29, 79-87.

**Method:** Sixty infants were videotaped at 10, 12, and 14 months as they played with toys in their homes. Play was assessed by providing the infants with novel objects and evaluating the level of “sophistication” of play, using the Infant Play Behaviors instrument. Relationships between age, growth in play ability, and types of objects were studied.

**Findings and Conclusions:** Findings show that play abilities with objects increase with age. However, there was significant variation among individuals, depending on what object was being used. For some children, a ball or stuffed animal elicited high play levels, whereas a rattle or squeeze toy did not. For others, the ball or animal did not lead to these same high levels of play. The authors conclude that play will advance only when toys are provided that meet infants’ play needs and interests.

**Implications:** This study demonstrates the importance of tailoring play environments and materials to the play needs and interests of individual infants. Even at this young age, infants show a preference for certain kinds of toys and will exhibit their highest levels of play when using these. Teachers and caregivers need to observe and identify these play interests for each child. They might also interview parents about their children's toy preferences. Based on these steps, teachers and caregivers can alter the selection of toys within a classroom to better meet the interests of babies currently in their care.

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### Play and Brain Development

This section reviews studies that are part of a growing body of research on both animals and human infants that show how play and physical activity stimulate development of important parts of the brain. These articles also demonstrate how the brain is protected by play by reducing the production of harmful chemicals that are produced in response to stressful situations. This research explains why thinking, learning, and feeling are so highly related to physical activity.

Bell, H. C., Pellis, S. M., & Kolb, B. (2010). Juvenile peer play experience and the development of the orbitofrontal and medial prefrontal cortices. *Behavioural Brain Research*, 207, 7-13.

**Method:** Young Long-Evans rats, whose brains, surprisingly, resemble those of human infants, were raised in environments with varying levels of opportunities for active play, alone and with other rats. Various tests of brain functioning were conducted over the course of the study and brain growth was examined physically at its conclusion. Comparisons were made among rats raised in different play settings.

**Findings and Conclusions:** Rats raised in environments with active play opportunities showed advanced development of the medial prefrontal cortex (MPFC), which, in humans, is believed to be responsible for understanding the thoughts and emotions of others. Rats raised with other rats in an environment without toys and play opportunities showed a lesser rate of growth in this part of the brain. Rats deprived of any social contact or play showed actual damage to the MPFC.

**Implications:** These findings suggest that play promotes brain development. Active play may be particularly important for infants and toddlers, who are in a formative period for the creation of neurons (brain cells) and synapses (the connections between brain cells where the mind's signals travel). This study suggests that play in infancy may lay the groundwork for important functions of the brain in later life. In stimulating the MPFC, play may support regions of the brain responsible for the interpretation of others' feelings or an understanding of how one's own brain works. Teachers, parents and caregivers should provide play environments that are rich in movement challenges and toys that inspire action. Encouraging interactions with peers in such environments is also recommended.

Watanabe, S. E., Donzella, B., Alwin, J., & Gunnar, M. R. (2003). Morning-to-afternoon increases in cortisol concentrations for infants and toddlers at child care: Age differences and behavioral correlates. *Child Development*, 74, 1006-1020.

**Method:** Cortisol<sup>2</sup> samples were taken from the saliva of 20 infants and 35 toddlers over the course of a day in high quality child care centers. The researchers also observed children's play interactions and other classroom behaviors. The cortisol samples were taken by giving children a small amount of juice to stimulate saliva production, then encouraging them to chew on a cotton swab. A similar procedure was followed to gather cortisol samples for each of these children during a full day at home. The researchers wanted to see if classroom experiences or time of day were associated with higher or lower levels of this hormone.

**Findings and Conclusions:** Authors found that in infant and toddler classrooms, cortisol levels rose throughout the day, while just the opposite was true at home. However, children who engaged in more active motor and social play during the child care day had significantly lower levels of this hormone than those who did not play frequently.

**Implications:** Play may serve to protect infants and toddlers from physiological harm caused by stress in child care. Teachers and caregivers should view play as a way to both promote social development and learning and to protect the health of the infant brain, and should provide play spaces, toys, equipment, and outdoor time for these young children.

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### Play Intervention and Play Environments

This section reviews research on the effects of specific interventions and environments on motor play and development of infants and toddlers with and without special needs. These studies offer insights into how teachers, caregivers and parents can interact with children, provide play materials, and arrange classroom and playground space to promote play.

\*DiCarlo, C. F., Reid, D. H., & Strickin, S. B. (2006). Increasing toy play among toddlers with and without disabilities by modifying the structural quality of the classroom environment. *NHSA Dialog: A Research-to-Practice Journal for the Early Intervention Field*, 9, 49-62.

**Method:** These researchers tested the effects of the classroom environment on toddlers' play abilities. Nine toddlers, ages 18 to 30 months, who were enrolled in three different classrooms were observed and coded on their play abilities. Four of the toddlers had developmental disabilities. Each classroom was then assessed using three instruments to rate environmental quality: The Infant/Toddler Environment Rating Scale, the National Association for the Education of Young Children Classroom Observation Form, and the Assessment Profile for Early Childhood Programs. The classrooms were modified based on resulting assessment data. Learning centers were rearranged; furniture and materials were added. The toddlers were rated again on their play competence following these modifications.

**Findings and Conclusions:** The authors report that eight of the nine infants studied, including all four who had disabilities, showed increases in their ability to play with toys and other objects

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<sup>2</sup> Cortisol is a hormone that is produced in particularly high quantities when humans and other animals are under stress. An elevated cortisol level has been associated with greater fearfulness and vulnerability to stress in later life. Animal studies suggest that high cortisol levels impair the immune system and increase susceptibility to disease. Elevated cortisol has been associated with damage to neurons in parts of the brain responsible for memory and the regulation of emotions.

after classrooms were modified. The authors conclude that the physical play environment has a significant effect on the play of very young children.

**Implications:** The findings of the study suggest that professionals and parents analyze and regularly modify play environments to meet the needs of children in their classrooms. Teachers, caregivers, and parents might regularly study toddlers' use of spaces, at home, in classrooms, and on the playground. Are centers and play equipment used infrequently? Are toddlers highly engaged in each space? Are social interactions in all areas positive? After these assessments, adults can make modifications to strengthen play areas. Specifically, they should experiment with the arrangement of play spaces and add novel equipment and materials. These steps appear to be particularly important for supporting the play of children with disabilities.

\*Washington, K., Deitz, J. C., White, O. R., & Schwartz, I. S. (2002). The effects of a contoured foam seat on postural alignment and upper-extremity function in infants with neuromotor impairments. *Physical Therapy*, 82, 1064-1076.

**Method:** Four infants, ages 9 to 18 months, who were diagnosed with neuromotor impairments (spastic quadriplegia, Down syndrome, congenital hypotonia, and asymmetrical spastic quadriplegia) and who were unable to sit independently, were observed playing with toys in three different types of seats: a regular high chair, a high chair with a thin foam liner, and a contoured foam seat—an adaptive seating device that can be placed within a high chair. The researchers examined which of the three seating options would provide the most stable base to allow children to reach for and use toys.

**Findings and Conclusions:** All four infants showed improved postural alignment when seated in the contoured foam seat, compared to the other seating devices. Positive postural alignment was defined as the positioning of the upper body above the pelvis to allow better access to toys and other objects directly in front of the infant. This is the position recommended for play for children with neuromotor impairments. Two of the four children studied were more likely to play with their arms free of support when sitting in the contoured foam seat. The authors conclude that a contoured foam seat, which can be placed into high chair and fabricated to meet the specific needs of an individual child, is a highly effective and affordable way for families and infant care centers to support play in children with neuromotor impairments.

**Implications:** This study demonstrates how physical support in the environment can promote the play of children with severe motor challenges. Sitting upright is a required position for many kinds of play as infants grow older. This adaptive seating device ensures that infants can remain in a seated position and move their arms freely in order to play.

## The Play of Preschool Children and Physical Development

### Development of Movement and Play

This section presents an overview of the typical and atypical development of movement and play in young children. Work cited here provides a foundation for understanding, observing, and supporting specific motor skills. This research also examines diverse types of play that are common and beneficial for preschool children.

\*Casby, M. W. (2003). The development of play in infants, toddlers, and young children. *Communication Disorders Quarterly*, 24(4), 163-174.

**Method:** This article presents a comprehensive review of literature on the development of all types of play in infants, toddlers, and young children. It highlights the ways play becomes more physically and intellectually complex with age and how each stage of play supports motor, cognitive, communicative, and social-emotional growth.

**Findings and Conclusions:** The authors conclude that all types of play can support development. For example, they describe how physical play can enhance the learning of communicative abilities. Because of the active, social nature of play, the authors contend, it is also an ideal context in which teachers and parents can interact with children to support language development. Play, more than other settings, also allows adults to adapt environments and materials to meet individual needs.

**Implications:** This work provides evidence of the importance of play across the early years. An implication of this work is that teachers, caregivers, and parents should carefully observe the types of play children engage in at varying ages and should adapt activities and interactions to meet their specific developmental needs. This is especially important for those working with children with special needs. This review shows that play is an authentic, enjoyable context in which to administer interventions to promote development in any domain.

\*Case-Smith, J., & Kuhaneck, H. M. (2008). Play preferences of typically developing children and children with developmental delays between ages 3 and 7 years. *OTJR: Occupation, Participation and Health*, 28, 19-29.

**Method:** These researchers administered questionnaires to 166 parents about their preschool children's play. Half of the participants were parents of children who were identified with developmental delays. Parents were asked indicate which play activities their children preferred and where they most liked to play. Children's overall play preferences were determined from parents' responses. Preferences were then compared for children with special needs and those without. Age and gender differences were also examined.

**Findings and Conclusions:** Surprisingly, play preferences did not differ by gender. Older children were more likely to prefer computer games and less likely to enjoy simple object exploration than younger children. Children with developmental delays were more likely to prefer rough-and-tumble play and less likely to prefer drawing, playing with dolls, building with blocks, and other activities preferred by typically developing children. The authors conclude that



there can be a mismatch between what children with disabilities like to do, compared with those who are developing typically.

**Implications:** Several important implications can be drawn from this study. First, children with special needs might have distinctly different play interests than their typically developing peers. Adults might need to actively help their students to understand one another's play styles when preferences among them differ. The rough play of a child with developmental delays, for example, might be considered aggressive or mean-spirited by peers; adults might need to clarify that a child engaged in such activity is "just playing." Beyond this, teachers may need to assist all children in learning new play activities that will allow them to join the play of others. They might engage children with special needs in doll play or blocks. Just as important, typically developing children might be introduced to the joys of appropriate rough and tumble play with peers who have developmental delays. Providing safe spaces for wrestling, chasing, rolling, and falling over may encourage more positive peer interactions.

Payne, V. G., & Isaacs, L. D. (2008). Chapter 12: Fundamental locomotion skills of childhood. *Human motor development: A lifespan approach* (7<sup>th</sup> ed.) (pp. 299-327). New York: McGraw Hill.

Payne, V. G., & Isaacs, L. D. (2008). Chapter 13: Fundamental object control skills of childhood. *Human motor development: A lifespan approach* (7<sup>th</sup> ed.) (pp. 328-361). New York: McGraw Hill.

**Method:** These chapters provide one of the best summaries available of the development of two major categories of motor ability in young children: locomotion skills and object control skills. Chapter 12 reviews developmental milestones in walking, running, jumping, hopping, galloping, sliding, and skipping in early childhood. Sequences for the acquisition of each skill are discussed and illustrated with photographs and drawings. Chapter 13 describes developmental aspects of object control development, including skills such as the over-arm throw, two-handed catching, ball-striking (with bats and racquets), kicking, punting, and bouncing. Factors influencing the learning of these skills are considered, including how adults can provide instructional cues and proper equipment.

**Implications:** Teachers, caregivers, and parents should understand young children's progression through each stage of skill acquisition, for both locomotor skills and object control skills. Such an understanding will allow them to observe and assess children's motor development and guide future learning. Only with a clear knowledge of how children acquire these abilities, provided in these chapters, can adults create a developmentally appropriate environment for motor learning.

Williams, H. G., Pfeiffer, K. A., Dowda, M., Jeter, C., Jones, S., & Pate, R. R. (2008). A field-based testing protocol for assessing gross motor skills in preschool children: The Children's Activity and Movement in Preschool Motor Skills Protocol. *Measurement in Physical Education and Exercise Science*, 13, 151-165.

**Method:** These authors developed and tested an observation system, The Activity and Movement in Preschool Motor Skills Protocol, to measure the motor development of children from three to five years of age. What makes this assessment unique is that it was designed to be administered in a naturalistic, field-based setting, rather than an artificial laboratory or testing

site. The instrument was used to score 297 young children from 22 preschools. Data from this assessment were examined to establish the appropriateness of the tool for assessing motor development in preschool children.

**Findings and Conclusions:** The observation system was found to have high inter-rater reliability, indicating that independent observers obtained similar results when scoring the same children. Validity was established by studying the relationships between ratings on this field-based system and scores on more traditional tests of motor competence. High correlations were found among these measures, suggesting that this field-based instrument measures the same skills that a one-on-one laboratory test does. The authors conclude that this is as useful a measure of preschool children's motor development as commonly-used tests, but with the added benefit of allowing assessment of children in a more authentic play setting.

**Implications:** This instrument is useful for teachers, caregivers, and special education professionals because it can be administered in a naturalistic free play setting. Adults are able to assess young children's competence as they engage in real-life play on the playground. In addition, the instrument provides a useful listing of the critical motor skills that should be acquired by preschool children. Teachers and caregivers can use this tool as a guide for setting motor development goals for their students. The observation system describes in detail both the locomotor skills—running, jumping, galloping, and leaping—and the object control skills—throwing, rolling, catching, kicking, and striking—that are important for children to acquire in preschool.

## Gender and Motor Development

This section reviews several studies that document differences in motor performance between boys and girls. Findings and conclusions from these investigations raise concerns about gender equity in movement and play opportunities in the classroom and on the playground. This research suggests that both boys and girls may need special support in acquiring motor skills in particular areas.

Goodway, J., Robinson, L., & Crowe, H. (2010). Gender differences in fundamental motor skill development in disadvantaged preschoolers from two geographic regions. *Research Quarterly for Exercise and Sport*, 81(1), 17-24.

**Method:** This study examined the influence of gender, socioeconomic status, and region of the country on object control and locomotor skill development. Participants were 275 African American and Latino preschool-aged children, both boys and girls, living in poverty in the Midwest and Southwest United States. These children were evaluated using the Test of Gross Motor Development-2.

**Findings and Conclusions:** The authors report that all preschoolers studied were developmentally delayed in locomotor and object control skills. Midwestern preschoolers had better locomotor skills, but still performed poorly. Boys outperformed girls in both regions.

**Implications:** The findings are troubling for a number of reasons. That all of these children had poor motor skills suggests that this may be yet another area of development in which children of color and those living in poverty have fallen behind. Teachers serving low-income and culturally

diverse group of preschoolers should ensure that children have opportunities to exercise both locomotion skills such as running, jumping, and galloping, and object control skills, such as throwing, catching, and kicking. This study finds that children from disadvantaged backgrounds perform poorly in both areas. More worrisome is that girls received especially low scores on these motor abilities. Teachers, caregivers, and parents should be aware that girls living in poverty are at special risk of poor physical development. Through careful observation, they might be able to identify motor play activities that are more likely to engage this high-risk group. A classroom assessment of the amount of time and types of motor activities provided for girls would be critical.

Pollatou, E., Karadimou, K., & Gerodimos, V. (2005). Gender differences in musical aptitude, rhythmic ability and motor performance in preschool children. *Early Child Development and Care*, 175, 361–369.

**Method:** Ninety-five 4- and 5-year olds were assessed in three areas: their musical ability, their rhythmic competence, and their large motor development. Music ability was measured using the Primary Measures of Music Audiation, rhythmic ability using the High/Scope Rhythmic Competence Analysis Test, and overall motor development using the Gross Motor Development Test-2. The authors compared the performance of girls (n = 50) and boys (n = 45) on all three measures.

**Findings and Conclusions:** No gender differences were found in children’s musical ability and gross motor development. However, girls performed better than boys on rhythmic performance. The authors note that previous research indicates a strong relationship between rhythmic competence and various aspects of motor coordination. They recommend that rhythm experiences become a regular part of preschool classroom activities. Boys, in particular, should be guided in rhythm activities during indoor and outdoor motor play.

**Implications:** Although previous research suggests that boys often score higher than girls on motor assessments, this study identifies areas of development in which boys perform less well—rhythm skills. Teachers, caregivers, and parents can build rhythm activities into lessons, play activities, transitions, and other routines. Encouraging children to move in synchrony to handclaps, rhythmic music, and foot tapping will enhance rhythmic abilities.

### **Physical Activity Level: Research, National Reports, and Position Statements**

This section reviews a variety of documents that address national concerns about young children’s activity level. Reports and position statements of national organizations and government agencies highlight the need for increased opportunities for motor play in preschools. These works offer guidelines for professional practice and policy to meet this need. Research studies are also included that document the importance of inspiring young children to play and move in homes and classrooms.

Benham-Deal, T. (2005.) Preschool children’s accumulated and sustained physical activity. *Perceptual and Motor Skills*, 100, 443–450.

**Method:** This researcher placed a heart-rate monitor on 39 three- to five-year olds for 12 hours per day on three consecutive days while the children were at home. They also asked parents to keep a log of children’s activities, including the type of play they engaged in and its location. These data were examined to determine the intensity of children’s physical activities and when the most vigorous activity levels were reached during the day.

**Findings and Conclusions:** The highest number of minutes of moderate to vigorous physical activity (MVPA) was measured during the afternoons, both on weekdays and weekends. This was a period when children were more often playing outdoors. Many of the children (71%) engaged in recommended total minutes of MVPA on the weekday, far fewer (46%) on the weekend. However, sustained activity—vigorous play without significant periods of inactive time—was brief for almost all children studied. The authors conclude that adults must attend to both the overall minutes of active play and the degree to which high activity level is sustained, in order to assure that children are receiving adequate exercise.

**Implications:** This study suggests that teachers, caregivers, and parents should monitor two aspects of motor activity to assure the health and motor learning of young children. First, the number of minutes children engage in active play is critical. This study suggests that outdoor time is when this is most likely to occur. Second, during play periods, adults need to engage children in activities that are intense and sustained. They might plan games or motor challenges that encourage children to move more intensely (“Let’s run even faster!”) and to maintain a high activity level for longer periods (“Let’s keep going!”)

Brown, W., McIver, K., Pfeiffer, K., Dowda, M., Addy, C., & Pate, R. (2009). Social and environmental factors associated with preschoolers’ nonsedentary physical activity. *Child Development, 80*(1), 45-58.

**Method:** These researchers studied 539 Euro-American and African American 3-, 4-, and 5-year-olds who were enrolled in 24 different urban preschools. They observed children during outdoor play, gathering data on their physical activity. They also identified social and environmental factors that influence their activity level. They conducted an analysis to determine which factors are the best predictors of children’s moderate to vigorous physical activity (MVPA) and nonsedentary behavior.

