



Contributions of play and toys to child development

Key studies

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EXECUTIVE SUMMARY

Nearly everything the growing child needs to learn is developed and practiced in play, including concrete skills, such as counting, motor co-ordination, speech and abstract skills, including imagination, problem-solving, planning, and 'learning how to learn'. I believe that play is of fundamental importance to children, but this is not always appreciated by adults. Following are summaries of selected studies that document the importance of play in child development. This review of research on play value was prepared for the Toy Industries of Europe (www.tietoy.org).

Why Play is Important

All types of play, from fantasy to rough-and-tumble, have a crucial role in children's development. Play is the lens through which children experience their world, and the world of others. If deprived of play, children will suffer both in the present and in the long-term. With adequate play, children stand the best chance of becoming healthy, happy, productive members of society.

- **Play has immediate benefits, such as cardiovascular fitness, and long-term benefits, including a sense of morality**
- **Play develops the brain**
- **According to the Welsh Assembly Government, '*Society should seek every opportunity to support play*' [Welsh Assembly Government Play Policy, 2002]**
- **Play is an effective teaching strategy both in school and out**

Studies of Play Value

Virtually every aspect of the growing child's life is affected by play. Early play experiences set the stage for all subsequent development. Children benefit most by varying their play activities, sometimes playing alone but also with others, playing quietly on the floor as well as actively outdoors. In order to stimulate and prolong play, adults should support and encourage it by providing sufficient space in which to play, and a broad assortment of toys and other play objects to enable the broadest range of play possibilities. This will ensure that neural pathways in the brain are developed and strengthened, that every muscle is exercised, and that great feats of imagination are displayed.

- **A review of more than 40 studies concludes that play enhances early development by at least 33%**
- **Toy play at age 18 months is related to the child's intelligence at age 3 years**

Play deprivation

Children who do not play or who do not have the opportunity to play are at increased risk for abnormal development and deviant behaviour.

- **Without play, self-control does not develop adequately**
- **Some children need extra support to reap the benefits of play**

Cognitive development, creativity and communication

The growing child learns nearly everything through play.

- **Play prepares preschool children for school**
- **Disruptive play is associated with difficulties at school, while competent play is related to early school performance**
- **Creativity increases following free play**
- **Social play requires clear communication**

Personality and social development

Whilst playing together children learn to cooperate, follow rules, develop self-control, and learn generally how to get along with other people.

- **Playful children are popular and happy**
- **Play accelerates psychosocial development in young children**
- **Lack of play threatens children's personality development**
- **Emotional self-regulation (impulse control) is developed through social play**
- **Social fantasy play is especially beneficial for highly impulsive children**
- **Impairment of play skills may result in later adjustment problems**

Sex differences in play style and toy preference

Recent studies point to a biological basis for the differences in how boys and girls play, and for their choice of sex-stereotyped toys.

- **Sex differences in sensitivity to colour and movement, coupled with findings that hormones influence play and toy selection, support an evolutionary view of play**
- **Baby primates (vervet monkeys) show sex differences in play styles and toy preferences that mirror those of children**
- **Children may be biologically predisposed to respond to particular toys**

Parent-child play

Children will profit most by variety in play and in playmates. The infant's first playmates are parents, but once children reach school age they spend most of their playtime with age-mates. Parents need never stop playing with their children. It is of benefit to all. Children and parents will have fun spending time together, and get to know one another in the pressure-free atmosphere of play.

- **Parent-child play is a win-win situation, with play offering different benefits to both children and adults**
- **In play, parents directly affect the development of their young children**
- **Playful parent-child interactions are correlated with the security of children's attachments**
- **Fathers and mothers each have unique contributions to make to their children's play**

Play and health

The amount of public space devoted to playgrounds and sports fields continues to diminish, reducing children's opportunities for active and social play. This contributes to the sedentary lifestyle of young people and the problems, such as obesity, that accompany it. Encouraging active play and participation in sport thus becomes of vital importance.

- **If obesity is the problem, play may be the solution**
- **Young animals living in an environment with a surplus of food rarely develop obesity – they simply play more**
- **Functions of physical play include motor control, strength and endurance, and self-regulation of emotions**
- **Girls who engage in active 'masculine' play as children are more likely later to be involved in sport**
- **Active play and ADHD**
- **Some video games combine play with dance and exercise**

Computer games

A growing percent of the population, children and adults, men and women, play video games and computer games. These games provide hours of enjoyment, but they also sharpen visual skills and can be used to teach many other skills. Computer games are used increasingly in education and therapy.