**Findings and Conclusions:** The authors report that preschoolers’ physical activity was primarily sedentary—89% of observations—throughout the preschool day. In contrast, MVPA was recorded in only 3% of observations. Several contextual and social factors were associated with higher activity level. Amount of open playground space and the frequency of play with wheeled toys, balls, and other objects was related to higher MVPA. In contrast, fixed playground equipment and number of dramatic play props were associated with lower levels of MVPA.

**Implications:** The data should inspire teachers, childcare providers, and policymakers to place greater importance on young children’s physical activity and motor skill development. Those working directly with young children should recognize the potential health issues surrounding inactivity and sedentary behavior and purposefully integrate appropriate movement experiences, indoors and out. This study shows that teachers and caregivers can increase the percentage of time that children spend in moderate to vigorous physical activity by providing ample access to open spaces and by encouraging the use of balls, wheeled toys and other movable equipment.

Centers for Disease Control and Prevention. (2010). *State indicator report on physical activity, 2010*. Atlanta, GA: U. S. Department of Health and Human Services.

**Method:** This report presents national and state information on the physical activity levels of children. Twelve indicators of the amount of support states provide for physical activity were identified, based on recommendations from two national reports--*Healthy People 2010 Objectives*, and the *2008 Physical Activity Guidelines for Americans*. These indicators were further categorized into four basic strategies to ensure adequate physical activity: 1) creating or enhancing access to places for physical activity, 2) enhancing physical education and activity in schools and child care centers, 3) supporting urban design, land use, and transportation policies that lead to physical activity, and 4) developing and maintaining a public health workforce knowledgeable in promoting physical activity.

**Findings and Conclusions:** The findings show that there are vast differences across states in their support for physical activity. For example, the percentage of children with access to parks ranged from 26% in several states to over 65% in others. Fewer states require recess in elementary schools than states that don't. Most important to early childhood educators is the finding that only 8 states provide guidelines regarding the number of minutes of moderate-to-physical activity young children should receive per day. The report notes that, across states, 45% of children, ages 3 and 4, are enrolled in childcare centers, yet policymakers rarely take advantage of the opportunity to legislate greater physical activity in young children in this setting.

**Implications:** Schools and child care centers are ideal places to increase physical activity in young children. Policymakers and advocates for young children must work together to increase moderate to vigorous physical activity in child care centers, where young children spend most of their time outside of the home.

National Association of Early Childhood Specialists in State Departments of Education. (2001). *Recess and the importance of play: A position statement on young children and recess*. Washington, DC: Author.

**Findings and Conclusions:** This position statement of a professional organization of early childhood professionals provides a research-based argument for including adequate outdoor play time in programs for young children. They offer a compelling case for including all types of play in schools, but particularly active motor and outdoor play.

**Implications:** Through this paper, the organization takes a strong stance against the trend of eliminating recess to provide greater time for quiet academic learning. They also warn against withholding outdoor play as a punishment for misbehavior. These practices may cause particular difficulties for children with disabilities. For such children, losing opportunities for recess may contribute to increases in challenging behaviors, greater learning difficulties, and difficulty sustaining attention. The authors note that pressure to increase standardized test scores may lead to such practices, but that these strategies will have unintended negative effects on learning, given the well-documented benefits of physical play.

National Association for Sport and Physical Education. (2009). *Active start: A statement of physical activity guidelines for children from birth to age 5* (2<sup>nd</sup> ed.). Reston, VA: Author.

**Method:** This document provides guidelines for the physical activity of children from birth to age five. Developed by practitioners and researchers in a variety of fields, these guidelines articulate the kinds of experiences that young children need to become healthy, physically competent, and equipped to form positive relationships with others through play. Guidelines for infants include daily, playful adult-child interactions, structured and unstructured environments that promote both general activity level and the acquisition of specific motor skills, and safe play spaces that allow free exploration and movement. Toddler guidelines suggest at least 60 minutes of physical activity per day in safe indoor and outdoor environments—at least 30 of which are structured and/or guided by an adult. Parents, teachers, and parents are encouraged to become familiar with the specific skills learned by toddlers, and to engage them in activities which lead to their acquisition. Preschoolers must also be provided with at least an hour a day of active, safe, structured and unstructured play, according to the guidelines. Outdoor and indoor play experiences and motor tasks should be planned for this age group to address the multitude of motor skills emerging during this period.

**Implications:** Teachers and childcare providers should look to these guidelines when establishing policies, facilities, and curricular goals and activities for young children. They must work together with families to provide experiences to meet these guidelines both at home and school.

Pate, R. R., Pfeiffer, K. A., Trost, S. G., Ziegler, P., & Dowda, M. (2004). Physical activity among children attending preschools. *Pediatrics*, *114*, 1258–1263.

**Method:** These researchers placed accelerometers—devices that measure the activity level of children—on the right hips of 281 three- four- and five-year olds enrolled in nine preschools. Children wore these devices for four hours per day for 6 days over the course of the study. Readings from this device allowed the authors to determine the amount of time children engaged in vigorous physical activity (VPA), moderate-to-vigorous physical activity (MVPA), light physical activity, and sedentary activity. Children's activity level scores were compared for girls and boys, African American and Euro-American children, and those attending different preschools.

**Findings and Conclusions:** Boys and African American children engaged in more VPA and MVPA than girls and Euro-American children. The best predictor of activity level, however, was the preschool in which children were enrolled. Major variation was found in physical activity of students across the classrooms studied. The authors conclude that practices and policies of individual classroom teachers have a significant impact on how active young children are.

**Implications:** These findings should encourage preschool teachers to reexamine their motor development curriculum and to observe the activity levels of their students. All preschools examined in this investigation included some outdoor motor play. Yet variations in the amount of time outdoors and the interactions of teachers made a significant difference in the amount of vigorous and sustained activity children engaged in. Teachers in some classrooms may need to

provide longer play periods and more energetic playground interventions in order to help children reach and maintain the levels of activity needed for healthy development.

Schneider, H., & Lounsbery, M. (2008). Setting the stage for lifetime physical activity in early childhood. *Journal of Physical Education, Recreation, and Dance*, 79(6), 19-23.

**Method:** The authors conducted a review of the research on physical activity in the preschool years, showing that children of this age group are not meeting the expected standards for activity level. Authors cite studies that indicate this low level of activity will place children at risk for health problems later in life. The authors present evidence that preschool classrooms are ideal contexts for providing health-related physical education. They suggest that the professional preparation of child care providers and preschool teachers should include skills and dispositions for supporting motor activity and play in young children. Teacher accreditation organizations should mandate competencies in physical education for all early childhood teachers.

**Implications:** Professional organizations, agencies, institutions involved in the preparation of teachers, physical education specialists, administrators, and child care providers should advocate for more stringent teacher preparation requirements that require knowledge, skills, and dispositions in promoting motor development and enhancing activity level in young children. Current teachers and caregivers who have not received such preparation should educate themselves by reading literature or attending conferences that outline the benefits of and approaches to including movement and play in the classroom.

Timmons, B. W., Naylor, P., & Pfeiffer, K. A. (2007). Physical activity for preschool children: How much and how? *Applied Physiology, Nutrition, and Metabolism*, 32, 122–134.

**Method:** The authors conducted a systematic review of literature on physical activity in early childhood. They summarize studies that examine the effects of activity level on the acquisition of motor skills, overall health, and body mass for children under five years of age. They also cite research on home and school factors that influence level of activity. The authors draw several conclusions from their review. Preschool motor activity tends to occur in “brief bursts” and is of insufficient intensity to assure healthy development. Lack of movement activities in preschool and child care inhibits the learning of specific motor skills. Conversely, high activity level in these programs will promote such skills, even for children with physical disabilities. Physical activity and play also affect emotional and cognitive development. Variation in preschool children’s activity levels are determined by biology, temperament, self-esteem, and family life. The overall environment in the home, including the amount of television watched, opportunities for play, and parent-child play interactions make a particularly important difference.

**Findings and Conclusions:** Based on their review, the authors offer the following recommendations for parents and teachers: 1.) They should make a careful study of the natural activity patterns of individual children and build active play and motor activities around these. Many children are active, but only intermittently, for example. For these children, adults should inspire more intensive and sustained play. For others, activity is primarily spontaneous and playful, but does not include specific motor behaviors. For these children, planned activities that target motor skills should be implemented. 2.) Play and motor activity should be made enjoyable. Only then will sustained movement and motor learning occur. 3.) Adults should facilitate play

and motor development. In particular, modeling specific motor skills is beneficial. 4.) Schools and centers should increase outdoor play time; parents should do so at home.

**Implications:** This review establishes the need for more active play for young children and presents recommendations for accomplishing this. Teachers, caregivers, and parents should strive to meet all four of the authors' suggestions in order to increase vigorous motor activity among young children.

Tucker, P. (2008). The physical activity levels of preschool-aged children: A systematic review. *Early Childhood Research Quarterly, 23*, 547-558.

**Method:** The author conducted a systematic review of the literature on physical activity levels of preschool children. After searching in eight different national databases, researchers identified 39 studies that met their criteria for sound methodology. These were examined and discussed in detail.

**Findings and Conclusions:** The authors conclude that only 54% of preschoolers in these studies met the recommendation of the National Association of Sport and Physical Education (NASPE) for amount of physical activity necessary for good health—a minimum of sixty minutes of moderate to vigorous physical activity (MVPA) and up to several hours of unstructured play per day for this age group. They found that preschool boys participated in considerably more physical activity than girls. They note that increasing the rate of MVPA of children in a preschool to 180 or even just 120 minutes per day would significantly increase the percent of children who are getting adequate levels of daily physical activity.

**Implications:** This review provides additional evidence that preschool children are not moving enough. According to these authors, nearly half of all young children are not meeting the recommended guidelines for physical activity set forth by NASPE. Long range responses should be explored. In the meantime, one immediate step should be taken, based on the research reviewed here: Preschool teachers and caregivers should ensure that all children have a minimum of 60 minutes of moderate to vigorous physical activity each day. This can be accomplished by adjusting the daily school schedule to provide more outdoor time and engaging children in more active play on the playground. Teachers and caregivers should pay special attention to girls' activity levels and develop strategies for prompting them to engage in more active play.

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## Health and Safety

This section addresses the connection between physical activity and children's overall health and safety. Studies explore the relationship between children's activity levels and their risk for later heart disease and look at state child care licensing regulations related to health, including nutrition and standards for the amount of physical activity children engage in. One study compares children's risk-taking behavior with their rate of injury, concluding that adult supervision that is carefully matched to a child's risk-taking behavior is critical to both promote active play and to prevent injury.



Kaphingst, K. H. & Story, M. (2009). Child care as an untapped setting for obesity prevention: State child care licensing regulations related to nutrition, physical activity, and media use for preschool-aged children in the United States. *Preventing Chronic Disease* 6(1). Retrieved May 20, 2010 from [http://www.cdc.gov/pcd/issues/2009/jan/07\\_0240.htm](http://www.cdc.gov/pcd/issues/2009/jan/07_0240.htm).

**Method:** These authors obtained state licensing regulations for child care centers, family child care homes, and large group care homes in all states. These regulations were then coded by independent raters on the degree to which they addressed health-related features, such as nutrition, amount of physical activity, available motor play space and equipment, and media use, including the restriction of television and video viewing. Data were analyzed to determine how fully states mandate physical activity and health-related practices in child care.

**Findings and Conclusions:** The findings varied greatly among states. Thirty-six states require that children have daily outdoor activity time, but only nine states set specific minimum lengths of time for children to play outdoors. Only eight states set time limits on how much television or computer time children should have per day or per week. The authors conclude that professionals need to advocate for more stringent policies to assure health and combat obesity in child care centers.

**Implications:** Childcare providers and other professionals should argue for more stringent health and activity guidelines; policymakers should listen. Strengthening state licensing regulations in several areas will promote child health. The alarming increase in the rate of childhood obesity should make such policy changes an urgent goal. Caregivers and teachers in states where physical health guidelines are minimal should turn to other national standards on physical activity for guidance, such as the National Association for the Education of Young Children. In spite of lax licensing requirements in some states, caregivers can commit, on their own, to providing adequate motor play and good nutrition for the children in their care.

Morrongiello, B. A., Klemencic, N., & Corbett, M. (2008). Interactions between child behavior patterns and parent supervision: Implications for children's risk of unintentional injury. *Child Development*, 79, 627-638.

**Method:** One hundred and twenty-four mothers of 2- to 5-year-old children were surveyed about their supervisory practices and the characteristics of their children. The survey also asked parents to share their children's injury history. Among the child characteristics the survey asked about were overall activity level and amount of *sensation seeking*—that is, the tendency of a child to seek out novel, daring, and risk-taking play activities. On this portion of the survey, parents were asked to agree or disagree with such statements as, “My child jumps off furniture and other structures.” Parents were asked to complete a questionnaire on their children's inhibitory control—their ability to control impulses and regulate their own actions. Finally, parents were instructed to record their own supervisory behaviors on 10 randomly selected days over a three week period. On these days, parents wrote down what children were doing, what they (the parents) were doing, and what other children and adults were doing in the home, yard, or playground from the moment of waking. The relationship between child characteristics and supervisory behaviors was examined.

**Findings and Conclusions:** The researchers report that boys scored higher in sensation-seeking and activity level and lower on inhibitory control than girls, but, in spite of this, did not suffer

higher rates of injury. Surprisingly, parents reported closer supervision of girls, although their scores were lower on these behavioral risk factors. Parents more closely supervised younger children than older ones, as expected. They provided closest supervision to any child—boy or girl—who showed these risk factors (high activity level, sensation-seeking, poor inhibitory control) in their play. The most important finding of the study was that reported injuries were highest for children who possessed behavioral risk factors *and* had lower levels of supervision by their parents. This was not true for active, risk-taking, uninhibited children whose parents increased their supervision to match these risk indicators. Authors conclude that parents who adjust their supervision to the age and risk level of their children can significantly reduce childhood injury.

**Implications:** These findings have important implications for caregivers. They challenge the notion that there is a one-size-fits-all level of supervision that children of a particular age must receive to avoid injury. This study suggests that teachers must carefully assess the characteristics of children and identify behavioral risk factors for injury—a particularly high level of activity, difficulty inhibiting one’s actions, or a tendency to take risks. Children with these characteristics must receive greater supervision on the playground or in the classroom than might typically be provided. Another important implication of the study is that adults can provide too much supervision for girls, even if this is not warranted from their play behaviors. Care must be taken not to overly protect girls whose risk-taking and vigor are within safe levels.

Saakslahti, A., Numminen, P., Varstala, V., Helenius, H., Tammi, A., Viikari, J., et al. (2004). Physical activity as a preventive measure for coronary heart disease risk factors in early childhood. *Scandinavian Journal of Medication Science and Sports*, 14, 143–149.

**Method:** These researchers investigated the worrisome possibility that sedentary behavior in early childhood contributes to risk factors for heart disease. They followed 151 four-, five- and six-year olds over a three year period, measuring their activity level twice a year—once in fall and once in spring. Children’s level of activity was assessed by asking parents to complete an observation diary for a full weekend during each biannual observation period. Every five minutes, parents rated their children’s activity as “sleeping,” “indoor play,” “very active indoor play,” “outdoor play,” “very active outdoor play,” and “unattended play.” Height, weight, body mass index (computed by dividing weight by height), blood pressure, cholesterol, and triglyceride were also measured at each observation point.

**Findings and Conclusions:** For girls, low activity level was related to a higher body mass index, higher cholesterol, and higher triglycerides. The relationship between activity level and these heart health measures for girls was greatest at 6 years of age. For boys, low amount of outdoor play and low activity level were associated with higher blood pressure and higher cholesterol, with the strongest relationships between health measures and activity scores found at ages four and five. The authors conclude that low activity level in preschool places young children at risk of later heart disease.

**Implications:** These disturbing findings highlight the urgency of encouraging higher levels of physical activity in the preschool years. Teachers and parents should take steps to increase the amount of outdoor time—particularly for boys—and to initiate more vigorous activity levels for both boys and girls when they are on the playground. Engaging children in active, sustained

running, jumping, climbing, and riding activities that raise heart rate and burn calories will help protect children from health problems later in life.

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### **Promoting Motor Play and Development: Curriculum Models and Interventions**

This section reviews a variety of models for enhancing young children's motor play and development. Several articles present motor play curriculum models. Others provide guidelines for planning motor play activities in the preschool classroom. Intervention programs for children living in poverty and those with special needs are described. The overall message of this work is that a motor play curriculum must be planned, just as a teacher plans for mathematics or literacy.

\*Apache, R. R. G. (2005). Activity-based intervention in motor skill development. *Perceptual and Motor Skills*, 100, 1011–1020.

**Method:** Thirty 4-year-olds with developmental delays (or at risk of such delays), who were enrolled in a morning and afternoon preschool program for children with disabilities were provided with two different motor skills interventions. In fall, the morning class received a 15-week activity-based motor play program. In this intervention, specific motor skills were taught through games, creative movement experiences, and motor play challenges. The focus of these was on making movement both challenging and fun. The afternoon group received direct instruction in these same skills during the fall in a more conventional, teacher-directed way. In spring, the methods of delivery were reversed for the two groups. The morning class received direct instruction and the afternoon group received an activity-based program to teach the same abilities. A pre- and post-assessment of locomotor skills (e.g., running, galloping) and object control skills (e.g., throwing, catching) were administered at the beginning and end of each 15-week session. Assessment data were compared for the activity-based and direct instruction groups in both fall and spring.

**Findings and Conclusions:** Children from both classrooms—the morning and afternoon groups—showed greater improvement in motor assessments following their participation in the activity-based program. The authors conclude that integrating the teaching of motor skills within enjoyable, play-oriented activities is more effective than providing teacher-directed lessons. They also note that activity-based programs are easier to administer within naturalistic preschool settings than more formal adult-guided approaches.

**Implications:** This study dispels the myth that children with special needs require intensive adult direction in order to learn motor skills. Findings suggest that teachers will be more effective addressing motor goals for children within play, games, and other enjoyable activities. Initiating a new chasing game to promote running over diverse surfaces, implementing a movement activity with scarves to enhance arm movements, or creating an obstacle course that requires climbing and sliding are examples of this more effective activity-based approach.

Carson, L. M. (2001). The “I Am Learning” curriculum: Developing a movement awareness in young children. *Teaching Elementary Physical Education*, 12(5), 9-13.

**Method:** The author discusses the “I Am Learning Curriculum”—a model to enhance children's awareness of their own bodies and movements as they engage in motor activities. The

components of movement awareness and their importance for motor development are presented. Various motor behaviors that are promoted in the curriculum are described. These include traveling actions, stabilizing actions, and manipulating actions. Finally, guidelines for implementing this curriculum are provided.

**Implications:** A unique focus of this motor curriculum is on helping young children become aware of their own movements. Teachers, caregivers, and parents need to understand and apply concepts of movement awareness in their planned motor activities and experiences. As children move and play, for example, teachers can ask questions that help children reflect on their own bodies, their movements, the space in which they are moving, and internal feelings experienced during various actions (e.g., “How does it feel standing there on that balance beam?”) Such experiences will help establish a connection between self-reflection and motor activity. Preschool teachers and caregivers might consider adopting the “I am Learning” curriculum to address movement awareness in a systematic way.