- **The ability to visualize and manipulate objects mentally is enhanced by playing action video games**
- **Game players use more advanced problem solving strategies**
- **Computer games can teach basic school curriculum**
- **Spelling enhanced with educational video games**
- **New videogame technology may help children with ADHD**
- **Violent video games improve visual skills**
- **Video games are good for the elderly**

Why Toys are Important

Play contributes directly to children's education and development. But it is toys that stimulate and prolong play. If children are to discover what they are good at, what they like, and what they are like, then they will need variety in their play, and a broad assortment of toys to make it possible.

Choosing toys

If play is to contribute to the broadest range of skills and interests, a broad range of play opportunities is to be encouraged.

- **Many children's toys in ancient Rome were similar to toys of today**
- **Children will play longer when allowed to choose their playthings**
- **Both girls and boys showed the greatest play complexity when playing with female stereotyped toys**
- **Toys are important, but they are no substitute for warm, loving, dependable relationships**

WHY PLAY IS IMPORTANT

Play is any behaviour that is freely chosen, intrinsically motivated, and personally directed by the child. All types of play, from fantasy to rough-and-tumble, have a crucial role in children's development. Play is the lens through which children experience their world, and the world of others. If deprived of play, children will suffer both in the present and in the long-term. With supportive adults, adequate play space, and an assortment of play materials, children stand the best chance of becoming healthy, happy, productive members of society.

Play has immediate benefits, such as cardiovascular fitness, and long-term benefits, including a sense of morality

An article in the American Psychological Association Monitor on Psychology examines the positive effects and utter necessity of play. The most common theory is that juveniles play at the skills they will need as adults. Some newer thinking proposes it is more than that. Play seems to have some immediate benefits, such as aerobic conditioning and fine-tuning motor skills, as well as long-term benefits that include preparing young animals for the unexpected and giving them a sense of morality. How? *'Through rough and tumble play, animals form social bonds, acquire different dominance ranks and learn what behaviours are acceptable: how hard they can bite, how roughly they can interact, and how to resolve conflicts'. They learn 'right' from 'wrong'.*

Play develops the brain

Play theorist Brian Sutton-Smith believes that the human child is born with a huge neuronal over-capacity, which if not used will die. *'Not only are children developing the neurological foundations that will enable problem solving, language and creativity, they are also learning while they are playing. They are learning how to relate to others, how to calibrate their muscles and bodies and how to think in abstract terms. Through their play children learn how to learn. What is acquired through play is not specific information but a general mind set towards solving problems that includes both abstraction and combinatorial flexibility where children string bits of behaviour together to form novel solutions to problems requiring the restructuring of thought or action.*

-- Brian Sutton-Smith. (1997). The Ambiguity of Play. Cambridge, Mass.: Harvard University Press.

'Society should seek every opportunity to support play'

'Play is so critically important to all children in the development of their physical, social, mental, emotional and creative skills that society should seek every opportunity to support it and create an environment that fosters it... The child's capacity for positive development will be inhibited or constrained if denied free access to the broadest range of environments and play opportunities.' -- Welsh Assembly Government Play Policy, 2002. available at www.wales.gov.uk

'Play affords juveniles opportunities to learn and practice new skills. The more complex the organism and the corresponding skills to be learned, the longer the juvenile period is extended and the more important play seems to be'. Research by Anthony Pellegrini of the University of Minnesota shows that providing children with play breaks during the school day maximizes their attention to cognitive tasks. Without play, self-control does not develop adequately. 'The idea that all types of play – from fantasy to rough-housing – have an important, if not critical, role in child development has not gotten much

attention from mainstream child development researchers', says Pellegrini. -- Beth Azar. (2002). It's more than fun and games. Monitor on Psychology, March.

Play is an effective teaching strategy, in and out of school

'Children play for the experience of control, for curiosity, for the intrinsic motivation of fun, and to learn. Types of play include sensory motor, dramatic symbolic, and games with rules; all are intertwined with developmental stages. Play activity stimulates the brain, lubricates action, and previews later life. Play is underutilized as a teaching strategy, despite the hundreds of empirical studies documenting its power in cognitive development, language development, the growth of imagination and creativity, and the development of social competence'. -- Dale Mann. (1996). Serious play. Teachers College Record, 97, 446-469.

STUDIES OF PLAY VALUE

Theories of play tend to emphasize its long-term value, the rehearsal of skills and social roles in a safe context. But children would not play if it did not bring immediate benefits. Following are studies of both immediate and long-term effects of play, demonstrating its value for cognitive, social, emotional, and physical development.

A review of research concludes that play enhances early development by at least 33%

A quantitative review of more than 40 studies found that play is significantly related to creative problem-solving, co-operative behaviour, logical thinking, IQ scores, and peer group popularity. Fisher estimates that play enhances the progress of early development from 33% to 67%, by increasing adjustment, improving language and reducing social and emotional problems. -- Edward P. Fisher. (1992). The impact of play on development: A meta-analysis. Play & Culture, 5, 159-181.