Goodway, J. D., & Branta, C. F. (2003). Influence of a motor skill intervention on fundamental motor skill development of disadvantaged preschool children. *Research Quarterly for Exercise and Sport*, 74(1), 36-46.

**Method:** These researchers studied the effects of a 12-week motor skill intervention program on the motor development of 31 African American 4-year-olds living in poverty in a Midwestern urban community. The participants were identified as at risk for developmental delays and/or becoming educationally disadvantaged. All were determined to be in need of special intervention. They participated in two 45-minute sessions a week in which they were engaged in guided motor activities. A control group of 28 children with similar characteristics, but not receiving the intervention, were also studied. Pre- and post-intervention measures of the object control and locomotor subscales of the Test of Gross Motor Development were obtained on all participants in the study. Changes in motor scores over the course of the study were compared for those in the intervention and non-intervention groups.

**Findings and Conclusions:** The findings of the study show that children who participated in the motor skill intervention program had significantly greater gains in locomotor and object control scores. The authors conclude that a focused intervention program can enhance the motor abilities of young children living in poverty.

**Implications:** The findings of this study have exciting and significant educational implications. If disadvantaged preschool children can acquire such benefits from twelve weeks of a two-session-per-week program, then physical educators and preschool teachers, who spend far more time with children in the classroom and on the playground, could achieve an even greater effect. This study shows that a carefully planned, research-based program can help close the “achievement gap” in motor development for children living in poverty.

Martin, E. (2000). Developmentally appropriate equipment: What does that mean? *Teaching Elementary Physical Education*, 11(6), 5-8.

**Method:** The author discusses the importance of a high quality physical education program for young children to meet national recommendations for activity level and skill development. Beyond sound instructional practices, a high quality program includes developmentally

appropriate equipment. Selecting equipment to match young children's play interests and needs—such as balls and objects to throw, catch, dribble, and kick—are crucial for an effective motor play curriculum. Teachers should also provide enough materials in order to reduce conflicts, allow a diversity of play activities to occur at once, and to encourage greater involvement in play.

**Implications:** If children are to be successful in their physical activities, then teachers, child care providers, and parents must provide developmentally appropriate equipment. Equipment that is too challenging, not challenging enough, or not related to children's play interests will not help children feel a sense of mastery in their motor play. Open-ended equipment that has many uses and can be used by children of different levels of play ability should be included. For example, appropriate-sized, soft balls can be used for many different throwing and catching activities. These activities can be very challenging (playing catch with a peer or adult standing farther and farther away) or less so (a simple throw, chase, throw game). The author recommends continued study and analysis of various types of equipment. This research can be conducted by practitioners as well as researchers.

McCall, R. M., & Craft, D. H. (2004). *Purposeful play: Early childhood movement activities on a budget*. Champaign, IL: Human Kinetics.

**Findings and Conclusions:** These authors introduce the concept of *purposeful play*. They argue that all play activities—no matter how open-ended—should have a purpose in early childhood classrooms and on playgrounds. One example of this is the intentional selection of equipment to achieve specific motor goals. They note that inexpensive equipment can sometimes have the greatest impact on learning. Such equipment is also easy to store, can be introduced, removed, and reintroduced on the playground to maintain children's interest, and can have multiple creative uses. The authors provide examples of inexpensive movement activities. They suggest themed activities, such as experiences related to cycle safety or nutrition or those that match what children are studying in the classroom. They also propose simple ways to integrate music into the movement curriculum.

**Implications:** The authors counter the argument that an exciting and effective movement program for young children requires flashy, high-priced equipment. They propose that children are natural movers who can use their own imagination to play without such equipment. Teachers and caregivers should plan motor experiences by building on children's natural desires to move and play, stimulating their interests in their own bodies and how they work, rather than relying on specific pieces of equipment. Often a low cost activity—a simple game with a ball, a run up and down a hill, or a chasing game with peers—can lead to greater learning than play with an expensive piece of equipment ever could.

Robert, D. L. (2001). Successful preschool movement programs: Research guiding C.H.A.O.S.. *Teaching Elementary Physical Education*, 12(5), 30-33.

**Findings and Conclusions:** This author discusses the importance of motor development in early childhood and the need for advocacy to assure that movement programs are implemented in preschools and child care centers. Research on successful movement programs is briefly reviewed; one particular approach, C.H.A.O.S, is described in detail. This program engages

preschool children in fundamental traveling, manipulating, and balancing activities, with their parents as play partners. Motor activities that involve jumping, skipping, catching, kicking, twisting, stretching, and many other movement skills are implemented. Parents are offered guidance on how to provide teaching cues and encourage their children to move. The research bases for the development of this program are discussed. The author suggests ways that teachers, caregivers, and administrators can plan and implement research-based preschool movement programs in schools and centers.

**Implications:** There is a growing body of research on motor development and approaches to teaching motor skills in early childhood education. When teachers and caregivers plan movement programs, they should make decisions based on this empirical and theoretical work. Applying research findings to classroom practice will result in higher quality, developmentally appropriate movement activities.

Trost, S. G., Fees, B., & Dzewaltowski, D. (2008). Feasibility and efficacy of a “Move and Learn” physical activity curriculum in preschool children. *Journal of Physical Activity and Health, 5*, 88-103.

**Method:** These researchers randomly assigned four half-day preschool classroom groups to either an experimental or control condition. Children in the two experimental classrooms participated in a special movement program that was designed to integrate motor activities into the academic curriculum. Those in the control classrooms received no special treatment. The 24 children in the two experimental classrooms were provided with whole group and small group activities adapted from the *Lets Move, Learn, and Have Fun!* curriculum and the physical activity components of the *Nutrition: Good for You!* curriculum. These experiences were designed to teach math, literacy, social studies, science, and nutrition through movement. For example, children were invited to toss scarves into the air and catch them using different body parts (e.g., between elbows, between knees, under the chin). They were then asked to count the different ways they were able to catch the scarves in order to address a mathematical goal involving numbers. The experimental and control groups were compared on two measures. Overall activity level was assessed using accelerometers—devices worn on the hip that measure the amount of vigorous movement children engage in. An observation system was also used to code each child’s level of activity, type of activity, location, and social grouping. These data were used to compare experimental and control group children.

**Findings and Conclusions:** Children who were enrolled in experimental classrooms scored higher on activity level as measured by the accelerometer. Observation data indicate that experimental group children engaged in higher levels of activity during group time, indoor and outdoor free play, and even snack time and transitions than did control group children. The authors conclude that integrating movement into curriculum activities can increase activity level of preschoolers, without sacrificing academic learning time.

**Implications:** Most movement programs focus on increasing and enhancing motor play experiences on the playground or large motor area in a classroom. This study suggests that incorporating movement into the daily academic curriculum is another way to encourage children to move. These findings show that providing academic learning and active motor play need not be an either-or choice. Teachers and caregiver can invent novel ways to help children move while they are learning literacy, numeracy and other academic skills.

Young, B., & Robert, D. (2005). *Play, physical activity, & physical activity for young children*. Dubuque, IA: Kendall/Hunt Publishing Company.

**Findings and Conclusions:** This book presents guidelines for creating movement experiences for young children. The three sections of the book are named for the “dynamic triangle” of critical components in movement programs: “The Mover,” “The Task,” and “The Environment.” The authors show how teachers and child care providers can consider all three corners of the triangle when planning movement experiences. The mover must be considered first—the developmental characteristics, temperament, gender, strengths or challenging conditions, and family backgrounds of children served. The task itself must be designed with the learner in mind. Innovation, national standards, curriculum outcomes, and the needs of each learner must all be considered together. Finally, the environment and the objects within it should be selected and arranged to accommodate children’s needs and the desired task.

**Implications:** This book suggests that teachers and caregivers plan motor experiences in a dynamic triangle. First, they must consider the naturally existing biological contributions and experiential backgrounds of each “mover” (child). They must understand each child’s cognitive and emotional development, as well as physical growth and maturation, when planning motor activities. This is particularly important for professionals working with children with special needs. A child with perceptual impairments, physically challenging conditions, or autism will have different motor needs than typically developing children. When designing movement and play activities, the professional must also give thought to the second feature of the triangle—the features and demands of the “task.” What does a particular activity require of a child, physically, cognitively, and socially? How does a particular traveling, manipulating, or stabilizing activity affect children of varying developmental levels or special needs? What criteria will be used to measure success? What innovative features might be added to enhance this success—unique management protocols, teaching cues, musical elements, competition or cooperation? This book highlights the complexity of designing a single, research-based, individualized motor learning experience in an early childhood classroom.

Živčić, K., Trajkovski-Višić, B., & Sentderd, M. (2008). Changes in motor abilities of preschool children, age 4. *Physical Education and Sport*, 6, 41-50.

**Method:** Ninety-six 4-year-olds were assessed on their motor abilities, then assigned to an experimental group (n = 57) or control group (n = 30). Experimental children participated for nine months in a one-hour, four-day-per-week exercise program, guided by a teacher. Control group children participated in outdoor play, but did not receive any special teacher guidance or instruction. The experimental program was unique in that it was tailored to the play activities and games of interest to children in Croatia where the study took place. Children were engaged in such culturally-meaningful activities as artistic and rhythmic gymnastics, racing on a track, dance, wrestling, and even badminton—activities less often observed on American preschool playgrounds. At the end of program, experimental and control group participants were compared on their performance on the same motor tasks as in the pre-assessment.

**Findings and Conclusions:** Children in the experimental group showed greater gains than the control group in running, backwards walking, hopping, sit ups, and a v-sit and reach test (in

which children are asked to sit, legs spread slightly, and to reach as far forward as they can to assess flexibility). The authors conclude that adult guidance in organized motor activities contribute to learning a wide variety of motor skills at this young age. Further, they note that this unique program—with its emphasis on culturally-based activities—achieves the same goals as more conventional motor development programs studied in other countries.

**Implications:** There are several important implications of this study. First, findings indicate that planned motor activities by adults may be more beneficial in promoting motor development in specific skill areas than simple free play on the playground. This should give pause to those advocating a “hands-off-play” approach, in which adults merely watch young children play on their own without becoming involved. The study suggests that there is not just one set of movement activities that lead to motor development. Teachers and caregivers might experiment with games and activities from around the world that are not typical in American schools. They might also interview parents to learn about the motor experiences that are most valued by families of diverse cultural backgrounds.

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### **Promoting Motor Play and Development: Teaching Practices**

This section summarizes articles on teaching practices that foster motor play and development for children with and without disabilities. The focus of these studies and reviews is on strategies teachers can use in the classroom—both planned and spontaneous—to facilitate children’s movement. A theme of these articles is that simply planning a curriculum is not enough to ensure motor development. Actively engaging children at play and adapting materials and activities to meet individual needs are also required.

\*Doctoroff, S. (2001). Adapting the physical environment to meet the needs of *all* young children for play. *Early Childhood Education Journal*, 29(2), 105-109.

**Method:** This author identifies environmental factors that influence young children’s play, including children with disabilities. Drawing from research, the author examines a range of classroom and playground variables that can support and expand children’s play. Research-based modifications of the environment to support the play of children with intellectual disabilities, visual impairments, autism, and ADHD are included.

**Findings and Conclusions:** The author identifies two broad categories of environmental factors that influence play: physical space and materials. The author concludes that the amount of available space, in the classroom or on the playground, is a significant factor in determining play quality. Physical accessibility is also identified. When all equipment and furnishings, including climbers, small getaway spaces, and pathways, are accessible to children of all physical abilities, play is enhanced. A third factor the author finds important for play is noise-control and avoidance of over-stimulation. This is an important consideration in indoor motor spaces, such as a gymnasium. Too much noise and glare have been found to interfere with play for many young children, particularly those with specific disabilities. In regard to materials, the authors find that materials that can be used by more than one child—a rocking boat, a tire swing, a tube several children can crawl through—will promote more social play. Including a mixture of both realistic and non-realistic play materials will meet a wider variety of play needs.



**Implications:** Teachers and caregivers can support the play of children with and without disabilities by making adjustments to play spaces to meet a variety of needs. By thoughtfully selecting materials that provide varying levels of challenge, they can inspire many different kinds of play.

\*Kern, P. & Wolery, M. (2002). The sound path. *Young Exceptional Children*, 5(3), 12-20.

**Method:** The authors of this article present a case study of a 3-year-old boy with congenital blindness. He was observed having difficulty engaging in spontaneous and autonomous play on the playground. The authors describe the specific difficulties he exhibited, including his continual clinging to an adult's hand and his frustration in moving on the playground.

**Findings and Conclusions:** The authors found that an intervention using music was particularly effective in addressing the child's play difficulties. Songs were helpful in helping the child to know where others on the playground were located and to identify his own location in large open spaces. This musical intervention had a positive effect on the child's adjustment and subsequent participation with peers on the playground.

**Implications:** This case study demonstrates how specific disabilities can pose challenges to children and teachers in open spaces such as playgrounds. It is not surprising that a child with visual impairments would have more difficulty navigating through a space that had fewer furnishings to use for orientation. The rapidly moving play of children in and out of spaces can be disorienting to such a child. The use of music to help children locate peers or teachers is one way to address this problem. All children can be engaged in a game in which they walk, run, march, gallop or crawl while singing a song. A child with visual impairment could then follow along. A teacher could also place one or more CD players in different spaces on the playground, each playing a distinct type of music to help the child determine her/his location. These strategies would help a child who is blind to participate in motor experiences on the playground.

Labiadh, L., & Golomer, E. (2010). Preschool-aged children's jumps: Imitation performances. *Journal of Electromyography & Kinesiology*, 20, 322.

**Method:** These researchers studied how imitation can be used to teach young children to perform different kinds of jumps. They first modeled jumping behaviors for 131 children, between 3.5 and 7 years of age. As they demonstrated various jumps, the researchers used verbal instruction and gestures to encourage imitation. Children were then videotaped jumping as they moved through an obstacle course. The researchers scored the degree to which children emulated the adult's jumps. Measures of more complex jumping, such as children's control of their movements, and the length of "jump flights" (their time in the air) were also examined on the video.

**Findings and Conclusions:** Children of all ages accurately imitated the types of jumps that the adults demonstrated. However, only older children—after age 5.5 years—were able to benefit from this adult modeling to learn more complex skills, such as taking off with only one foot or making broader or higher jumps. The authors conclude that adult modeling is effective in teaching the performance of simpler movements, but that more advanced skills require maturation and experience over time.

**Implications:** These findings suggest that children will try new behaviors that adults demonstrate for them. When playing with children on the playground, teachers, caregivers, and parents can model a variety of movements—jumping, galloping, or walking backwards, for example. This study shows that using verbalizations (e.g., “Watch how I can shuffle sideways”) and gestures (pointing at one’s own legs while galloping) will increase the effectiveness of this strategy. This study also suggests that imitation is mainly effective in encouraging children to try simpler movements. Imitation is not as useful in teaching more complex motor processes. Maturation and experience over time are necessary for children to acquire stability and control in their movements.

\*Martin, S. (2006). *Teaching motor skills to children with cerebral palsy and similar movement disorders: A guide for parents and professionals*. Bethesda, MD: Woodbine House.

**Method:** This author cites research on the motor development of young children with cerebral palsy and other movement disorders. Specific strategies that can be applied to classroom teaching are presented—motivating motor actions, strengthening muscles, and engaging children in motor play with peers. The author discusses optimal position of children for play—including the use of sitting devices or side-sitting. Use of certain kinds of motor play equipment—riding toys and swings, for example—are examined. She also reviews advanced therapeutic approaches used by occupational therapists, physical therapists, and speech-language pathologists. One such approach, Neurodevelopmental Treatment (NDT), is described in detail. The premise of this approach is that supporting the movement and play of children with cerebral palsy requires the support of the whole child, including perceptual-cognitive and emotional areas of development, not just specific muscles or movements. Strategies include exercises and postures that promote inhibitory control—the ability to control undesired, involuntary movements—and those that engage the whole body—arm and leg movements coordinated with motions of the head, shoulders, and pelvis. These experiences are provided to children in playful and enjoyable interactions that inspire movement.

**Implications:** Teachers, caregivers, and parents can integrate some of the specialized methods of occupational and physical therapists into their daily interactions with children in classrooms and on the playground. With guidance from specialists and ideas from this book, teachers and caregivers can implement sitting positions, play activities, and peer interactions strategies with children with cerebral palsy that can increase the effectiveness of other therapeutic services they are receiving.

\*Menear, K. S., & Davis, L. (2007). Adapting physical activities to promote overall health and development: Suggestions for interventionists and families. *Young Exceptional Children*, 10(2), 11-16.

**Method:** The authors describe strategies for adapting materials and activities to support the physical play of young children with disabilities. Such adaptations are intended to promote physical development and play, but also lead to more positive social interactions, self-concept, and cognitive development. The authors highlight several specific adaptations: providing play materials of varying textures, adjusting the size of materials being used (e.g., a larger ball or beanbag), and scheduling shorter but more frequent activities.

**Implications:** Based on this article, teachers, caregivers, and parents might implement a variety of strategies to support children’s physical play, especially those with disabilities. Providing textured, easy-to-handle materials will allow all children to acquire object control skills. Adding multipurpose equipment that can be used in ways that match each child’s abilities will promote locomotor skills. These might include various riding toys, obstacle courses, or scarves for play or musical expression.

\*Menear, K. S., Smith, S. C., & Lanier, S. (2006). The multipurpose fitness playground for individuals with autism: Ideas for design and use. *The Journal of Physical Education*, 77(9), 20-25.

**Method:** The authors present a number of playground design features and uses that can promote the motor play and development of young children with autism. Given the play characteristics of children with this condition, the authors suggest the creation of larger, more open spaces for play on playgrounds. They also recommend that pieces of climbing equipment be made more accessible to address the physical challenges that often accompany autism.

**Implications:** Teachers, caregivers, and parents need to consider the unique needs of all children when selecting playground equipment or designing new playgrounds. Not only should they consider the play abilities of those with physically challenging conditions, but they should examine the play characteristics of children with other developmental disorders such as autism. Making sure children with autism have open space and access to equipment that is easy to climb, swing, and ride on will allow them to engage in physical play with or near typically developing peers.

Sacha, T. J., & Russ, S.W. (2006). Effects of pretend imagery on learning dance in preschool children. *Early Childhood Education Journal*, 33, 341-345.

**Method:** Thirty-two 3- to 5-year olds were randomly assigned to one of two groups—one that received traditional dance instruction, and one that participated in dance activities that incorporated pretend play. In the first group, children were guided by an adult in learning and practicing technical dance movements. In the second, children were taught these same dance skills, but were provided with pretend images to help them learn. In the first group, a teacher might instruct, “Raise your arm out and up, and turn your head to look at your hand.” In the second group, this same movement would be prompted by a statement like, “Raise your arm and imagine a little bird is landing on your hand. Now look up at the bird that’s sitting on your fingertips.” The researchers videotaped and coded these dance activities and compared the two groups on how quickly skills were learned, how well they were retained, how attentive children were, and how much they demonstrated their enjoyment of dance, as measured by the frequency of smiling, laughing, and other signs of positive affect.

**Findings and Conclusions:** The pretend imagery group was found to learn dance skills more quickly, retain them for a longer period, and to show greater attention during dance activities. This group also displayed significantly more behaviors that showed positive affect. The authors conclude that teaching dance movements within the context of pretend play is an effective way to promote learning and enjoyment of this art form.

**Findings and Conclusions:** Pretend play is the preferred activity of early childhood. Literacy, mathematics, and even motor skills have been taught using this kind of play. This study suggests that pretend play may be an ideal context for learning dance movements as well. Teachers, caregivers, and parents can integrate pretend play enactments into music and dance activities in preschool. Teachers might suggest dance movements that involve the enactment of the roles of characters in a song, or children might be encouraged to invent these make believe dance actions themselves. Conversely, music might be integrated into pretend play. The dramatic play center might be redesigned into a dance studio or performance stage. Mirrors might be included so children can view themselves as they pretend.

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### **Play and Physical Development: Summary and Implications**

The literature on the play and physical development of young children is rich and varied. There are carefully controlled laboratory studies and descriptive investigations. A multitude of research-to-practice articles offer recommendations for materials, teaching practices, and parenting approaches to support early motor development. Based on this research, the reports of national organizations and agencies provide standards for the early acquisition of motor skills. Several broad themes can be drawn from these disparate articles and studies. First, supporting physical development should begin in the first days of life. Research cited above shows the amazing capacity of very young babies to move their bodies and act on objects in purposeful and complex ways. Second, infant motor development does not involve simple maturation; the environment plays a crucial role. When adults place babies in the beneficial prone position, allow free movement without the restriction of walkers or other equipment, and provide engaging play materials to act on, motor development is advanced. Creating a variety of surfaces, slopes, and challenging barriers for infants to crawl and walk over or around, will promote their motor skills.

A third theme drawn from this literature is that, as American children reach preschool age, they can become sedentary, distracted from active play by television and computers at home and quieter academic learning in school. Increasing opportunities for motor play for both boys and girls, at home and school, has become an urgent national goal. However, an additional theme from this research is that merely providing time and space for play is not enough. Teachers and parents can implement models, interventions, specific teaching practices and play experiences proposed in many of these articles. In designing such strategies, adults should target specific learning goals recommended by national organizations in such areas as throwing, catching, jumping, running, climbing, changing directions, and starting and stopping. Providing appropriate challenges and encouraging safe risks should be part of all motor experiences for young children. In short, a motor play curriculum should become as important a part of an infant, toddler, or preschool program as any academic subject.

## Effects of Motor/Outdoor Play on Cognitive and Language Development

### Infant/Toddler Play and Cognition, Perception, and Language

#### Play and Cognitive and Perceptual Development

This section reviews studies on the relationship between infant movement and motor play and cognitive and perceptual development. Taken together, these articles confirm a body-mind connection during the earliest months of life. They identify critical motor actions and play activities that enhance thinking, learning, and perceiving the world in infants and toddlers.

Barbu-Roth, M., Anderson, D. I., Desprès, A., Provasi, J., Cabrol, D., & Campos, J. J. (2009). Neonatal stepping in relation to terrestrial optic flow. *Child Development, 80*, 8-14.

**Method:** Researchers have discovered that perception and motor development are highly interrelated. What children see, hear, and feel influence their motor action; movement, in turn, strengthens perceptual development. How early in life does this motor-perception relationship appear? To address this question, the authors placed 48 three-day-old babies in front of a screen which showed one of three images—a video of “terrestrial optic flow” (in which the ground is shown moving toward and under the baby who is watching), a swirling video, and a still pattern. Researchers then observed the frequency of infants’ stepping movements before each image.

**Findings and Conclusions:** Infants engaged in more frequent stepping when viewing the video of the ground passing under them. The authors conclude that even shortly after birth infants’ motor actions are highly influenced by what they see. They further conclude that babies possess a sense of motion that is based on sight.

**Implications:** Teachers, caregivers, and parents often provide experiences with motion for walking infants and older children through the use of swings and riding toys. These findings suggest that motion experiences might be useful for babies, even before they are ambulatory. Safe methods of creating a sense of motion might enhance infants’ coordination of sight, sense of motion, and motor action. Infant swings, rides in a wagon or stroller, gentle twirling and swinging games with adults, or adult-supported pushes on a toddler riding toy are examples. These experiences will be most useful if babies have full freedom to move arms, legs, and full bodies in response to this motion.

Berger, S. E., & Adolph, K. E. (2003). Infants use handrails as tools in a locomotor task. *Developmental Psychology, 39*, 594–605.

**Method:** These researchers wanted to explore whether infants would use “tools”—in this case, handrails on a bridge—to complete a motor task. Such tool use would provide evidence that motor actions are intentional and involve intellectual ability, even in infancy. Twenty-four 16-month-olds were observed crossing a bridge that was widened or narrowed. The bridge had handrails that could be removed. With support from a researcher, participants were prompted to walk across the bridge; strategies to cross were videotaped and coded.

**Findings and Conclusions:** All infants were found to walk across the wider bridges with confidence and ease, whether they had handrails or not. They were less likely to cross the narrower bridges, if they did not have handrails. This suggests that children assessed the physical attributes of the bridge prior to crossing. They were more likely to use the handrails on the narrower bridges, and modified their handrail use—holding on with two hands instead of one or holding on for longer periods—as the bridge was made narrower. They also modified the number and pace of their steps and experimented with a variety of unique bridge crossing methods, with or without the handrails. Sometimes they shifted from one strategy to another mid-way across—switching from using one hand on the rail to two hands, or getting down and crawling. Often infants carefully explored the handrails before stepping onto the bridge. The authors conclude that there is complex mental planning that occurs both before and during a motor task that involves tools.

**Implications:** This study confirms that there is a cognitive contribution to completing motor tasks. Findings suggest that teachers, caregivers, and parents should provide children with a variety of motor challenges that require them to use alternative solutions and tools. For example, an obstacle course might be created that includes a low “bridge,” built from cushions, that children can walk across with and without supports on either side.

Bosco, F. M., Friedman, O., & Leslie, A. M. (2006). Recognition of pretend and real actions in play by 1- and 2-year-olds: Early success and why they fail. *Cognitive Development, 21*, 1-10.

**Method:** When do infants begin to pretend as they play? These researchers studied 48 one- and two-year-olds as they played with objects under two conditions. In the first, researchers performed an action with a toy in front of the participants. For example, they would drink from a cup that had a small amount of real water in it. Children were then given the cup with water to play with. In the second condition, children were given a similar, slightly less realistic toy. For example, the researchers would pretend to drink from an empty cup, then give the toy to the children. They recorded whether children would engage in pretend with toys after seeing a model do so.

**Findings and Conclusions:** Both one- and two-year-olds would imitate adults’ actions with real objects as they played with them. For example, both age groups would drink from a cup that had real water. Only the two-year-olds would pretend to drink from the empty cup. One-year-olds simply performed playful motor acts with the less realistic objects. The authors conclude that, as early as one year of age, babies imitate adult actions in play, but they cannot pretend with objects until age two.

**Implications:** Findings suggest that adults should tailor their interactions and materials to infants’ play abilities. Younger babies might be provided with realistic props to incorporate in play. For example, a realistic toy stroller with a doll in it might be offered to children to push on the playground. For two year olds, non-realistic toys might be included and modeled by adults. Instead of a realistic car, for example, caregivers might provide a cardboard box and a paper plate to use as a steering wheel. In each case, adults should model the use of these materials to help children learn how to perform make-believe actions.

Claxton, L. J., Keen, R., & McCarty, M. E. (2003). Evidence of motor planning in infant reaching behavior. *Psychological Science, 14*, 354-356.

**Method:** Twenty-one 10-month-olds were given two balls and two different pieces of equipment to play with. The first was a tube down which a baby could push the balls; the other was a tub into which a baby could throw them. After experimenters modeled these two actions for the children, they recorded them performing each. They then conducted a motion analysis on each infant, focusing particularly on the specific ways each would approach and reach for the ball before using it. They compared reaching behaviors prior to both the tube stuffing and the tub tossing games. Their hypothesis was that infants would adjust their reach for the ball depending on which action they planned to perform. This behavior would mirror the way adults adapt their reaching for an object based on its intended use.

**Findings and Conclusions:** Babies used different approaches and reaching behaviors depending on which play action they were going to perform. They reached for and grasped a ball more quickly prior to throwing it; and grasped it slowly and with more precision when they were going to stuff it into the tube. This difference in action cannot be explained by differences in the balls—they were identical in both tasks. According to the authors, these findings show that infants anticipate upcoming actions and adjust their prior movements accordingly. This is evidence of prior planning in motor play before infants reach one year of age.

**Implications:** This study confirms that motor action has a cognitive component—that children analyze the demands of an upcoming action prior to performing it. What is surprising in this study is how early in development this ability appears to emerge. Teachers, caregivers, and parents can promote this planning phase of motor action in babies during outdoor play. They might provide several *identical* balls or other objects with which to perform a variety of *different* actions. (This will assure that infants are adjusting their movements in anticipation of the activity, not to the size or shape of the object.) Infants can be encouraged to reach, grasp and throw the balls at a target first, then drop the same balls into containers. Finally, they might be prompted to push the balls into holes of different sizes cut in boxes. Findings of this study suggest that infants as young as 10 months will use different approaches and grasping actions in anticipation of each of these distinct play activities.

Hauf, P., & Aschersleben, G. (2008). Action–effect anticipation in infant action control. *Psychological Research, 72*, 203–210.

**Method:** Two experiments were conducted to determine if infants' play with objects would help them learn about cause and effect. In the first experiment, 36 nine-month-olds were presented with two button-press toys, one of which caused an interesting sound and light response. They were observed playing with these; the speed and duration of button-pushing was measured. In the second experiment, 36 seven-month-olds were studied using the same toys.

**Findings and Conclusions:** After brief active play with the toy, the nine-month-olds were found to push the button toy that produced a result more quickly and for a longer period than the toy that did not lead to such a response. In the second experiment, the seven-month-olds did not initially alter their button pushing when playing with the light and sound toy. As they played longer, however, they gradually modified their actions when playing with the more stimulating toy. The authors conclude that at both these ages, infants' play reflects an understanding of how

their actions can lead to certain consequences. This understanding required more time for seven-month-olds to acquire than for nine-month-olds.

**Implications:** The study suggests that when babies play with objects, they begin to anticipate cause and effect—a very important cognitive ability. Beginning in the second half-year of life, infants should be provided with toys that cause interesting effects when manipulated. Squeeze toys, rattles, mobiles that can be acted on, and safe stuffed animals that make noises are examples. Teachers, caregivers, and parents might also provide a variety of like objects—some that do and some that do not produce sound or light—to help children further explore cause and effect.

\*Laplante, D. P., Zelazo, P. R., Brunet, A., & King, S. (2007). Functional play at 2 years of age: Effects of prenatal maternal stress. *Infancy, 12*, 69–93.

**Method:** These researchers studied whether toddlers whose mothers were in distress while they were in utero acquired play skills in the same, predictable sequence as other children. Previous research has shown that toddlers' play progresses from simple motor action to the more intentional, "functional," and cognitively-oriented use of toys as they get older. For example, a toy dump truck or a plastic bat might simply be explored or pounded on the ground in the first year and a half of life. With age, children begin to play with toys in more conventional ways. A toy truck might be pushed around on the playground, accompanied by engine noises. A baseball bat might be used to strike a ball. The latter types of play are considered to be intellectually advanced. The researchers studied 52 two-year-olds whose mothers experienced a severe ice storm in Canada while they were pregnant with their children. The play of those whose mothers reported severe stress during the storm while their children were in utero were compared to the play of toddlers whose mothers did not suffer high stress levels. The play behaviors of both groups were recorded.

**Findings and Conclusions:** Functional play—the more cognitively advanced form of play—was observed more frequently in the free play activities of those whose mothers experienced little stress during the storm. Toddlers whose mothers experienced the highest stress engaged in more simple motor play; those who were in the first or second trimester of pregnancy during the storm displayed the least mature forms of play. The authors conclude that a single stressful event during a mother's pregnancy, even a short-lived one, can have an impact on her toddler's play and cognitive development. They suggest that this is due to harm to the developing prenatal brain that results from such stressful experiences.

**Implications:** This study suggests that environmental threats to the brain can impede play and its underlying cognitive processes. Teachers and caregivers should learn about stressors affecting families, not only while their children are in their care, but prior to their enrollment. Those who are at risk due to early family stress might be carefully assessed in regard to their play abilities. Especially rich play experiences and interventions might be provided. One such intervention, suggested by this study, is to model or prompt more conventional uses of objects and equipment in play.



Lobo, M. A., & Galloway, J. C. (2008). Postural and object-oriented experiences advance early reaching, object exploration, and means – end behavior. *Child Development, 79*, 1869 – 1890.

**Method:** Parents of 142 eight- to eleven-week-olds were encouraged to engage their babies in a variety of play experiences over a 12 week period. Parents of approximately one-third of the babies simply engaged in more frequent social interaction, placing their children on their stomachs, without toys, and lying face-to-face with them for “conversations.” One third involved their infants in activities to enhance posture, such as a clapping game played with the child in a sitting position. The third group of parents engaged their children in frequent toy play. The three groups were compared on a range of motor abilities and an assessment of means-end thinking (understanding that actions cause consequences).

**Findings and Conclusions:** The authors report that the infants of the three groups of parents did not vary significantly on motor development measures. It appears that enhanced social interactions, unique postural experiences, and play with objects all have a similar positive impact on physical development. However, the group of babies whose parents provided object play had the highest scores on means-end measures. The posture group scored less well than the objects group, but significantly higher than the social interaction group. The authors conclude that certain kinds of motor action—particularly play with objects—are the foundation for understanding actions and their consequences.

**Implications:** Play interactions with adults and peers are critical for infants’ social and emotional development. However, this study suggests that these may not be enough to support the early emergence of cause and effect thinking. Object play and experiences in different positions to strengthen posture are also needed. Findings of this study suggest that teachers, caregivers, and parents should give special attention to providing objects for infants to play with. In particular, toys that produce sounds or other effects when struck, thrown, dropped, or squeezed will enhance infants’ cause and effect thinking.

Rakison, D. H., & Woodward, A. L. (2008). New perspectives on the effects of action on perceptual and cognitive development. *Developmental Psychology, 44*, 1209–1213.

**Method:** The authors provide an extensive review of research on the role of infants’ physical action on their acquisition of cognitive and perceptual skills. They begin by reviewing Piaget’s groundbreaking work on infant sensorimotor intelligence and then survey over 40 more recent studies on infant motor development and its effects on thinking and perception.

**Findings and Conclusions:** The authors conclude that new research supports the idea that all development has its roots in the motor behaviors of babies. The relationship between movement and cognitive development is bidirectional. Things babies act upon in play help them understand about the world and its objects. These new understandings, in turn, influence what babies act upon next and in what ways.

**Implications:** Teachers, caregivers, and parents can create an action-oriented play environment that includes equipment designed for climbing, crawling and walking. Toys that can be physically acted on to cause auditory or visual responses should be provided. These environments should be slightly adapted over time, so that babies can act in different and increasingly complex ways in order to enhance both cognition and perception.

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## Play and Communication

This section explores how language influences play and how play, in turn, affects language in infants and toddlers. These studies demonstrate the important role of parents' verbal interactions in promoting play and development, and suggest strategies for teachers and caregivers in play-based classrooms.

\*Gernsbacher, M. A., Sauer, E. A., Geye, H. M., Schweigert, E. K., & Goldsmith, H. H. (2008). Infant and toddler oral- and manual-motor skills predict later speech fluency in autism. *Journal of Child Psychology and Psychiatry, 49*, 43–50.

**Method:** In this investigation, the relationship between motor and oral skills in infancy and later language fluency were studied in a unique way. Forty-four children between the ages of 12 and 18 years, who have autism, were assessed on their verbal fluency. Their parents were then asked to recall their children's very early motor and oral abilities, using a *landmark-based interview*. This technique is designed to promote parents' memory of their children's very early experiences. The interviewer first asked each parent to remember a specific event that occurred during the time their child was a certain age (e.g., "Do you remember something special you did with your family when your child was 6 months old?"). After discussing the event at length to extend memory, the interviewer asked questions about the child's development (e.g., "Did you remember him crawling during that time?"). Using this method these researchers identified specific motor skills and oral-motor abilities (for example, blowing raspberries or sticking out one's tongue). They verified these findings by viewing old home videos and photos. They then determined whether there was a relationship between these very early skills and current-day language fluency.

**Findings and Conclusions:** Home videos and photos corroborated the information obtained in interviews. Parents' recollections of their child's development were determined to be very accurate. Those children whose parents reported poor motor skills and oral-motor behaviors showed the poorest verbal fluency in older childhood and adolescence. Those whose parents recalled relatively typical motor development and oral skills were more fluent in language in later life. The authors conclude that speech fluency is based on early motor and oral abilities in children with autism.

**Implications:** These findings suggest that very young children—particularly those who show indicators of disability—are in need of stimulating play environments in which to acquire motor skills. In particular, experiences can be planned by teachers, caregivers, and parents to exercise motor actions related to communication. For example, reaching and grasping are related to pointing and gesturing, while noise-making, blowing bubbles, singing and playing with sounds require oral-motor skills.

Lindsey, E. W., Cremeens, P. R., Colwell, M. J., & Caldera, Y. M. (2009). The structure of parent-child dyadic synchrony in toddlerhood and children's communication competence and self-control. *Social Development, 18*, 375-396.

**Method:** One hundred and thirty-four 15-month olds were observed naturally playing with parents in both their homes and a laboratory setting. All subjects were observed playing with their mothers; 88 of the participants were also observed playing with their fathers. Parent-child play was scored according to the degree of synchronicity in interactions. Synchronicity refers to how much a parent and child focus on the same play activity and respond to each other's actions. A mother and child rolling a ball back and forth to one another is an example of a highly synchronous play interaction. Synchronicity also refers to whether both parent and child share the same positive emotions. A father and child playing a wrestling and tickling game with much smiling and laughter by both is an example. The researchers measured both types of synchronicity—a parent's and child's focus on the same actions and their shared emotions. Children's expressive and receptive language and their self-regulation—the ability to control actions and impulses—were measured at age 3.

**Findings and Conclusions:** Children who experienced high levels of synchrony with their parents in play as infants scored higher on measures of expressive language and verbal comprehension in the early preschool years. They also showed greater self-regulation at this age. The authors conclude that when adults adapt their playful interactions to the actions and feelings of their infants, they are not just promoting play, but enhancing important language abilities.

**Implications:** There are several implications of these findings for parents and professionals. When interacting with children at play, adults should strive to understand and share the focus of the play in progress. For example, if a child is throwing a ball and chasing after it, the adult should join this game rather than initiate a completely new one. Furthermore, adults should express positive emotions as they play along—showing laughter, joy, excitement, and surprise that match the child's affective state. Such synchronous play with children, this study suggests, will enhance language development and self-control.

Namy, L., Acredolo, L., & Goodwyn, S. (2000). Verbal labels and gestural routines in parental communication with young children. *Journal of Nonverbal Behavior*, 24, 63-79.

**Method:** These authors conducted two studies to determine how frequently parents use verbalizations and gestures in two different contexts—a shared book reading experience and in free play. In study 1, eighty 15-month-olds were videotaped in a book reading session with a parent. In study 2, twelve 11- to 13-month-olds were videotaped playing with parents in play with toys. In this setting, participants engaged in both active motor play and quieter object exploration. Video from both studies was coded to determine the frequency of verbal interactions and non-verbal gestures by parents.