Toy play at age 18 months is related to the child's intelligence at age 3 years

Playful children are happier, better adjusted, more co-operative, and more popular with their peers than those who play less. Children play longer when a wide variety of toys are available. In one study the availability of toys in infancy was related to the child's IQ at 3 years of age. Children with access to a variety of toys are found to reach higher levels of intellectual achievement, regardless of the children's sex, race, or social class. -- R. Elardo, R. Bradley, & B. M. Caldwell. (1975). The relation of infants' home environments to mental test performance from 6 to 36 months: A longitudinal analysis. Child Development, 46, 71-76. R. H. Bradley. (1985). Play materials and intellectual development. In C. Brown & A. Gottfried, eds., Play interactions. Skillman NJ: Johnson & Johnson.

PLAY DEPRIVATION

Children who do not play, or who do not play as often as other children, are at increased risk of psychological, intellectual and social deficits. To reap the full benefits of play, children need supportive adults who recognise the value of play and encourage children

by providing a safe play environment and sufficient playthings to permit a wide variety of play activities.

'A child who is not being stimulated, by being ... played with, and who has few opportunities to explore his or her surroundings, may fail to link up fully those neural connections and pathways which will be needed for later learning.' (Sutton-Smith 1997, p. 17).

Yet play opportunities are continually reduced in Western society. Children have fewer brothers and sisters with whom to play. Less school time is devoted to active play, and public outdoor play spaces are disappearing whilst those that remain are often regarded as unsafe. (Paul McArdle. 2001. Children's play. Child: Care, Health & Development, 27, 509-514).

'What happens if animals or humans are deprived of play? Brains mature more slowly. Play increases gene expression in the frontal lobe for a protein thought to be involved with brain maturation. Without play, self-control does not develop adequately.' – Beth Azar. (2002). It's more than fun and games. Monitor on Psychology, March.

Some children need extra support in order to reap the benefits of play

Children who are not highly motivated by play tend to have difficulties with language. Misunderstandings occur during play when they use the wrong words to reply and cannot act out their role as the other children want them to. Westman believes that some children do not have 'play competence', and they lack motivation for play because of this communication barrier. These children need support so that they can experience the benefits of play. – Gunhilde Westman. (2003). Lek och kommunikation. [Play and communication.] Förskoletidningen, No.1, 11-17. [adapted from Lego Learning Institute Newsletter, 2003 Sept./Oct.]

COGNITIVE DEVELOPMENT, CREATIVITY AND COMMUNICATION

Many studies find that play is positively related to a host of cognitive and social skills. However, Power (2000) cautions against over-interpreting this research. It is true that children who show the highest levels of play involvement and complexity score high on various assessments of cognitive functioning and communication. Perhaps competent children play more. It is likely a two-way relationship. Competent children play more, and through play any child's competence can be improved.

Play prepares preschool children for school

Play is often derided as a trivial childhood activity that has little value in education. Yet there is evidence that various forms of pretend play can enhance school readiness, social skills, and creative accomplishment. Children's early exposure to and participation in pretend play in the preschool years is related to their emergent literacy skills when they reach kindergarten. -- Jerome Singer & M. A. Lythcott. (2002) Fostering school achievement and creativity through sociodramatic play in the classroom. Research in the Schools, 9, 43-52, and Jane Katz. (2001). Playing at home: The talk of pretend play. In D. K. Dickinson & P. O. Tabors (Eds.). Beginning

literacy with language: Young children learning at home and school. Baltimore, MD: Paul H. Brookes.

Disruptive play is associated with difficulties at school, while competent play is positively related to early school performance

Relationships between parental reports of children's peer play at home and indicators of children's school readiness were examined. Behaviour ratings and observational data were collected for 242 preschool children from a large urban Head Start programme. Relationships between children's home-based, peer-play behaviours and 4 measures of children's classroom behaviours (school-based peer play, approaches to learning, self-regulation, and behaviour problems) were analyzed. Play competence exhibited in the home environment was significantly associated with prosocial behaviour in the classroom, motivation to learn, task persistence, and autonomy. Disruptive or disconnected play behaviours were significantly related to patterns of disruptive and dysregulated experiences in the classroom with peers and with the learning process. -- John Fantuzzo. (2002). The relationship between peer play interactions in the family context and dimensions of school readiness for low-income preschool children. Journal of Educational Psychology, 94, 79-87.

Creativity increases following free play

Children produced more colourful and complex art after being allowed to play, compared to children who first followed a structured exercise. Fifty-two English school children 6 to 7 years old were randomly assigned to two groups. The first group was allowed to play for 25 minutes, while the other group copied text from the board. All children were then asked to produce a collage of a creature, using a controlled range of tissue-paper materials. Ten judges assessed the creative quality of the resulting work. The range of colours and total number of pieces used by each child was recorded. The results revealed a significant positive effect of unstructured play upon creativity. -- P. A. Howard-Jones & others. (2002). The effect of play on the creativity of young children during subsequent activity. Early Child Development & Care, 172, 323-328.