**Findings and Conclusions:** Parents uttered many verbal comments in the storytelling context of study 1. However, gestures were relatively infrequent in this setting. In the play setting in study 2, mothers used, on average, twice as many verbalizations as in the story reading study and almost 10 times the number of gestures. The authors conclude that gestures were less common in study 1, partly because children were older. As infants gain in language competence, their parents may rely less on physical communication to interact with them. The authors speculate that differences in adult verbal and gestural interactions between the two studies is also the result of context, as there may be more verbal and non-verbal communication in play settings.

**Implications:** These findings suggest that play is a natural setting for adult language intervention—perhaps a more ideal context than a shared reading experience. Such results should give pause to those who recommend reducing play time to include more literacy-oriented activities in classrooms. A more language-rich setting, at least for infants, appears to be play.

Widerstrom, A. (2006). Mothers' language and infant sensorimotor development: Is there a relationship? *Language Learning*, 32, 145-160.

**Method:** The interactions of three mothers and their infants were recorded, transcribed, and analyzed over a 6 month period, as they played together in naturalistic home settings. The language that mothers used in play was studied, as their children developed from two to eight months of age. Comparisons were made between the mothers' language use in play at the stage of primary circular reactions and the language they used in the stage of secondary circular reactions. Primary circular reactions are movements—often playful—that infants make in a repetitive fashion using their own bodies. The typical pattern for a child in the primary circular reactions stage is to move, note the interesting sensation, and so repeat the movement. A child might kick her legs, enjoy the sensation, and repeat this action-sensation sequence again and again. In contrast, secondary circular reactions are playful actions performed on objects. Children act on a toy, note the outcomes of this, then repeat the action. For example, a child might shake a rattle, notice its sound, and repeat the shaking. In this study, children were determined to be in the primary circular reactions stage until about 2 months. The secondary circular reactions stage appeared after 2 months of age.

**Findings and Conclusions:** Mothers' language when playing with their infants changed dramatically as children moved from one stage to another. When their children were in the primary circular reaction stage, mothers' comments focused most often on children themselves—their actions, vocalizations, and facial expressions. Mothers' language shifted as their children began to exhibit secondary circular reactions. They now talked more about what infants were doing with toys and other objects. Many of their utterances were aimed at naming the toys and their properties. They used less repetition of statements in this later stage and spoke in longer, more meaningful sentences. The authors conclude that there is a bi-directional relationship between infant play and mothers' language. As infants' actions become more object-oriented, mothers begin to use more elaborate speech about objects. This altered speech, in turn, prompts infants to pay greater attention to and to play more often with objects.

**Implications:** This research suggests that teachers, caregivers, and parents should comment in increasingly complex ways about infants' motor play as children get older. Not only do such verbal interactions promote language, but, according to these findings, they prompt more elaborate motor action. Adults can shift this commentary from descriptions of children themselves when they are two or three months old, to language about the toys and other objects they act on as they approach six months. Although infants may not comprehend the precise language, such adult comments may draw their attention to objects and promote play interactions with them.

## The Play of Preschool Children and Cognition, Perception, and Language

### Movement, Cognition, and Perception

This section presents diverse perspectives and investigations on the relationship between movement, play, thinking, and learning. Several studies are described that demonstrate links between motor play and cognitive development; others provide practical applications of this research. A number of these articles show how the brain affects motor behavior and, conversely, how movement, play, and motor skills promote brain growth. Taken together, the work cited in this section provides further evidence of a body-mind connection in the early years.

Blakemore, C. (2003). Movement is essential to learning. *Journal of Physical Education, Recreation and Dance*, 74(9), 22-25, 41.

**Method:** It is a long-held belief, now supported by research, that human movement is inseparable from learning. If the brain is activated during physical activity, this author contends, it seems wise to have young children move while trying to learn something. The author discusses ways to facilitate this body-mind connection. Infusing movement into the educational curriculum is one approach. Engaging children in movements that stimulate the brain prior to or during lessons or reading periods may enhance achievement. For example, a preschool teacher might initiate a cross crawl exercise, which is believed to stimulate both hemispheres of the brain, prior to a shared book reading session. The exercise involves repeatedly raising the left knee to touch the right elbow, then the right knee to touch the left elbow while remaining in place. Other “cross lateral” activities are also recommended. Any experience in which children must move a body part across their top-to-bottom midline will strengthen the full brain. This is one of many strategies, the author suggests, by which movement can enhance learning.

**Implications:** There is growing evidence that there is a connection between learning, academic achievement, and physical activity. This suggests that a trend toward reducing motor and outdoor play in school to promote academic learning is counterproductive. Not only should teachers and caregivers include a planned movement curriculum, but they should incorporate movement before and during learning periods in their classrooms.

Piek, J., Dawson, L., Smith, L., & Gasson, N. (2008). The role of early fine and gross motor development on later motor and cognitive ability. *Human Movement Science*, 2(5), 668-684.

**Method:** The aim of this study was to determine whether young children’s motor development would predict later motor and cognitive abilities when they reached school age. Thirty-three children were assessed annually, using the Ages and Stages Questionnaires (ASQ), beginning at four months of age and continuing to age 4. The ASQ is a survey completed by parents that indicates a child’s progress in achieving developmental milestones in motor, cognitive, and social-emotional areas in relation to other children of the same age. Between the ages of six and eleven, these children’s cognitive and motor abilities were measured each year using the McCarron Assessment of Neuromuscular Development.

**Findings and Conclusions:** The authors found several important relationships between early childhood measures and elementary school abilities. First, low socioeconomic status (SES) in early childhood predicted poor performance on both fine motor and cognitive measures in elementary school. Scores on early childhood measures were not associated with performance on fine motor measures when researchers controlled for SES. However, early childhood measures of gross motor abilities were significantly related to cognitive performance in the elementary years. There was a particularly strong relationship between young children’s gross motor development in the early years and their scores on subtests of two critical cognitive abilities in later years: working memory and processing speed. Both of these skills have been found in previous research to be related to learning and academic achievement.

**Implications:** This study provides definitive evidence that gross motor abilities in the early years predict later cognitive achievement. Teachers, caregivers, and parents should provide activities and materials that enhance the acquisition of specific motor skills. Based on this research, such experiences might be as important as literacy or number activities in preparing young children for success in school. Two cognitive processes have especially strong links to early motor skill. Both of these—working memory and processing speed—are related to a children’s control over their own thinking and actions. It makes sense that motor development would be related to these cognitive abilities, since movement also requires children to be aware of and control their actions and thought. To strengthen this connection between physical activity and these cognitive skills, teachers and caregivers might play movement control games such as “freeze,” “run and stop,” “red light, green light,” and “Simon says.”

\*Isbell, C., & Isbell, R. (2007). *Sensory integration: A guide for preschool teachers*. Beltsville, MD: Gryphon House, Inc.

**Method:** These authors discuss the reasons that professionals who work with young children need to understand and apply research on *sensory processing dysfunction*. The authors define this condition and use real-life stories about children and families to illustrate major research findings. Through these stories, they present practical applications of the work of early luminaries in the field, such as A. Jean Ayres, as well as more recent research in the area of occupational therapy.

**Findings and Conclusions:** The authors’ main conclusion is that practitioners need to identify children with sensory processing dysfunction and adapt classrooms, playgrounds, and their interactions to support individual needs associated with this disorder. Since sensory processing difficulties are related to the brain and neurological function, the authors note, interventions to support motor coordination and control are especially important. Such interventions need to take into account the contrasting variations in sensory processing dysfunction. Some children with this condition seek extra stimulation; others actively avoid it.

**Implications:** Teachers and caregivers can provide support to children with sensory processing dysfunction, both on the playground and in the classroom. This must begin with a careful assessment of the characteristics of a particular child’s condition. If the child avoids stimulation, then active, loud playground play may not be ideal to promote development. The teacher might strive to create a quieter outdoor environment, in which there are fewer children or more structured motor activities. In contrast, children who seek greater stimulation may need to be continually guided by the teacher in identifying play activities that offer sensory variety—

playing on different surfaces, moving and swinging, or playing in sand. The playground is an ideal setting for these kinds of experiences. Teachers and caregivers must also be cautious to help peers understand the sometimes extreme reactions of children with sensory processing dysfunction. Even statements such as, “He just doesn’t like loud noises,” will help peers to understand this less visible condition.

Iverson, J. M. (2010). Developing language in a developing body: The relationship between motor development and language development. *Journal of Child Language*, 37, 229-261.

**Method:** This is a theoretical work that articulates the interrelationship between movement in young children and their acquisition of language. Relying on research on early movement and the acquisition of words and sounds, the author contends that changes in movement and play skills during the early years alter the ways children move through their environment, and affect the way they communicate about the world. For example, the kinds of motor skills that children learn that allow them to move under, around, and through spaces support their learning of the words for these concepts. Their increasing ability to cause events to occur with their bodies—to throw a ball that hits a target, to run and jump longer distances—guides their use of causal statements (e.g., “If you push that harder it rolls really far.”) Motor play gives rise to the discovery of new objects and people and, consequently, their names. Social interactions in motor play provide the motivation to improve communications with others.

**Implications:** One way to enhance children’s language development may be to engage them in play with peers on the playground. Another might be to create challenges so children can “play their prepositions” (e.g., climb over, under, and around). One strategy teachers, caregivers, and parents might use is to overlay language across what children are doing. (e.g., “You’re swinging up and up, higher and higher” or “You threw that hard and look how far it went.”) Such verbal interchanges might strengthen the connection between motor play and language.

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## Movement and The Brain

This section reviews articles on how the brain affects motor behavior and, conversely, how movement, play, and motor skills development promote the organization of the brain. This work provides further evidence of a body-mind connection in the early years.

Gabbard, C. (1998). Windows of opportunity for early brain and motor development. *Journal of Physical Education, Recreation and Dance*, 69(8), 54-55, 61.

**Method:** The author reviews research on early brain development and reports that, while some neurological functions—control of breathing and heartbeat—are pre-wired at birth, other functions are highly influenced by the environment. He notes that there are “windows of opportunity” when the brain is most ready for growth and change. He argues these are the critical times for teaching and learning. For example, he cites the preschool years as a period when early experiences with beads, blocks and games have been found to have a pronounced effect on IQ and academic achievement. He suggests that such periods exist in which motor action similarly affects the brain.

**Implications:** This article suggests that movement experiences in the early years are so critical because they can promote positive brain development. Starting from birth, teachers, caregivers, and parents should provide a variety of gross motor and sensory motor activities that stimulate visual, tactile, auditory, and kinesthetic awareness. Such activities will nurture brain growth.

James, K. (2010). Sensori-motor experience leads to changes in visual processing in the developing brain. *Developmental Science, 13*, 279-288.

**Method:** Researchers used new technology to study the brains of 20 pre-literate preschool children who were learning new letters under two conditions. Ten children were assigned to a sensori-motor group. These children were taught new letters, but were encouraged to move about in a variety of different ways while learning them. This included physically trying to form the letters on paper with various media. A second group remained stationary and only looked at letters that were being taught, with no opportunity for copying or movement. The researchers used functional magnetic resonance imaging—a process by which images of the brain’s electrical activities are captured—to determine which parts of the brain were being used in these two learning situations.

**Findings and Conclusions:** Both groups used the left hemisphere in the brain when learning letters. However, the sensori-motor group also showed activity in a part of the brain following the *visual association cortex*, an area known to be responsible for visual processing of information. The non-active group did not show this same activation in this part of the brain. The researchers conclude that, while both groups showed brain activity in a common area when learning letters, the group that could engage in active movement also experienced activation of the visual system. This provides evidence that sensori-motor action supports visual processing, the authors conclude, and supports the argument for “learning by doing.”

**Implications:** Counter to traditional instructional practices, teachers, caregivers, and parents should try to engage children in movement as they teach cognitive skills. This strategy has been found effective in programs for elementary school children—jumping rope while reciting multiplication tables, or clapping, jumping, and bobbing to remember spelling words. This study suggests the approach can benefit even younger children. Clipboards and markers can be included on the playground for children to keep score in a game to learn numbers. Print might be used to identify different targets in a beanbag game to promote literacy. Children may learn more readily in settings that activate the visual processing centers of the brain.

\*Panksepp, J. (2007). Can play diminish ADHD and facilitate the construction of the social brain? *Journal of the Canadian Academy of Child and Adolescent Psychiatry, 16*, 57-66.

**Method:** The author, a leading brain researcher, presents a review of literature on the effects of active, social play on the development of both animals and humans. He raises the provocative question of whether play can actually reduce the symptoms of attention-deficit hyperactivity disorder (ADHD) and speculates that the reduction in opportunities for outdoor play in preschool is actually contributing to the increase in the incidence of ADHD in the U.S.

**Findings and Conclusions:** The author presents the findings of animal studies that show how active play promotes the maturation of the frontal lobe of the brain. This is the part of the brain that is responsible for inhibiting impulses, regulating one’s own thinking and behavior, and



understanding the emotions of others. Animals without opportunities to play—especially in active, social settings—exhibit behaviors that resemble those of humans with ADHD. He also cites research on humans suggesting that children with inadequate play opportunities in the early years are more likely to exhibit impulsive, anti-social behaviors in later childhood and engage in criminal activity as adults. The author recommends that preschools become “safe havens for play,” where all children can exercise the neurologically-based urge to engage in playful actions with peers.

**Implications:** This article suggests that outdoor play, in particular, can lead to greater inhibitory control and promote healthy social relationships—things that would benefit all children, but reduce the effects of ADHD in particular. Teachers may find that strategically increasing the amount of time that children spend daily in active, outdoor play may have a positive impact on children’s abilities to regulate their own behavior and to engage in positive social interactions.

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### **Play and Cognitive, Perceptual, and Language Development: Summary and Implications**

With the development of remarkable technology to study the human brain, the relationship between physical and intellectual development is now far better understood. Scientists can pinpoint areas of the brain that are most affected by movement—in particular the frontal lobe, which is responsible for a variety of types of thinking and learning. This body-brain connection explains the conclusion of many studies that active play and the acquisition of specific motor skills can improve young children’s intellectual abilities. Studies indicate that, even in infancy, children think and solve intellectual problems when they move. They adjust their actions in thoughtful ways to the challenges of the immediate environment—the slope of a hill or the properties of a particular play object, piece of equipment, or unique surface. They can even alter their movements—their grasp of an object, for example—to perform upcoming actions that they *anticipate* making. Language influences motor play; the opposite is also true. Parents direct children’s attention to actions and play objects with comments and gestures. Children communicate about play to their parents and peers in a similar way.

Many new articles and books on movement and cognition focus on the meaning of this new research for teachers of young children. What skills in movement, musical expression, or sensory processing contribute most to the development of a healthy brain? How can these abilities be fostered in the classroom and on the playground? What are some proven models for integrating motor activities into the academic curriculum? How does movement enhance underlying cognitive processes, such as attention, memory, or self-regulation? These are some of the questions being asked and answered in the literature.

Several preliminary implications can be drawn from this work. First, movement activities for young children should provide intellectual challenges. It is not enough for children to simply run, climb, or jump. They must be challenged to solve problems with their bodies through adult interaction, careful planning, and the selection of engaging equipment. Second, although outdoor play has effects on development that indoor activities do not, teachers should not lose sight of the opportunities for movement within the classroom as well. Incorporating movement into the

curriculum, through active group time experiences, music, and learning centers with movement challenges has been found to contribute to children's development. Finally, teachers should guide families in connecting play with thinking and learning in their children's play at home. A large portion of motor play occurs outside of school. Encouraging parents to ask questions and pose challenges while children are playing will strengthen the body-mind connection. Suggesting that parents use rich language to narrate children's actions or guide their attention will support communicative competence.

## Effects of Motor/Outdoor Play on Social/Emotional Development

### Infant/Toddler Play and Social and Emotional Development

#### Play and Emotional Development

This section summarizes research on the emotional aspects of motor development and play in infancy. These studies identify the emotional prerequisites for engaging in active play and mastering motor abilities. Mastery motivation and feelings of security are examples. Some of this research also shows how play can contribute to emotional health. For example, one study shows links between the quality of infant-parent play interactions and attachment.

\*Comfort, R. L. (2005). Learning to play: Play deprivation among young children in foster care. *Zero to Three, 25*, 50-53.

**Method:** The author reviews research on the importance of play for infants in foster care. He suggests that in some foster care settings or in situations where there are multiple foster care arrangements, infants suffer from play deprivation. He describes this as a condition in which infants have so few play experiences that they are eventually unable to enter into “playful relationships” with others. He shows how this threatens attachment and trust in young children.

**Findings and Conclusions:** The author concludes that teachers, foster care providers, and other professionals need to provide many playful experiences—including physical play—for infants who show signs of play deprivation. This is particularly necessary when working with children currently in the foster care system.

**Implications:** This article provides further justification for providing play experiences in classrooms and homes at a very early age. The author argues persuasively that active, physical play is a fundamental way that babies form attachments to caregivers. Teachers, caregivers, and foster parents can contribute to this fundamental emotional bond by playing with children. Professionals should watch carefully for signs of play deprivation, particularly among infants who are in foster care. Such indicators as listlessness, lack of responsiveness to playful adults or peers, and little or no smiling and laughter may signal a need for special play intervention.

\*Glenn, S., Dayus, B., Cunningham, C., & Horgan, M. (2001). Mastery motivation in children with Down syndrome. *Down Syndrome Research and Practice, 7*, 52-29.

**Method:** The authors review the research on mastery motivation—the internal motivation to master motor skills and tasks—for typically developing infants and those with Down Syndrome. They then summarize the results of their own study on the mastery motivation of 65 children from 8 to 23 months old, 45 of whom had Down syndrome and 20 of whom were developing typically and of the same mental age. Participants were observed performing motor tasks that were appropriate for their developmental age. Researchers coded participants’ motor behaviors according to the frequency of three mastery motivation indicators: persistence, pleasure displayed during a task, and directedness (i.e. the ability to focus on the action performed). In

addition, parents participated in a survey about infant competence. The researchers compared typically developing infants and those with Down syndrome on these measures.

**Findings and Conclusions:** The authors report that their findings are consistent with previous research on mastery motivation: infants with Down Syndrome display the same internal motivation to master motor tasks that typically developing children do. Interestingly, parents rated their infants with Down syndrome as less mastery motivated. Further, parents of those with Down syndrome were found to be more directive in play interactions. Authors conclude that infants with Down syndrome possess a strong motivation to master motor tasks, but adults may not always recognize this.

**Implications:** An implication of this research is that all infants—even those with disabilities—have a desire to master skills and become competent. Promoting motor play on the playground or in the classroom requires no special rewards or incentives, even for those with special needs. The focus in motor play should be on engaging infants with highly enjoyable and challenging materials and activities. Neither rewards nor negative responses are appropriate or required.

Mayes, L. C., & Zigler, E. (2006). An observational study of the affective concomitants of mastery in infants. *Journal of Child Psychology and Psychiatry*, *33*, 659-667.