Social play requires effective communication

Studies from many countries show a relationship between early social play and later communication skills. Newland (2001) found that maternal responses to infant toy initiations, as well as manipulation and labeling of toys at age 11 months were related to infant language at 14 months. In Finland, Lyytinen reported that symbolic play at age 14 months predicts children's development at the age of 2 years. -- P. Lyytinen & others. (1999). The development and predictive relations of play and language across the second year. Scandinavian Journal of Psychology, 40, 177-86.

Gunhilde Westman of Uppsala University in Sweden sees play as an arena for developing language and communication. Play is demanding for children because they have to pay attention to each other's words and actions. They have to concentrate on their own use of language in order to communicate clearly. Children learn these by listening to each other when they play. Through play children learn to reach agreement and to reciprocate words and actions. One of the functions of preschools and schools is to educate children to become citizens who can participate in discussions and reach mutual agreements. Westman believes there may be a link between children's confidence and motivation when playing, and their language development. Children who are motivated by play and try to expand their play actions tend to be more linguistically developed and confident. Children who are not as motivated by play tend to have

difficulties with language. -- G. Westman. (2003). Lek och kommunikation. [Play and communication.] Förskoletidningen, No.1, 11-17. adapted from Lego Learning Institute Newsletter, 2003 Sept./Oct.]

PERSONALITY AND SOCIAL DEVELOPMENT

Whilst playing together children learn to cooperate, follow rules, develop self-control, and learn generally how to get along with other people.

Playful children are popular and happy

Playful children are happier, better adjusted, more co-operative, and more popular with their peers than those who play less. Children play longer when a wide variety of toys is available. Playful children are more physically active, creative, humorous, imaginative, emotionally expressive, curious and communicative. -- Jerome Singer. (1994). Imaginative play and adaptive development. In J. Goldstein, ed. Toys, play and child development. Cambridge University Press.

Play accelerates psychosocial development in young children

An intervention programme of structured play resulted in acceleration of psychosocial development in otherwise healthy institutionalized children. All 30 children (age 6 months – 2.5 years) in an orphanage in India were assessed for their Motor, Mental and Social Quotients and the Vineland's Social Maturity Scale. A structured regime of play was then built into the routine of the orphanage. Impact was assessed at the end of 3 months. The children's mean Motor Quotient rose from 63.7 to 81.7, mean Mental Quotient rose from 65.8 to 89.6 and the mean Social Quotient rose from 61.9 to 91.3. There was also an overall change in the environment of the orphanage. Children became more active, playful, responsive and independent. Contrary to what caretakers assumed, their workload actually decreased. This study shows that short daily sessions of play can significantly improve the development of children in such institutions. [Comment. Some of the children's improvements resulted from simple maturation, the natural improvement in intellectual and social skills with age. The results reported here occurred after only 3 months, not long enough for maturation to have had much of an effect. Because there was no control group, we do not know the relative contributions of play and maturation. But it is likely that play contributed to the positive changes in intellectual and social skills.] -- V.Taneja, S. Sriram & others. (2002). 'Not by bread alone': Impact of a structured 90 -minute play session on development of children in an orphanage. Child: Care, Health & Development, 28, 95-100.

Lack of play threatens children's personality development

Drawing on research from a number of disciplines, McArdle concludes that '*play may well be central to normal personality development. However, its place in contemporary Western society is not secure, perhaps risking the development and well-being of urban and disadvantaged children in particular.*' -- Paul McArdle (2001). Children's play. Child: Care, Health and Development, 27, 506-514.

Emotional self-regulation (impulse control)

Fantasy play allows children to work through conflict and painful feelings. In play, children learn how and when to express or control their emotions. Even play fighting

requires a good deal of self-control and restraint, serving as practice for exercising restraint in more serious contexts (Power 2000, Galyer & Evans 2001).

Social fantasy play is especially beneficial for highly impulsive children

This study tested Vygotsky's assumption that sociodramatic play in early childhood contributes to the development of self-regulation. It also explored whether the link between sociodramatic play and self-regulation differs for impulsive and non-impulsive preschoolers. 51 middle-income 3- and 4-year-olds were observed in their preschool classrooms. Observations of total dramatic play, complex sociodramatic play, and solitary dramatic play and of self-regulation in two classroom contexts -- clean-up periods and group circle time -- were gathered at Time 1, in the fall of the school year. To assess development of self-regulation, clean-up and circle time observations were repeated at Time 2, in late winter and early spring. Complex sociodramatic play predicted development of self-regulation during clean-up periods. Sociodramatic play improved self-regulation particularly for highly impulsive children. Findings are consistent with Vygotsky's theory and suggest that sociodramatic experiences may be especially advantageous for impulsive children, who are behind their peers in self-regulatory development. -- Cynthia L. Elias & Laura E. Berk. (2002). Self-regulation in young children: Is there a role for sociodramatic play? Early Childhood Research Quarterly, 17, 216-238.

Impairment of play skills may result in later adjustment problems

Stagnitti and Unsworth outline the skills essential for pretend play. Pretend play occurring at 18 months to 6 years of age is internally motivated, transcending as well as reflecting reality, controlled by the player, involving attention to process, usually fun, unpredictable, pleasurable, and spontaneous. Any impairment in these skills reduces the ability to pretend play. This can lead to possible restrictions in the child's life, such as difficulties in fulfilling usual social roles. Cognitive, social, and emotional skills have the biggest impact on pretend play development, with motor and sensorimotor skills that enable the child to manipulate objects in the environment having a secondary role. -- Karen Stagnitti & Carolyn Unsworth. (2000). The importance of pretend play in child development: An occupational therapy perspective. British Journal of Occupational Therapy, 63, 121-127.

SEX DIFFERENCES IN PLAY STYLE AND TOY PREFERENCES

Boys are typically more physically active than girls and this is reflected in their play. Sex differences have been explained in terms of both culture and biology. The cultural view is that sex differences are learned as part of gender socialisation, during which children are influenced by the adults, and later by the other children, around them. Recent biological studies provide further explanation. Sex differences in sensitivity to colour and movement, coupled with findings that hormones influence play and toy selection, support an evolutionary view of play (Alexander & Hines 2002; Hines & Kaufman, 1994; Norderstrom & others 2002). Although boys and girls play differently they are alike in basic ways. Both need variety in their play – playing alone as well as playing with others of varying ages, playing quietly and playing actively.

Baby primates (vervet monkeys) show sex differences in play styles and toy preferences that mirror those of children

Evidence from patients with endocrine disorders suggests that biological factors during early development (levels of androgens) are influential in children's toy preferences. In this study, vervet monkeys aged 2-18 months show sex differences in toy preferences similar to those documented previously in children. The percent of contact time with toys typically preferred by boys (a car and a ball) was greater in male vervets than in female vervets, whereas the percent of contact time with toys typically preferred by girls (a doll and a pot) was greater in female vervets than in male vervets. In contrast, contact time with toys preferred equally by boys and girls (a picture book and a stuffed dog) was comparable in male and female vervet monkeys. These differences may have evolved based on the different behavioural roles of males and females. – Gerianne M. Alexander & Meilissa Hines. (2002). Sex differences in response to children's toys in nonhuman primates (*Cercopithecus aethiops sabaeus*). Evolution & Human Behavior, 23, 467-479

Children may be biologically predisposed to respond to particular toys

Large sex differences in children's toy preferences are typically attributed to gender group identification and social learning. Alexander suggests that contemporary categories of 'masculine' and 'feminine' toys are also influenced by evolved sex differences in perception. Research on children exposed prenatally to atypical levels of androgens suggests that sex preferences exist for certain object features, such as movement, colour and form. The evolution and neurobiology of visual processing, plus the findings of Alexander & Hines (2002) on male-female differences in toy preferences in nonhuman primates, suggest that an innate sex difference in processing movement, colour or form may contribute to 'adaptive significance' for males and females. There may be a 'biological preparedness' for objects such as toys that prepare the young for a 'masculine' or 'feminine' gender role, which develops more fully when coupled with contemporary gender socialization. -- Gerianne M. Alexander. (2003). An evolutionary perspective of sex-typed toy preferences: Pink, blue, and the brain Archives of Sexual Behavior, 32, 7-14. And Norderstrom & others. (2002). Sex-typed toy play behaviour correlates with the degree of prenatal androgen exposure assessed by CYP21 genotype in girls with congenital adrenal hyperplasia. Journal of Clinical Endocrinology, 87, 5119-5124.

PARENT-CHILD PLAY

Obviously parent-child play is good for children – they spend enjoyable time whilst they learn. But this play is also good for parents, who learn more about their children and at the same time can guide them in 'life's lessons.'

In play, parents directly affect the development of their young children

'Parents directly affect the behaviour of their young children when they engage the children in play. When playing with parents, infants' and toddlers' behaviour is more complex, more conventional, of longer duration, and more symbolic than when playing with peers, siblings, or alone... When parents play with infants and young children, the complexity of children's behaviour increases substantially, both in the length of the social interactions, and in the developmental level of children's social behaviour'. --Thomas G. Power. (2000). Play and exploration in children and animals. pp. 362, 375.

Playful parent-child interactions are correlated with the security of children's attachments to their parents, their developing social perspective-taking and self-regulatory skills, and the quality of children's interactions with other adults and peers. It is for these same reasons that play is used so successfully as a form of psychotherapy for children. -- Sue Bratten & Dee Ray. 2000. What the research shows about play therapy. International Journal of Play Therapy, 9, 47-88.