**Method:** These researchers studied the degree to which positive affect was related to the mastery of motor skills. Five 9- to 11-month olds were observed over time in naturalistic play situations. When each participant engaged in new motor abilities—pulling to a stand, standing with support, or taking steps—the researchers recorded all behaviors that suggested positive affect—smiling, laughing, and playful babbling. The researchers then compared the amount of positive affect displayed in performing new, more challenging skills to the amount of such affect shown when engaging in previously-learned, less challenging actions.

**Findings and Conclusions:** Researchers found that more positive affect behaviors were exhibited when infants were attempting new motor skills. The authors conclude that there is an enjoyment associated with learning new skills that comes from within—not from external rewards or adult encouragement. They suggest that these findings confirm the theory that infants possess an early mastery motivation.

**Implications:** This study suggests that motor play for babies and toddlers should be, first and foremost, enjoyable. Playful contexts for learning, which inspire babies *internally* to try out new skills, should be created. Not only should play experiences be positive, based on these findings, but they should be appropriately challenging. Teachers, caregivers, and parents should create opportunities for infants and toddlers to exercise skills just above their current level of mastery.

\*Naber, F., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Swinkels, S., Buitelaar, J. K., Dietz, C., et al. (2008). Play behavior and attachment in toddlers with autism. *Journal of Autism and Developmental Disorders*, *38*, 857-866.

**Method:** The play of 72 toddlers, who either had autism, other identified developmental delays, or who were developing typically, was observed in a laboratory play room. The quality of their motor and pretend play was coded. Further, their interactions with their mothers were studied.

Using a common research method—the strange situation procedure—the toddlers’ attachment to their mothers was also measured.

**Findings and Conclusions:** Toddlers’ play quality was directly related to the quality of interactions with their mothers. Those who engaged in higher levels of motor and pretend activity elicited greater numbers of responses and positive interactions from their parents. Play ability was also related to toddlers’ attachment to their mothers. Remarkably, play ability was a better predictor of how attached children were to their parents than was their disability. The authors conclude that play ability is critical for making connections with and forming attachments to adult caregivers. They believe this is particularly important for children who have special needs.

**Implications:** Teachers, caregivers, and parents should interact with children in ways that facilitate attachment. Responding quickly and with enthusiasm to children’s play initiatives, engaging in physical warmth, and displaying a positive affect are ways adults can use play to promote strong emotional relationships.

\*Smidt, M. L. & Cress, C. J. (2007). Mastery behaviors during social and object play in toddlers with physical impairments. *Education and Training in Developmental Disabilities, 39*(2), 141-152.

**Method:** These researchers studied the mastery motivation of 25 toddlers who had significant physical impairments. Mastery motivation is an inner drive to acquire new motor skills and solve challenging problems. All children studied had limited motor coordination and exhibited language and other developmental delays. Researchers recorded their play with their parents and coded their performance of specific mastery motivation indicators, such as positive affect, persistence, and attention to task. Researchers also categorized play episodes according to whether they were social or object oriented. The overall development of children was assessed using the Battelle Developmental Inventory. Relationships among type of play, mastery motivation measures, and general development scores were examined.

**Findings and Conclusions:** The researchers found that two indicators of mastery motivation—attention to task and persistence—were more common during object play. Social referencing (looking to others for emotional cues) and positive affect, however, were more often observed during social play. Participants’ overall developmental measures were related to some mastery motivation indicators, across both types of play. Scores on cognitive development and receptive language on the Battelle were positively correlated with persistence and exploration. Higher scores on motor development were related to engagement and persistence. The authors conclude that different areas of mastery motivation are associated with different kinds of play and specific variations in overall development.

**Implications:** These findings suggest that two kinds of play should be provided to support toddlers with physical disabilities in acquiring mastery motivation. Social play with an adult, this study suggests, is related to children’s positive affect and other mastery motivation indicators. Teachers, caregivers and parents should spend time on the playground interacting with children in purely social ways—playing hand-clapping, walking, or bouncing games, for example, and conversing during these activities. Object play is related to very different indicators of mastery motivation, such as persistence. So, adults should also provide activities that include engaging

objects to explore and play with. On the playground, small pieces of movable equipment should be included. This balance of both social and object play activities is most important for children with severe physical impairments. Mastery motivation is more difficult to acquire when children have extremely poor coordination and locomotor skills.

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### **Social Play with Parents**

This section reviews articles on the motor play of infants and toddlers with their first playmates—their parents. Studies on the influences of parent-infant interactions and their effects on play are reviewed. Implications of this research are presented for supporting social and emotional development of children through adult interactions in play.

Bigelow, A. E., Maclean, K., & Proctor, J. (2004). The role of joint attention in the development of infants' play with objects. *Developmental Science, 7*, 518–526.

**Method:** Thirty one-year-olds were observed as they engaged with their mothers in free play with objects. The frequency of different kinds of actions on objects—from simple mouthing, banging, and fingering to more complex conventional play activities, such as stacking colored rings, was recorded. In addition, the researchers noted the periods when mother and infant were engaged in “joint attention”—that is, when both were focused on the same object and play action. Play activities that included joint attention and non-joint attention were compared.

**Findings and Conclusions:** The researchers report that children were engaged in more complex play actions when they were in situations where they shared joint attention with their mother. The authors conclude that when mother and child are focused on the same activity, the mother naturally promotes more cognitively and physically complex levels of play. It is this period of joint attention when mothers appear to have the greatest impact on their children's activities.

**Implications:** These findings suggest that it may not be enough for a teacher, caregiver, or parent to be simply present or superficially involved in children's play. It is when teachers fully enter a child's play and share a focus with the child that play is best supported. This does not mean that adults should continually be involved in infant play, however: This study found mothers engaged in joint attention with their children about half the time.

\*Brachfeld, S., Goldberg, S., & Sloman, J. (2005). Parent-infant interaction in free play at 8 and 12 months: Effects of prematurity and immaturity. *Infant Behavior and Development, 3*, 289-305.

**Method:** These researchers conducted two studies of how infants and mothers interact in play. In the first, 30 participants—full term, healthy preterm, and sick preterm infants—were observed in four, 15-minute play interactions with their mothers at age 8 months and again at 12 months. In the second study, the authors reanalyzed their data, this time comparing full term and sick premature babies who were at the same maturation level (i.e. their ages after conception were the same, rather than their ages after birth).

**Findings and Conclusions:** In the first study, infants in the sick preterm group were found to play less and fuss more than did those of the other two groups. Mother's interactions with this

group matched this difference in play: they stayed closer to these babies, held and touched them more, more actively initiated play and demonstrated the use of toys and actions more frequently than the other two groups. Mothers of the full term babies, in contrast, were less active in playing with their children and more often observed self-guided play than mothers of the two preterm groups. In the second study, the play behaviors of the two groups of babies—full term and sick preterm of the same maturation level—were found to be very similar. However, mothers of the premature group were still more active in playing with, holding, and staying close to their babies in play. The authors conclude that it is the fact of having a premature baby, not the actual maturational level or play behaviors of a child, that leads some mothers to be more directive in play.

**Implications:** This study suggests that adults sometimes adapt their interactions in infant play to identified special needs or medical diagnoses, even when a child is playing independently and in a useful way. Mothers in this study, for example, appeared to be more highly engaged in their children's play simply because they were born prematurely, not due to actual play needs. Teachers and caregivers can also provide too much guidance in play, based on their knowledge that a child in their care has special needs. It is important for classroom interactions to be tailored to the observed play needs of children, not simply a knowledge that they have challenging conditions.

\*Cress, C., Arens, K., & Zajicek, A. (2007). Comparison of engagement patterns of young children with developmental disabilities between structured and free play. *Education and Training in Developmental Disabilities, 42*(2), 152-164.

**Methods:** These authors studied the engagement behaviors of 25 one-year-olds with developmental delays in two different settings—a structured play setting and free play setting with a parent. These children had an average developmental age of 6 months and motor age of 4.5 months, based on their scores on the Battelle Developmental Inventory. In the structured play setting, the parent was asked to facilitate the child's play, with pre-planned goals for responding to the child's play initiatives. In the free play setting, the child and parent simply played together in a naturalistic way. The researchers recorded the frequency of gazing—that is, looking intently at play objects or parents—as a measure of a child's engagement. They also observed the complexity of children's engagement behaviors, such as interacting with the same object, engaging in the same play action as the parent (called “establishing joint attention”) or shifting gaze from one toy to another. In previous research, these gazing and engagement behaviors have been found to be related to later communication abilities.

**Findings and Conclusions:** The researchers found that children gazed more frequently and initiated more complex engagement behaviors in the structured play setting than the free play setting. The authors conclude that for infants with severe developmental delays, a more structured play environment with purposeful adult interactions can provide greater support for learning engagement behaviors related to later communication skills.

**Implications:** This study suggests that for some children, particularly those with significant disabilities, more structure and guidance in play are needed. An important finding was that preplanned responses to infants' play, based on specific developmental goals, led to more complex engagement behaviors. Caregivers working with children with disabilities should not only provide greater guidance to children in their play, but should also plan out specific

interactions that will meet identified needs. For example, a caregiver might plan to increase an infant's sustained looking at objects in play by responding verbally and with animation when the child begins to explore or manipulate a particular toy. It is important to note that the structured play setting still included active motor play and exploration. Even in this setting, parents responded to children's play initiative rather than fully directing them.

\*Cress, C., Moskal, L., & Hoffmann, A. (2008). Parent directiveness in free play with young children with physical impairments. *Communication Disorders Quarterly*, 29(2), 99-108.

**Method:** These researchers observed the play of infants with physical disabilities and their parents. All participants had one of the following characteristics that led them to be identified as having significant impairment: prematurity, birth anoxia, other prenatal risk factors, feeding difficulties, delayed onset of vocalization, or evidence of neurological difficulty. The researchers observed parent-child play interactions in a laboratory play setting. They provided toys and asked parents to "play with your child as you normally would." They then coded the parent's interactive style (e.g., directive, indirectly involved, uninvolved). They also measured each child's overall development—their communication abilities, cognitive competence, and motor development—using the Batelle Developmental Inventory. They examined relationships among parenting interactive style, type and severity of disability, and specific measures of development.

**Findings and Conclusions:** The researchers found only one significant correlation among the variables they examined: There was a strong association between parenting style and children's motor abilities. Parents whose children scored lower on the motor development assessment were found to be more physically directive in their play interactions. The authors conclude that the play needs of infants with disabilities lead parents to become more physically directive in play. They note that parents of these children still interact in spontaneous, playful ways with their children as well.

**Implications:** This study suggests that parents adjust their interactive style to the individual motor development needs of their children. In particular, they become more directive when they perceive their children have greater need for physical support. In a similar manner, teachers and caregivers should strive to read children's play needs on the playground and in the classroom. When working with children with significant physical disabilities, they might tailor their interaction to more fully engage them in movement activities, toy manipulation, and other experiences—particular those intended to enhance motor development.

Tamis-LeMonda, C. S., Adolph, K. E., Lobo, S. A., Karasik, L. B., Ishak, A., & Dimitropoulou, K.A. (2008). When infants take mothers' advice: 18-month-olds integrate perceptual and social information to guide motor action. *Developmental Psychology*, 44, 734-746.

**Method:** Do toddlers make motor play decisions based on social information? This study attempted to answer this question in an experiment in which 24 infants were observed walking down ramps of varying levels of "risk." (Risk level was determined in a separate study in which various slopes of ramps were tested. Slopes that babies refused or hesitated to walk down were assumed to be more risky to babies than those they would walk down without hesitation.) The mothers of the infants sat at the bottom of the ramp and were asked either to encourage or



discourage their children from walking down, using whatever method they chose. Children's ramp-walking was then studied in response to their mothers' varying social messages.

**Findings and Conclusions:** The researchers found that no amount of encouragement from mothers would entice babies to walk down very steep ramps. On the other hand, no amount of discouragement would keep babies from walking down less steep ramps; they would do so despite mothers' warnings. Where mothers' social messages mattered was in the "borderline" slopes, where ramps were just steep enough to cause some hesitation, but not so steep as to be "risky." On these slopes babies relied on their mothers' advice. They would walk down when their mothers encouraged them, but would not if they were discouraged. The authors conclude that motor action is influenced by both the challenges of the environment and the social messages of adults.

**Implications:** This study suggests that toddler motor play is influenced by social as well as environmental factors. It is not enough to provide challenging equipment in order to encourage young children to take risks. Adults' interactions also play a role. Even if these children are hesitant, teachers, caregivers, and parents can encourage children to climb higher, run faster, or try new play activities. This study also contains a caution for caregivers: Even after adult warning, children might take unsafe risks if actions *appear* safe. Vigilant supervision is especially critical at this age.

Super, C. (2008). Environmental effects on motor development: The case of "African infant precocity." *Developmental Medicine and Child Neurology*, 18, 561-567.

**Method:** The author, one of the world's foremost authorities on child development and culture, observed 64 infants from birth to one year of age during play and other family activities in a community in rural Kenya. The purpose was to identify specific parent-child interactions that might explain the advanced motor abilities commonly found in African children. The researcher spent time in families' homes, recording naturalistic interactions. The ages at which children first achieved several basic motor milestones, such as crawling, sitting, standing, and walking, were recorded. Relationships between parent-child interactions and these motor skills were examined.

**Findings and Conclusions:** Mothers, fathers, and other adult caretakers were found to directly enhance babies' learning of certain motor abilities—particularly sitting up and walking. They also provided infants with much practice in these particular skills. Such milestones were found to be reached early by these children when compared to American norms. However, skills that were not promoted in parent-infant play, such as crawling, did not emerge any earlier in development than they typically do in American children. The author concludes that "precocious" motor development of African infants is a function of the social and family environment, not differences in genetics or maturation.

**Implications:** These findings indicate that motor development has a social component. Through play interactions in the home, children acquire the specific physical skills that are valued by their family and culture. The findings suggest that teachers and caregivers can also promote motor development through their involvement in children's play. A first step is to learn about the motor competencies that are emphasized by parents and families, particularly those of diverse cultural backgrounds. Caregivers and teachers can focus on these abilities in their play interactions with

children. Eventually, they can broaden children's repertoire of motor behaviors by designing activities to address skills that are less emphasized by families.

\*Walworth, D. D. (2009). Effects of developmental music groups for parents and premature or typical infants under two years on parental responsiveness and infant social development. *Journal of Music Therapy, 46*, 32-52.

**Method:** Fifty children, aged 6 to 24 months, were assigned to either participate with their parents in a developmental music and movement program or to a control group. The children were born preterm or full term and had visual impairments, developmental delays, or were developing typically. The program, which lasted for 36 weeks, was designed to engage the experimental group children and parents in active movement on mats accompanied by singing and guitar. All musical experiences were developed to address specific learning and motor goals. Following the program, both control and experimental group children were observed in free play and coded according to the amount of toy play, social play with parents, and vocalization in play they engaged in. Parents were also observed in free play settings with their children and scored on measures of their responsiveness and involvement.

**Findings and Conclusions:** Both children with special needs and typically developing babies who participated in the developmental music program scored higher on play abilities than those who did not participate. In particular, these infants engaged in a great deal more social play than their control group peers. Parents who participated in the program showed slightly greater responsiveness and positive affect than those who did not participate. The authors conclude that music play can be more powerful than non-music play in supporting play development and positive parent-child interactions.

**Implications:** Teachers, caregivers, and parents should incorporate musical experiences in the classroom and on the playground. Singing, playing instruments, or playing recorded music during active motor play may stimulate more complex actions and social contacts among toddlers than play without these musical accompaniments.

### Social Play with Peers

This section summarizes research on how motor play influences infants' and toddlers' relationships with peers. These studies dispel the myth that children of this age cannot cooperate and learn from other children. This research found that children collaborate on tasks, connect with one another through humor, and influence one another's interactions with adults.

Brownell, C. A., Ramani, G. B., & Zerwas, S. (2006). Becoming a social partner with peers: Cooperation and social understanding in one- and two-year-olds. *Child Development, 77*, 803-821.

**Method:** Eighty-eight 19-, 23-, and 27-month-olds were observed playing in same-age, same-gender pairs. After several preliminary minutes of active free play, each pair of babies was presented with a special toy that had two colorful handles to pull. When both handles were pulled simultaneously, the toy would play music. However, the handles were too far apart for

one child to pull at the same time. Both children needed to pull them in order to play the music. The researchers coded each pair of babies as they played with the toy, according to whether they coordinated their actions in order to play the music, whether they communicated with one another when doing so, or whether they did not cooperate to pull the handles simultaneously.

**Findings and Conclusions:** Younger children performed fewer cooperative handle-pulls than older children. For example, almost a third of 19-month-olds did not coordinate their actions at all. In contrast, all 27-month-olds pulled the handles together at least once. Authors conclude that by age 2, children are able to collaborate in achieving a common goal in play.

**Implications:** This study dispels the myth that toddlers are unable to play cooperatively. By two years of age, children in this study could engage in complex, collaborative action in play. Teachers and caregivers can provide toys and play experiences that encourage toddlers to coordinate their actions to achieve a common goal. Small group motor activities and games on the playground that children need to do together are examples. Teachers might organize a “train” on the playground by asking children to hold onto one another and move together in a line around the playground, choosing together which direction they will go or when they will stop.

Clearfield, M. W., Osborne, C. N., & Mullen, M. (2008). Learning by looking: Infants’ social looking behavior across the transition from crawling to walking. *Journal of Experimental Child Psychology, 100*, 297-307.

**Method:** The researchers conducted two studies to determine what factors cause infants to approach strangers to communicate and interact in play. In the first study, 32 nine- and fourteen-month olds were observed playing in mixed-age pairs with an unknown adult. Play and social behaviors were recorded and described. In the second study, the researchers observed the same infants playing, this time noting their progress toward walking.

**Findings and Conclusions:** Nine-month-olds were found to follow a precise pattern in their play with a stranger: They would first pause in play to watch intently as their older partner interacted with the adult stranger. After a significant period of watching, their interactions with the adult increased as well. These children seemed to be taking cues from an older peer that interacting with this adult was safe and enjoyable. In the second investigation, the same set of infants was studied. This time, each younger infant’s progress toward walking was examined, along with the watching-and-social-interaction patterns found in study one. Children who were more advanced in their walking abilities more frequently engaged in this watching-then-interacting routine with the adult stranger. Children who were slower in acquiring walking abilities were less likely to watch their older peer interact with the adult and, consequently, were less likely to interact with the adult themselves. The authors conclude that participation in the social environment is influenced by both observations of peers and the emergence of motor abilities. It may be that greater mobility gives infants more confidence and a wider range of skills for interacting with others.

**Implications:** Teachers, caregivers, and parents often adopt a goal of helping infants learn to interact more frequently with peers. This study suggests that a mixed-age play setting may be an ideal context for promoting this goal, since younger infants watch and learn from older peers’ interactions. These findings also suggest that motor development contributes to social

participation. Providing active motor play may promote not only physical development, but also social competence.

Loizou, E. (2007). Humor as a means of regulating one's social self: Two infants with unique humorous personas. *Early Child Development and Care*, 177, 195–205.

**Method:** Two infants, 18 and 21 months of age, were observed for four months as they played with peers in their child care center. Through observation and field notes, the researcher recorded how the children incorporated humor into their play activities as a way to make social connections with other children.