Fathers and mothers each have unique contributions to make to their children's play. The child becomes more securely attached to the parental play partner. Fathers also tend to play more physically with their children (Grossmann & others 2002). In one study, the amount of time spent in parent-child play was followed by improvement in conduct problems among 4-year-olds (Gardner & others 2003). -- Frances Gardner & others. (2003). The role of mother-child joint play in the early development of children's conduct problems: A longitudinal observational study. Social Development, 12, 361-378. Karin Grossmann & others.. (2002). The uniqueness of the child-father attachment relationship: Fathers' sensitive and challenging play as a pivotal variable in a 16-year longitudinal study. Social Development, 11, 301-337.

Hypothesized functions/effects of parent-child play

Cognitive stimulation and learning

Promoting general cognitive development

Promoting linguistic skills

Providing information about the physical environment

Social development

Establishing social relationships

Facilitating social perspective-taking skills

Facilitating self-regulation and control

Facilitating gender role development

(from Power, 2000, p. 354)

PLAY & HEALTH

Active play is continually limited by diminishing public space for play and sports, and reduced opportunities for outdoor and social play. This contributes to the sedentary lifestyle of young people and the problems, such as obesity, that accompany it. Encouraging active play and participation in sport thus becomes of vital importance.

If obesity is the problem, play may be the solution. Young animals living in an environment with a surplus of food rarely develop obesity – they simply play more.

'Animals play so that they burn up energy that might otherwise be stored as fat... By engaging in energy-burning play, animals remain lean and fit, making them less susceptible to predators. If excess calories were not burnt off in play, then the resulting obesity might increase the risk of predation by impeding escape ability through increasing balance problems, fatigue, muscle strain, inability to enter narrow spaces, and amount of non-propulsive tissue. Moreover, because play activity raises basal body temperature, it could decrease the young animal's susceptibility to cold stress and

pathogens.... The amount of play varies with the amount of food available. Young animals living in an environment with a surplus of food rarely develop obesity – they simply play more. -- Thomas G. Power. 2000. Play and exploration in children and animals. Hillsdale, NJ & London: Lawrence Erlbaum Associates. p. 154.

...‘Professionals need to be careful not to equate play-fighting with serious fighting, and not to label a child as “aggressive” simply because he or she prefers a particular kind of play. Given many children’s interest and enjoyment in active, locomotor play, children should be given numerous opportunities for this type of play as well. Such activities likely contribute to motor development, overall physical fitness, and possibly cognitive development.’ -- Thomas G. Power. (2000). Play and exploration in children and animals. p.395. Penny Holland. (2003). We don’t play with toy guns here. London: Open University.

Functions of physical play include motor control, strength and endurance, and self-regulation of emotions

Pellegrini and Smith consider the nature and possible developmental functions of physical activity play. They distinguish 3 kinds of physical activity play: rhythmic stereotypies peaking in infancy, exercise play peaking during the preschool years, and rough-and-tumble play which reaches its peak in middle childhood. Gender differences (greater prevalence in males) characterize the latter 2 forms. Function is considered in terms of beneficial immediate and deferred consequences in physical, cognitive, and social domains. Whereas most theories assume that children's play has deferred benefits, Pellegrini and Smith suggest that forms of physical activity play serve primarily immediate developmental functions. Repetitive rhythmic movements in infancy are hypothesized to improve control of specific motor patterns. Exercise play is hypothesized to function primarily for strength and endurance training; less clear evidence exists for possible benefits for fat reduction and thermoregulation. In addition, there may be cognitive benefits of exercise play that is largely incidental to its playful or physical nature. Rough-and-tumble play has a distinctive social component; it serves primarily dominance functions; evidence for benefits to fighting skills or to emotional coding are more equivocal. -- Anthony Pellegrini & Peter K. Smith. (1998). Physical activity play: The nature and function of a neglected aspect of playing. Child Development,69,577-598.

Girls who engage in active ‘masculine’ play as children are more likely later to be involved in sport

Do childhood play activities predict future sport participation by women? Eighty-four American women university students (40 varsity athletes and 44 non-athletes) completed a questionnaire that measured their adult experiences with sports as well as their childhood play activities. The results revealed that playing with ‘masculine’ (rather than ‘feminine’) toys and games, playing in predominantly male or mixed-gender groups, and being considered a ‘tomboy’ distinguished between women who later became college athletes and those who did not. These findings suggest that childhood play activities should be considered, along with other agents of socialization (family, peers, coaches), as important factors in predicting future sport participation by females. -- T. Giuliano, K. E. Popp, & J. L. Knight. (2000). Footballs versus Barbies: Childhood play activities as predictors of sport participation by women. Sex Roles, 42, 159-181.

ACTIVE PLAY AND ADHD

Panksepp and his colleagues propose a connection between rough and tumble play and ADHD (attention deficit hyperactivity disorder). ADHD is characterised by an inability to concentrate on one task, hyperactivity, and impulsivity. It is the fastest-growing behavioural problem among young people, estimated to affect 7% of school-age children. Its rise has coincided with a reduction in outdoor spaces for play and recreation. In his research with experimental animals, Panksepp reports that abundant access to active play reduces impulsivity. Panksepp believes that a regimen of social rough and tumble play might help children with ADHD impulse control (though this has yet to be tested directly). -- J. Panksepp, J. Burgdorf, C. Turner, & N. Gordon. (2003). Modeling ADHD-type arousal with unilateral frontal cortex damage in rats and beneficial effects of play therapy. Brain & Cognition, 52, 97-105.

Some video games combine play with dance and exercise

We often hear of the passive nature of video and computer games, which young people are playing rather than engaging in more active and healthy pursuits. However, some computer games and videos are designed to enhance cardiovascular fitness. Dance video games are modern versions of 'Simon Says' and dance mats. They require movement in time with music and images on a screen. *'The health benefits of rhythmic action have been well documented in the U.S. Dance video games require bodily action that has helped promote the genre as a beneficial tool for weight loss. In particular 'Dance Dance Revolution' has been promoted on college campuses as a tool both for building community and fitness. ... The health benefits of 'bemani' have been incorporated into the California school system where some institutions have incorporated DDR into their physical education programmes... The possible health benefits are clear: one DDR song, 'Max 300' is 88 seconds long and, set on 'maniac' requires 578 steps. That works out to an average of 6 steps per second.'* -- Edge, 2003, no.124.

COMPUTER GAMES

Games have been used to teach reading, vocabulary, and maths to elementary school pupils (Rosas et al. 2003), health care, science, and politics to high school students. There are educational games built around Thomas the Tank Engine, Sesame Street, and Barbie. There are games to improve virtually every skill. Certain games improve visual skills (Green & Bavelier 2003, DeLisi & Wolford 2002).

The ability to visualize and manipulate objects mentally is enhanced by playing video games

De Lisi and Wolford investigated the relation between mental rotation (MR) and experience playing computer games. 47 third-grade boys and girls completed a 2-dimensional MR test before and after playing computer games (during 11 separate 30-minute sessions), which either involved the use of MR skills (the experimental group) or did not involve the use of MR skills (the control group). The experimental group outperformed the control group on the MR posttest but not on the pretest. Boys outperformed girls on the pretest but not on the posttest. Children whose initial MR performance was low improved after playing computer games that entailed MR skills. The findings imply that computer-based instructional activities can be used in schools to enhance children's spatial abilities. -- Richard De Lisi & Jennifer L. Wolford. (2002).

Improving children's mental rotation accuracy with computer game playing. Journal of Genetic Psychology, 163, 272-282.

Game players use more advanced problem solving strategies

This study explored ways to analyze gains in children's cognitive skills (including decision making, choice behaviour, and use of logical reasoning) through playing computer games focusing on the development of their ability to make and use inferences. 87 children aged 6-8 and 9-10 years played a computer game called *Find the Flamingo*. The game consisted of a set of rules, given with affirmative and negative if-then statements. Development, individual differences and learning were found in children's game play. It was also found that there were already different play patterns from the beginning of the games between the good problem solvers and the random guessers. -- Seonju Ko. (2002). An empirical analysis of children's thinking and learning in a computer game context. Educational Psychology, 22, 219-233.

Computer games can teach basic school curriculum

Rosas in Chile developed software in which the incidental learning that occurred while playing video games matched the school curriculum for 1st and 2nd grade students -- reading and math skills. Five computer games were written for a Game-boy-like device, each with educational components. For example, *Hermes* is designed to enhance language and communication skills. In the game, Hermes is the messenger of the Gods who must save his friends imprisoned inside the temples of the city. During the adventure, he must face wicked Gargoyles and Gods who impede his entrance to the temples. In each of the temples, an instruction is presented with two possible answers. If the player chooses the correct answer, a prisoner is released and, after completing all the exercises of a scene, the player may enter the next city. The game requires identification of initial phonemes and syllabic analysis of words. It requires addition and subtraction and identification of symbols < + - and >. -- R. Rosas & others. (2003). Beyond Nintendo: design and assessment of educational video games for first and second grade students. Computers & Education, 40, 71-94.

Spelling enhanced with educational video games

Using a pretest--posttest design, this study investigated whether 47 kindergarten students who played Sony PlayStation *Lightspan* educational video games learned better than peers who did not play such games. Participants in the experimental group played the games for 40 minutes per day in school for 11 weeks. The Wide Range Achievement Test was used for measurement. Results indicate that the experimental group gained significantly more than the control group in spelling and decoding areas. No difference was found in the math area. -- Feng S. Din & Josephine Calao. (2001). The effects of playing educational video games on kindergarten achievement. Child Study Journal, 31, 95-102.