**Findings and Conclusions:** Various categories of humorous actions were constructed from observations; rich examples of each are presented in the article. One category was named *incongruous actions* (e.g., bending over and peering at another child through one's legs or pretending to fall down while walking), another was termed *violation of expectations* (e.g., putting a sponge in one's mouth in front of the caregiver to make others laugh or rubbing yogurt in one's hair as if shampooing), and a third category was *incongruous use of materials* (e.g., putting boxes on one's feet instead of shoes or putting a cone on one's head as a hat). Such humorous actions promote social understanding, positive peer relations, and intellectual and language abilities.

**Implications:** Caregivers, teachers, and parents should not be afraid to allow and even engage in silly behavior with toddlers on the playground and in the classroom. For this age group, slapstick actions, silly words or songs, or the playful misuse of equipment—by both adults and other children—will not only promote a sense of humor, but will teach children unique methods for making contact with peers in positive ways.

Løkken, G. (2000). The playful quality of the toddling “style.” *Qualitative Studies in Education*, 13, 531–542.

**Method:** In a qualitative study of seven toddlers who were between 1 and 2 years of age, this researcher describes the ways that children with various “toddling styles” (overall motor play preferences and behaviors) form relationships with peers in play. The unique strategies each child used to connect with other children were observed and recorded in field notes.

**Findings and Conclusions:** Several motor-related strategies were used by these toddlers to connect with peers. One toddler used motor “tutoring,” in which he tried to teach peers specific actions (jumping on a mat or pounding a fist on a table, then pausing and waiting for another child to copy the action). Several others were observed initiating a “concert” of toy pounding on a table. The most prevalent kind of motor play that was focused on engaging peers was spontaneous music-making: Many of the toddlers studied would begin to sing or dance in an effort to influence peers. In one observation, for example, a toddler initiated a spontaneous musical performance at snack time by rocking back and forth in his chair and tapping a beat on the table. Once peers copied him, he began to sing an invented song, which others vocalized with him. The authors conclude that playful motor actions, especially music, are not merely performed for enjoyment, but have a social purpose at this young age.

**Implications:** This study demonstrates that children as young as one year of age make efforts to engage peers in play. The findings reveal unique motor actions that children use to connect with others. That music was one of the most common ways toddlers initiated play with peers affirms the importance of spontaneous singing and dancing in the classroom or on the playground. Teachers and caregivers might initiate spontaneous songs and movements as children swing, jump or twirl. Helping children to build spontaneous musical expression into their repertoire of play behaviors is not only useful for musical development, but also for establishing peer relationships.

## The Play of Preschool Children and Social and Emotional Development

### Motor Play and Emotional Development

This section reviews research and theory on how play affects young children's emotional health. A focus of one study cited here is on how poor motor development and obesity can affect peer acceptance. Other investigations indicate the importance of mastery motivation, an affective state that influences the physical development of preschoolers, with and without special needs. One study explores the impact of play on positive affect and self-regulation—processes that are important for both social and cognitive development.

\*Bieberich, A. A., & Morgan, S. B. (2004). Self-regulation and affective expression during play in children with autism or Down Syndrome: A short-term longitudinal study. *Journal of Autism and Developmental Disorders*, 34, 439-448.

**Method:** These researchers observed and recorded the play of 36 preschool children, 18 with autism and 18 with Down syndrome, over a two year period. The two groups were matched on scores on the Peabody Picture Vocabulary Test-Revised in order to control for verbal abilities. Their free play with their mothers in a special play room was recorded in 25 minute sessions. In each session, children were provided with toys that encouraged either active, physical play or quieter activities. Mothers were asked to respond to children's initiatives, but not to control or direct the play. Videorecordings were made of these sessions over the two year period of the study. Videoclips were coded to assess children's self-regulation, including their ability to pay attention, persist at tasks, and focus on objects, using the Minnesota Preschool Affect Rating Scales (MN-PARS). Their positive and negative affect were also coded using this same instrument.

**Findings and Conclusions:** Children with autism scored lower on the self-regulation measure in play than did children with Down syndrome. They were more likely to be distracted and were more often inattentive and unengaged with objects. These children also scored lower on positive affect (sharing, smiling, and showing excitement). Contrary to predictions, the autism group scored no differently than the Down syndrome group on negative affect (hostility, irritation, and lack of compliance). So, children with autism were less enthused and exhibited a "dull" affect, but were not more negative in their interactions than children with Down syndrome. These trends were relatively consistent over the two years of the study.

**Implications:** These findings indicate that children with disabilities will interact very differently on the playground or in a classroom, depending on the nature of their condition. There is not a single, deficient play style that characterizes all young children who have intellectual disabilities. Those with Down syndrome might be well-equipped to regulate their own behavior and to enjoy activities with others in play settings. Children with autism, in contrast, may need more structured situations, rather than open-ended play settings, in order to be able to inhibit impulses, control behaviors and movements, and show enjoyment in peer interactions. Teachers and caregivers working with children with disabilities must recognize these differences in play needs and adapt activities and interactions accordingly.

\*Piek, J. P., Bradbury, G. S., Elsley, S. C., & Tate, L. (2008). Motor coordination and social-emotional behaviour in preschool-aged children. *International Journal of Disability, Development and Education*, 55, 143–151.

**Method:** The purpose of this study was to examine whether motor coordination difficulties, such as Developmental Coordination Disorder (DCD), affect the social and emotional development of preschoolers, as it does with older children. Forty-one 4-year-olds were assessed on their motor abilities using the McCarron Assessment of Neuromuscular Development. This instrument involves posing 5 large motor and 4 fine motor tasks to young children and is used to determine a child's overall motor competence. In addition, children were measured on their knowledge of emotions (using the Emotional Recognition Scales), their general intelligence (using the Wechsler Preschool and Primary Scale of Intelligence), and whether they exhibit internalizing or externalizing behavior problems, such as withdrawal and depressive symptoms (using the Child Behaviour Checklist). The researchers examined relationships between motor coordination and these social, emotional, and cognitive measures.

**Findings and Conclusions:** Children who scored very low on motor abilities were found to score significantly lower on the measure of emotional knowledge. They were less likely than more competent peers to accurately identify facial expressions of different emotions. However, when gender, sex, and IQ were controlled, this relationship between motor abilities and emotional knowledge was no longer significant. The authors propose that this is due to the strong relationship between intellectual ability and the understanding of others' emotions. When the influence of IQ is removed from the correlation, motor ability and emotional understanding are no longer highly associated. The most important finding of the study, however, was that poor motor skills were significantly correlated with items on the Child Behavior Checklist related to depression and anxiety. This relationship was still strong after IQ and other variables were controlled. The authors conclude that motor competence may be particularly important for those at risk for these mental health difficulties.

**Implications:** Although these findings are far from definitive, they suggest that motor coordination is related to at least some aspects of emotional development. The study indicates that active motor play and the acquisition of motor skills might diminish the potential for depression and anxiety in young children. It may be that increased motor development allows preschoolers greater access to peers and play opportunities. Play, in turn, may provide an outlet for children who suffer from internalizing problems such as depression. Motor play, indoors and out, is important for all children, but particularly those at emotional risk.

\*Vlachou, M., & Farrell, P. (2000). Object mastery motivation in preschool children with and without disabilities. *Educational Psychology*, 20, 167-176.

**Method:** Eight preschool age children, including four with Down syndrome, were observed playing with four sets of toys in a laboratory setting. Toys were selected so that each set posed greater challenges to the child. For example, the first set of toys included a box that had levers and knobs that could be pushed and pulled to create an interesting effect. Sets presented later had more complex toys that required children to match special keys to the color of each knob or level in order for them to be used. As children played with these toys, researchers coded mastery motivation indicators—that is, behaviors that showed children were intrinsically motivated to keep learning new motor and cognitive skills. These included visual signs of positive affect (e.g.,

smiling, laughing), persistence at play activities, and remaining on task. Children with and without Down syndrome were compared on these measures.

**Findings and Conclusions:** There were no differences between groups on ratings of positive affect and play persistence. Even as toys presented greater challenges, children with and without disabilities displayed positive dispositions and continued to solve problems in their play. This was the case even though children with Down syndrome were rated as “less successful” in their use of the toys. Where the two groups did vary was on measures of on-task behavior. Children with Down syndrome were more frequently distracted from play. The authors conclude that, by at least some measures, children with Down syndrome possess an internal mastery motivation. They suggest that the practice of external rewards may not be necessary for children with this disability to pursue play goals.

**Implications:** Teachers and caregivers working with children with Down syndrome should recognize the inner motives of all children to learn and play—even those with developmental disabilities. Engaging and challenging experiences should be provided for all children. Those with and without disabilities will participate without a need for external reward. This study should give pause to traditional educators who assume children with special needs require external guidance and rewards in order to learn. Providing engaging play materials and guidance may be more useful than stickers or stars.

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### Social Play

In the articles cited in this section, the effects of motor play on peer relationships are explored. Some studies confirm that motor competence is a primary predictor of being accepted by peers, for children with and without disabilities. Other studies describe the positive interactions of children as they engage in active play on the playground.

Bar-Haim, Y., & Bart, O. (2006). Motor function and social participation in kindergarten children. *Social Development, 15*(2), 296-310.

**Method:** These authors studied the indoor and outdoor play of 88 kindergarten children who were enrolled in seven public kindergarten classrooms in Tel Aviv, Israel. The social participation of the children (i.e., the degree of engagement and cooperative play with peers) was observed and recorded. Participants’ overall motor development was assessed using a variety of conventional assessments. The relationships among the location of play (indoors or outdoors), social participation, and overall motor development were examined.

**Findings and Conclusions:** The authors found significant relationships among the variables studied. Higher frequencies of social play occurred outdoors than indoors. There was a higher rate of social reticence (solitary play, prolonged watching, and playing without attempting to join others) indoors. Children who scored lower on motor development measures engaged in less social play and exhibited greater social reticence than children with average and high motor abilities.

**Implications:** This study provides powerful evidence of a link between outdoor motor play and social development. In meeting social goals in early childhood programs, teachers and caregivers should reexamine their outdoor play periods and extend these to enhance greater social



interaction among students. They should view outdoor play as the ideal location for facilitating positive peer interactions. Active adult involvement on the playground to promote greater contact and conversation among children is critical. These findings also show that children who exhibit socially withdrawn behaviors will benefit greatly from motor-oriented interventions to lessen such behaviors.

\*Diamond, K., & Hong, S. (2008). Context influences preschool children's decision to include a peer with a physical disability in play. *Exceptionality*, 61, 141-155.

**Method:** What leads typically developing preschoolers to include those with physical disabilities in their play? This was the question these authors asked in an interview-based study with 46 young children. The authors interviewed the participants individually using puppets and other props. In the interview, they presented vignettes that included fictional children with a variety of disabilities, including physically challenging conditions. They asked participants to point out those children they would most likely play with in a variety of different settings, including outdoor motor play. They then coded and analyzed children's responses.

**Findings and Conclusions:** Findings indicate that the children were aware of developmental differences, but were better able to identify and describe those with physical differences compared to intellectual ones. This finding appeared to be related to the relative visibility of physical conditions, the authors speculate. Children's response showed they were more willing to include children with disabilities in some activities more than others. Specifically, they stated they were more likely to include children with challenges in play activities that were not physical. For example, children were less likely to include children in wheelchairs in physical activities such as outdoor motor play. Girls were more willing to include peers with disabilities than boys. The authors conclude that previous studies of peer acceptance do not capture the reasons that children decide to include or not include peers with special needs. They argue that asking children to reflect on reasons for their decisions will illuminate the complex relationships between disabilities and positive peer relations.

**Implications:** These findings suggest that teachers and caregivers can and should talk to children with and without disabilities about their preferences for playmates. Such discussions may reveal important reasons children do or do not allow peers with disabilities into their play, and can guide teachers in planning a program for peer acceptance. These findings suggest that children with physical disabilities may be excluded from playground activities because their peers believe they cannot engage in this form of play. Teachers and caregivers can address this problem by assuring that many active play experiences on the playground are accessible to all children (e.g., ramps and adult assistance to reach the tops of climbers, wheel-chair accessible paths to reach all areas). In addition, adults can provide classroom experiences that demonstrate that all children can participate in play activities, and the ways children with physically challenging conditions can be included.

Lindsey, E. W., & Mize, J. (2000). Parent-child physical and pretense play: Links to children's social competence. *Merrill-Palmer Quarterly*, 46, 565-569.

**Method:** Researchers observed 54 mothers and 36 fathers playing with their 4- and 5-year-old children in a laboratory play room. They were encouraged to “play with your child as you would at home.” Two different sets of materials were provided, one at a time, to promote different kinds of play—Nerf bats and balls and a large Slo-Mo ball (to prompt motor play) and zoo animals, a pretend cooking set, and plastic vehicles (to encourage pretend play). Parent-child play interactions were videotaped; both child play behaviors and parents’ involvement with them were recorded. A variety of other assessments were administered with the children. A sociometric evaluation was conducted to determine how well-accepted children were by their peers in preschool. A measure of children’s knowledge of emotions was administered. Relationships of play observations, ratings and assessment data to children’s sociometric scores were examined.

**Findings and Conclusions:** The quality of parents’ interactions with their children in both physical play and pretend play were highly related to their sociometric status (how well accepted they were by peers in preschool). Although children’s emotional knowledge was also related to peer acceptance, this association was no longer significant when researchers controlled for parent-child play interactions. The authors note that sociometric status in a classroom group is an important indicator of overall social competence. These findings highlight the critical nature of parent-child play interactions in social development.

**Implications:** These findings illustrate how important it is for teachers, caregivers, and parents to interact with children in play in responsive and appropriate ways. Adult involvement, this study demonstrates, can have an impact on children’s positive peer relationships. That interactions in physical play are as important as those in pretend play suggests that a sit-back-and-watch approach of teachers on the playground may not adequately promote children’s social development.

Musher-Eizenman, D. R., Houlub, S. C., Miller, A. B., Goldstein, S. E., & Edwards-Leeper, L. (2004). Body size stigmatization in preschool children: The role of control attributions. *Journal of Pediatric Psychology, 29*(8), 613-620.

**Method:** This study assessed preschool-age children’s beliefs about other children who are obese and whether these other children are able to control their own weight. Forty-two preschoolers were shown illustrations of persons with different body sizes and interviewed about these. They were first asked to provide words to describe each of the different body figures shown. These adjectives were recorded. They were asked to indicate their preferences for the children, shown in the figures, whom they would most like to play with. Finally they were asked about the ability of children who were larger to control their own weight.

**Findings and Conclusions:** The researchers found that the adjectives children provided for obese figures were more negative than they were for typical-weight figures. Children’s adjectives were no different, however, for thin figures compared to average figures. Figures that were the heaviest were chosen less often as body-types of peers with whom children would most like to play. Children who held the strongest negative beliefs about overweight figures were most likely to say that these children could control their own weight if they wanted to.

**Implications:** There is great concern about the health problems related to childhood obesity. However, this study indicates that obesity may exact an emotional toll as well. These findings show that stereotypes and negative attitudes toward obese individuals exist at a very young age. Even preschool children possess “anti-fat” beliefs that affect their choices of playmates. That many children believe a large body-type can be avoided suggests that they think this attribute is intentional (e.g., “She/he wants to be fat”). Before these attitudes become too firmly engrained, teachers, caregivers, and parents should promote preschool children’s acceptance of diversity in all its forms, including varying body size. A curriculum theme focused on cultural, gender, socioeconomic, and family diversity should include body type as another emphasis. While implementing this approach, however, teachers and caregivers should not minimize health concerns related with being overweight. Programs that encourage physical activity and that teach healthy weight management through diet are also important, even at the preschool age.

\*Pierce-Jordan, S., & Lifter, K. (2005). Interaction of social and play behaviors in preschoolers with and without pervasive developmental disorder. *Topics in Early Childhood Special Education, 25*, 34-47.

**Method:** The indoor and outside play activities of 21 preschool aged children, 12 of whom were diagnosed with pervasive developmental disorder (PDD), were videotaped and analyzed over a 6 month period. A coding system was developed to measure the social, symbolic, and cognitive complexity of play and the level of social interaction that children engaged in. Children with and without PDD were compared on these measures.

**Findings and Conclusions:** Children with PDD engaged in fewer interactions with peers than those without this condition. For both groups, the complexity of play was negatively related to the degree of social interaction. That is, the more complex or challenging play became, the less likely children were to engage in conversation or social contact with others. The authors recommend that interventions to support the social interactions of children be implemented in settings where play tasks are less challenging, so that they might focus more on social behaviors and language.

**Implications:** Teachers, caregivers, and parents should provide challenges to children in play—particularly for those with pervasive developmental disorder. However, such challenging play settings may not be ideal for helping children to interact with each other in positive ways, according to these findings. When on the playground, a running and chasing game might be a better activity for facilitating peer conversation and cooperation than a new and challenging balancing or tossing game. This study suggests different types of play may achieve different goals: simpler movement experiences might lead to more social interaction; challenges might contribute more to motor development.

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## **Play and Social and Emotional Development: Summary and Implications**

Play is driven by emotions—joy, humor, curiosity, excitement, self-assuredness, daring, and even anxiety and sadness. It is not surprising, then, that active motor play contributes to, and is influenced by, young children’s emotional well-being. One emotional state that has been studied extensively is children’s mastery motivation—an urge to acquire new motor skills. Research suggests that, from early infancy, there exists an internal drive to learn physical abilities and to perform more complex actions with play objects. Children demonstrate their most positive affect when engaged in play activities that challenge them. This desire to master skills can be observed in all children—even those with special needs.

The relationship between play and children’s trust and feelings of security has also been studied. The quality of early parent-child play interactions is related to the strength of the attachment that forms between them. Sadly, children who are deprived of play opportunities in their homes may not form these secure bonds with caregivers. Movement and physical play contribute to other areas of emotional development as well. Children who have poor motor abilities are more likely to suffer from depression and anxiety, and, if they are overweight, to be viewed less positively by peers.

Areas of social development are also affected by motor play in the early years. Infants’ interactions with their parents help them learn how to play in more elaborate and varied ways. Parents help their children learn when to take risks (and when not to). Even young babies show interest in and learn social behaviors from peers in play. At a surprisingly young age they can collaborate with peers on motor tasks and use humor, music, and motor actions to initiate play activities. In the preschool years, motor ability becomes even more important in peer relationships. Preschool children who lack motor skills are likely to be less social, more hesitant in social interactions, and more likely to be rejected by classmates. They may also have difficulty with self-regulation. Those with physically challenging conditions and other disabilities may be less likely to be included in certain kinds of play.

What are the implications of this research for classroom practice? Teachers and caregivers can provide challenging, interesting, and joyful movement experiences that promote positive affect. They can instill intrinsic mastery motivation in children by helping them identify and appreciate their own physical accomplishments, rather than simply judging or praising them. Creating extra time for play for children at risk of poor emotional development is critical. Through play, such children can discharge anger or sadness and bring worrisome events to the surface to cope with. Young children of all ages should be provided opportunities to play with peers—particularly outdoors, where play is more social. This is particularly important for children with special needs.

## Alphabetical List of Citations

- Abbott, A. L., & Bartlett, D. J. (2002). [Infant motor development and equipment use in the home](#). *Child: Care, Health and Development*, 27, 295-306.
- Adolph, K. E., Vereijken, B., & Shrout, P. E. (2003). [What changes in infant walking and why](#). *Child Development*, 74, 475-497.
- Apache, R. R. G. (2005). [Activity-based intervention in motor skill development](#). *Perceptual and Motor Skills*, 100, 1011-1020.\*<sup>3</sup>
- Baranek, G. T. (2004). [Autism during infancy: A retrospective video analysis of sensory-motor and social behaviors at 9-12 months of age](#). *Journal of Autism and Developmental Disorders*, 29, 213-224.\*
- Barbu-Roth, M., Anderson, D. I., Desprès, A., Provasi, J., Cabrol, D., & Campos, J. J. (2009). [Neonatal stepping in relation to terrestrial optic flow](#). *Child Development*, 80, 8-14.
- Bar-Haim, Y., & Bart, O. (2006). [Motor function and social participation in kindergarten children](#). *Social Development*, 15(2), 296-310.
- Bell, H. C., Pellis, S. M., & Kolb, B. (2010). [Juvenile peer play experience and the development of the orbitofrontal and medial prefrontal cortices](#). *Behavioural Brain Research*, 207, 7-13.
- Benham-Deal, T. (2005). [Preschool children's accumulated and sustained physical activity](#). *Perceptual and Motor Skills*, 100, 443-450.
- Berger, S. E., & Adolph, K. E. (2003). [Infants use handrails as tools in a locomotor task](#). *Developmental Psychology*, 39, 594-605.
- Bieberich, A. A., & Morgan, S. B. (2004). [Self-regulation and affective expression during play in children with autism or Down Syndrome: A short-term longitudinal study](#). *Journal of Autism and Developmental Disorders*, 34, 439-448.\*
- Bigelow, A. E., Maclean, K., & Proctor, J. (2004). [The role of joint attention in the development of infants' play with objects](#). *Developmental Science*, 7, 518-526.
- Blakemore, C. (2003). [Movement is essential to learning](#). *Journal of Physical Education, Recreation and Dance*, 74(9), 22-25, 41.
- Bosco, F. M., Friedman, O., & Leslie, A. M. (2006). [Recognition of pretend and real actions in play by 1- and 2-year-olds: Early success and why they fail](#). *Cognitive Development*, 21, 1-10.
- Bourgeois, K. S., Akhwar, A. W., Neal, S. A., & Lockman, J. J. (2005). [Infant manual exploration of objects, surfaces, and their interrelations](#). *Infancy*, 8, 233-252.
- Brachfeld, S., Goldberg, S., & Sloman, J. (2005). [Parent-infant interaction in free play at 8 and 12 months: Effects of prematurity and immaturity](#). *Infant Behavior and Development*, 3, 289-305.\*
- Brown, W., McIver, K., Pfeiffer, K., Dowda, M., Addy, C., & Pate, R. (2009). [Social and environmental factors associated with preschoolers' nonsedentary physical activity](#). *Child Development*, 80(1), 45-58.
- Brownell, C. A., Ramani, G. B., & Zerwas, S. (2006). [Becoming a social partner with peers: Cooperation and social understanding in one- and two-year-olds](#). *Child Development*, 77, 803-821.
- Carson, L. M. (2001). [The "I Am Learning" curriculum: Developing a movement awareness in young children](#). *Teaching Elementary Physical Education*, 12(5), 9-13.
- Casby, M. W. (2003). [The development of play in infants, toddlers, and young children](#). *Communication Disorders Quarterly*, 24(4), 163-174.\*

<sup>3</sup> An asterisk (\*) indicates that the article discusses children with special needs.

- Case-Smith, J., & Kuhaneck, H. M. (2008). [Play preferences of typically developing children and children with developmental delays between ages 3 and 7 years](#). *OTJR: Occupation, Participation and Health*, 28, 19-29.\*
- Centers for Disease Control and Prevention. (2010). [State indicator report on physical activity, 2010](#). Atlanta, GA: U. S. Department of Health and Human Services.
- Claxton, L. J., Keen, R., & McCarty, M. E. (2003). [Evidence of motor planning in infant reaching behavior](#). *Psychological Science*, 14, 354-356.
- Clearfield, M. W., Osborne, C. N., & Mullen, M. (2008). [Learning by looking: Infants' social looking behavior across the transition from crawling to walking](#). *Journal of Experimental Child Psychology*, 100, 297-307.
- Comfort, R. L. (2005). [Learning to play: Play deprivation among young children in foster care](#). *Zero to Three*, 25, 50-53.\*
- Cress, C., Arens, K., & Zajicek, A. (2007). [Comparison of engagement patterns of young children with developmental disabilities between structured and free play](#). *Education and Training in Developmental Disabilities*, 42(2), 152-164.\*
- Cress, C., Moskal, L., & Hoffmann, A. (2008). [Parent directiveness in free play with young children with physical impairments](#). *Communication Disorders Quarterly*, 29(2), 99-108.\*
- de Campos, A. C., Rocha, N. A., Cicuto F., & Savelsbergh, G. (2010). [Development of reaching and grasping skills in infants with Down syndrome](#). *Research in Developmental Disabilities: A Multidisciplinary Journal*, 31, 70-80.\*
- Diamond, K., & Hong, S. (2008). [Context influences preschool children's decision to include a peer with a physical disability in play](#). *Exceptionality*, 61, 141-155.\*
- DiCarlo, C. F., Reid, D. H., & Strickin, S. B. (2006). [Increasing toy play among toddlers with and without disabilities by modifying the structural quality of the classroom environment](#). *NHSA Dialog: A Research-to-Practice Journal for the Early Intervention Field*, 9, 49-62.\*
- Doctoroff, S. (2001). [Adapting the physical environment to meet the needs of all young children for play](#). *Early Childhood Education Journal*, 29(2), 105-109.\*
- Eckerdal, P., & Merker, B. (2009). [Music and the "action song" in infant development: An interpretation](#). In S. Malloch & C. Trevarthen (Eds.), *Communicative musicality: Exploring the basis of human companionship* (pp. 241-262). New York: Oxford University Press.
- Gabbard, C. (1998). [Windows of opportunity for early brain and motor development](#). *Journal of Physical Education, Recreation and Dance*, 69(8), 54-55, 61.
- Garrett, M., McElroy, A. M., & Staines, A. (2002). [Locomotor milestones and babywalkers: A cross sectional study](#). *British Medical Journal*, 324, 1494.
- Gernsbacher, M. A., Sauer, E. A., Geye, H. M., Schweigert, E. K., & Goldsmith, H. H. (2008). [Infant and toddler oral- and manual-motor skills predict later speech fluency in autism](#). *Journal of Child Psychology and Psychiatry*, 49, 43-50.\*
- Gill, S. V., Adolph, K. E., & Vereijken, B. (2009). [Change in action: How infants learn to walk down slopes](#). *Developmental Science*, 12, 888-902.
- Glenn, S., Dayus, B., Cunningham, C., & Horgan, M. (2001). [Mastery motivation in children with Down syndrome](#). *Down Syndrome Research and Practice*, 7, 52-29.\*
- Goodway, J. D., & Branta, C. F. (2003). [Influence of a motor skill intervention on fundamental motor skill development of disadvantaged preschool children](#). *Research Quarterly for Exercise and Sport*, 74(1), 36-46.
- Goodway, J., Robinson, L., & Crowe, H. (2010). [Gender differences in fundamental motor skill development in disadvantaged preschoolers from two geographic regions](#). *Research Quarterly for Exercise and Sport*, 81(1), 17-24.

- Hauf, P., & Aschersleben, G. (2008). [Action–effect anticipation in infant action control](#). *Psychological Research*, 72, 203–210.
- Hemgren, E., & Persson, K. (2006). [Associations of motor co-ordination and attention with motor-perceptual development in 3-year-old preterm and full-term children who needed neonatal intensive care](#). *Child: Care, Health and Development*, 33, 1, 11–21.\*
- Isbell, C. & Isbell, R. (2007). [Sensory integration: A guide for preschool teachers](#). Beltsville, MD: Gryphon House, Inc.\*
- Iverson, J. M. (2010). [Developing language in a developing body: The relationship between motor development and language development](#). *Journal of Child Language*, 37, 229-261.
- James, K. (2010). [Sensori-motor experience leads to changes in visual processing in the developing brain](#). *Developmental Science*, 13, 279-288.
- Kaphingst, K. H. & Story, M. (2009). [Child care as an untapped setting for obesity prevention: State child care licensing regulations related to nutrition, physical activity, and media use for preschool-aged children in the United States](#). *Preventing Chronic Disease* 6(1). Retrieved May 20, 2010 from [http://www.cdc.gov/pcd/issues/2009/jan/07\\_0240.htm](http://www.cdc.gov/pcd/issues/2009/jan/07_0240.htm).
- Kern, P. & Wolery, M. (2002). [The sound path](#). *Young Exceptional Children*, 5(3), 12-20.\*
- Kuo, Y., Liao, H., Chen, P., Hsieh, W., & Hwang, A. (2008). [The influence of wakeful prone positioning on motor development during the early life](#). *Journal of Developmental and Behavioral Pediatrics*, 29, 367-376.
- Labiadh, L., & Golomer, E. (2010). [Preschool-aged children’s jumps: Imitation performances](#). *Journal of Electromyography & Kinesiology*, 20, 322.
- Laplante, D. P., Zelazo, P. R., Brunet, A., & King, S. (2007). [Functional play at 2 years of age: Effects of prenatal maternal stress](#). *Infancy*, 12, 69–93.\*
- Lindsey, E. W., & Mize, J. (2000). [Parent-child physical and pretense play: Links to children's social competence](#). *Merrill-Palmer Quarterly*, 46, 565-569.
- Lindsey, E. W., Cremeens, P. R., Colwell, M. J., & Caldera, Y. M. (2009). [The structure of parent–child dyadic synchrony in toddlerhood and children’s communication competence and self-control](#). *Social Development*, 18, 375-396.
- Lloyd, M., Burghardt, A., Ulrich, D. A., & Rosa, A. (2010). [Physical activity and walking onset in infants with Down syndrome](#). *Adapted Physical Activity Quarterly*, 27, 1-16.\*
- Lobo, M. A., & Galloway, J. C. (2008). [Postural and object-oriented experiences advance early reaching, object exploration, and means – end behavior](#). *Child Development*, 79, 1869 – 1890.
- Loizou, E. (2007). [Humor as a means of regulating one’s social self: Two infants with unique humorous personas](#). *Early Child Development and Care*, 177, 195–205.
- Løkken, G. (2000). [The playful quality of the toddling ‘‘style.’’](#) *Qualitative Studies in Education*, 13, 531–542.
- Looper, J., Wu, J., Barroso, R. A., Ulrich, D., Ulrich, B. D. (2006). [Changes in step variability of new walkers with typical development and with Down syndrome](#). *Journal of Motor Behavior*, 38, 367-372.\*
- Martin, E. (2000). [Developmentally appropriate equipment: What does that mean?](#) *Teaching Elementary Physical Education*, 11(6), 5-8.
- Martin, S. (2006). [Teaching motor skills to children with cerebral palsy and similar movement disorders: A guide for parents and professionals](#). Bethesda, MD: Woodbine House.\*
- Mayes, L. C., & Zigler, E. (2006). [An observational study of the affective concomitants of mastery in infants](#). *Journal of Child Psychology and Psychiatry*, 33, 659-667.
- McCall, R. M., & Craft, D. H. (2004). [Purposeful play: Early childhood movement activities on a budget](#). Champaign, IL: Human Kinetics.

- Menear, K. S., & Davis, L. (2007). [Adapting physical activities to promote overall health and development: Suggestions for interventionists and families.](#) *Young Exceptional Children*, 10(2), 11-16.\*
- Menear, K. S., Smith, S. C., & Lanier, S. (2006). [The multipurpose fitness playground for individuals with autism: Ideas for design and use.](#) *The Journal of Physical Education*, 77(9), 20-25.\*
- Morrongiello, B. A., Klemencic, N., & Corbett, M. (2008). [Interactions between child behavior patterns and parent supervision: Implications for children's risk of unintentional injury.](#) *Child Development*, 79, 627-638.
- Musher-Eizenman, D. R., Houlib, S. C., Miller, A. B., Goldstein, S. E., & Edwards-Leeper, L. (2004). [Body size stigmatization in preschool children: The role of control attributions.](#) *Journal of Pediatric Psychology*, 29(8), 613-620.
- Naber, F., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Swinkels, S., Buitelaar, J. K., Dietz, C., et al. (2008). [Play behavior and attachment in toddlers with autism.](#) *Journal of Autism and Developmental Disorders*, 38, 857-866.\*
- Namy, L., Acredolo, L., & Goodwyn, S. (2000). [Verbal labels and gestural routines in parental communication with young children.](#) *Journal of Nonverbal Behavior*, 24, 63-79.
- National Association for Sport and Physical Education. (2009). [Active start: A statement of physical activity guidelines for children from birth to age 5](#) (2<sup>nd</sup> ed.). Reston, VA: Author.
- National Association of Early Childhood Specialists in State Departments of Education. (2001). [Recess and the importance of play: A position statement on young children and recess.](#) Washington, DC: Author.
- Panksepp, J. (2007). [Can play diminish ADHD and facilitate the construction of the social brain?](#) *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, 16, 57-66.\*
- Pate, R. R., Pfeiffer, K. A., Trost, S. G., Ziegler, P., & Dowda, M. (2004). [Physical activity among children attending preschools.](#) *Pediatrics*, 114, 1258-1263.
- Payne, V. G., & Isaacs, L. D. (2008). [Chapter 12: Fundamental locomotion skills of childhood.](#) *Human motor development: A lifespan approach* (7<sup>th</sup> ed.) (pp. 299-327). New York: McGraw Hill.
- Payne, V. G., & Isaacs, L. D. (2008). [Chapter 13: Fundamental object control skills of childhood.](#) *Human motor development: A lifespan approach* (7<sup>th</sup> ed.) (pp. 328-361). New York: McGraw Hill.
- Piek, J. P., Bradbury, G. S., Elsley, S. C., & Tate, L. (2008). [Motor coordination and social-emotional behaviour in preschool-aged children.](#) *International Journal of Disability, Development and Education*, 55, 143-151.\*
- Piek, J., Dawson, L., Smith, L., & Gasson, N. (2008). [The role of early fine and gross motor development on later motor and cognitive ability.](#) *Human Movement Science*, 2(5), 668-684.
- Pierce-Jordan, S., & Lifter, K. (2005). [Interaction of social and play behaviors in preschoolers with and without pervasive developmental disorder.](#) *Topics in Early Childhood Special Education*, 25, 34-47.\*
- Pin, T., Eldridge, B., & Galea, M. P. (2007). [A review of the effects of sleep position, play position, and equipment use on motor development in infants.](#) *Developmental Medicine & Child Neurology*, 49, 858-867.
- Pollatou, E., Karadimou, K., & Gerodimos, V. (2005). [Gender differences in musical aptitude, rhythmic ability and motor performance in preschool children.](#) *Early Child Development and Care*, 175, 361-369.
- Rakison, D. H., & Woodward, A. L. (2008). [New perspectives on the effects of action on perceptual and cognitive development.](#) *Developmental Psychology*, 44, 1209-1213.
- Robert, D. L. (2001). [Successful preschool movement programs: Research guiding C.H.A.O.S..](#) *Teaching Elementary Physical Education*, 12(5), 30-33.
- Saakslähti, A., Numminen, P., Varstala, V., Helenius, H., Tammi, A., Viikari, J., et al. (2004). [Physical activity as a preventive measure for coronary heart disease risk factors in early childhood.](#) *Scandinavian Journal of Medication Science and Sports*, 14, 143-149.
- Sacha, T. J., & Russ, S.W. (2006). [Effects of pretend imagery on learning dance in preschool children.](#) *Early Childhood Education Journal*, 33, 341-345.



- Schneider, E. (2009). [Longitudinal observations of infants' object play behavior in the home context](#). *OTJR: Occupation, Participation and Health*, 29, 79-87.
- Schneider, H., & Lounsbery, M. (2008). [Setting the stage for lifetime physical activity in early childhood](#). *Journal of Physical Education, Recreation, and Dance*, 79(6), 19-23.
- Smidt, M. L. & Cress, C. J. (2007). [Mastery behaviors during social and object play in toddlers with physical impairments](#). *Education and Training in Developmental Disabilities*, 39(2), 141-152.\*
- Super, C. (2008). [Environmental effects on motor development: The case of "African infant precocity."](#) *Developmental Medicine and Child Neurology*, 18, 561-567.
- Tamis-LeMonda, C. S., Adolph, K. E., Lobo, S. A., Karasik, L. B., Ishak, A., & Dimitropoulou, K.A. (2008). [When infants take mothers' advice: 18-month-olds integrate perceptual and social information to guide motor action](#). *Developmental Psychology*, 44, 734-746.
- Timmons, B. W., Naylor, P., & Pfeiffer, K. A. (2007). [Physical activity for preschool children: How much and how?](#) *Applied Physiology, Nutrition, and Metabolism*, 32, 122-134.
- Trost, S. G., Fees, B., & Dzewaltowski, D. (2008). [Feasibility and efficacy of a "Move and Learn" physical activity curriculum in preschool children](#). *Journal of Physical Activity and Health*, 5, 88-103.
- Tucker, P. (2008). [The physical activity levels of preschool-aged children: A systematic review](#). *Early Childhood Research Quarterly*, 23, 547-558.
- Vlachou, M., & Farrell, P. (2000). [Object mastery motivation in preschool children with and without disabilities](#). *Educational Psychology*, 20, 167-176.\*
- Walworth, D. D. (2009). [Effects of developmental music groups for parents and premature or typical infants under two years on parental responsiveness and infant social development](#). *Journal of Music Therapy*, 46, 32-52.\*
- Washington, K., Deitz, J. C., White, O. R., & Schwartz, I. S. (2002). [The effects of a contoured foam seat on postural alignment and upper-extremity function in infants with neuromotor impairments](#). *Physical Therapy*, 82, 1064-1076.\*
- Watamura, S. E., Donzella, B., Alwin, J., & Gunnar, M. R. (2003). [Morning-to-afternoon increases in cortisol concentrations for infants and toddlers at child care: Age differences and behavioral correlates](#). *Child Development*, 74, 1006-1020.
- Widerstrom, A. (2006). [Mothers' language and infant sensorimotor development: Is there a relationship?](#) *Language Learning*, 32, 145-160.
- Williams, H. G., Pfeiffer, K. A., Dowda, M., Jeter, C., Jones, S., & Pate, R. R. (2008). [A field-based testing protocol for assessing gross motor skills in preschool children: The Children's Activity and Movement in Preschool Motor Skills Protocol](#). *Measurement in Physical Education and Exercise Science*, 13, 151-165.
- Young, B., & Robert, D. (2005). [Play, physical activity, & physical activity for young children](#). Dubuque, IA: Kendall/Hunt Publishing Company.
- Živčić, K., Trajkovski-Višić, B., & Sentderd, M. (2008). [Changes in motor abilities of preschool children, age 4](#). *Physical Education and Sport*, 6, 41-50.