New videogame technology may help children with ADHD

Alan Pope of NASA, the space agency, developed a technique whereby EEG biofeedback is used to keep a joystick operating. Signals from sensors attached to the player's head and body are fed through a signal-processing unit to a video game joystick. As the player's brainwaves come closer to an optimal, stress-free pattern, the joystick becomes easier to control. This encourages the player to produce these patterns or signals to succeed at the game. Children with ADHD (attention deficit hyperactivity disorder) have been found to increase attention span through this device.

-- Alan Pope. (2001). Attention and video games. Paper presented at University of Chicago Cultural Policy Center. <http://culturalpolicy.uchicago.edu/conf2001/index.html>

Violent video games improve visual skills

Shaun and Bavelier show that action-video-game playing is capable of altering a range of visual skills. Four experiments establish changes in different aspects of visual attention in habitual players of first-person shooter videogames, as compared with non-video-game players. In a fifth experiment, non-players trained on an action video game show marked improvement from their pre-training abilities, thereby establishing the causal role of playing in improving visual abilities.

The participants in all 5 studies are university students between 18 and 23 years of age. The 'video game players' were those who played action video games (such as *Grand Theft Auto3*, *Half-Life*, *Counter-Strike*) for at least 4 hours/week during the past 6 months. The 'non video game players' had little or no experience of video game use in the past 6 months. Women participated only in the 5th study, otherwise all participants were men. There were between 16 and 26 participants in each of the studies.

Study 1 tested the ability to localize targets in a cluttered environment and to spread visual attention over a wide area. The technique to measure attention requires the person to ignore a distractor in a visual field. Experienced action video game players scored 50% better than the nonplaying control group.

Study 2 tested the ability to count objects flashed quickly on a screen. Thirteen experienced gamers could identify up to 10 items, while most people can identify only 4. According to Green & Bavelier, '*video-game playing enhances the number of visual items than can be unerringly apprehended*'.

Study 3 examined whether the superior visual performance of experienced game players extended beyond the usual field of view. The task required participants to locate a target object among distractors. The target was placed within and beyond the usual visual field of the games. Experienced game players far outperformed non-game players at all angles, "even at untrained locations."

Study 4 tested the ability of experienced gamers to attend to several visual items involving a time dimension. People usually have difficulty reporting a second target when it appears 200-500 milliseconds after the onset of the first target. Video game players outperformed non-videogame players on detecting the second target at each of the temporal lags studied.

Study 5. Studies 1 through 4 are correlational in nature: Men who play action video games perform better on visual tasks than those who do not play action video games. To rule out the possibility that those with superior visual skills are drawn to these games, an experiment was conducted in which non-video game players trained for 10 hours with an action video game (*Medal of Honor–Allied Assault*). The control group trained with *Tetris*, in which only one task is attended to at a time. Sixteen subjects, both men and women, who had little or no experience in the past 6 months with video games, were randomly assigned to an experimental group or a control group. Three visual tasks were measured (attention, spatial distribution, and temporal resolution) before and after a 10 day training period. Those who played the action video game showed significant improvement on all 3 of the visual skills tested. The control group trained with *Tetris*

showed no such improvement. -- C. Shawn Green & Daphne Bavelier. (2003). Action video game modifies visual selective attention. *Nature*, 423, 534-537.

Video games are good for the elderly

We studied the effects of playing video games (*Super Tetris*) on the reaction time, cognitive/perceptual adaptability, and emotional well-being of 22 non-institutionalized elderly people aged 69 to 90. Volunteers in an elderly community in the Netherlands were randomly assigned to a videogame-playing experimental group or a non-playing control group. The televisions of the 10 videogame players were provided with Nintendo SuperNes systems. Participants played *Super Tetris* 5 hours a week for 5 weeks, and maintained a log of their play. Before and after this play period, measures of reaction time (Sternberg Test), cognitive/perceptual adaptability (Stroop Color Word Test), and emotional well-being (self-report questionnaire) were administered. Playing video games was related to a significant improvement in the reaction time task, and to a relative increase in self-reported well-being. On the Stroop Color Word Test, both the experimental and control groups improved significantly, but the difference between groups was not statistically significant. The videogame-playing group had faster reaction times and felt a more positive sense of well-being compared to their non-playing counterparts. Consistent with previous research on video games and the elderly, the present study finds the strongest effects on measures of reaction time, and the weakest effects on cognitive performance measures. -- Jeffrey Goldstein, Lara Cajko, & others. (1997). Video games and the elderly. *Social Behavior and Personality*, 25, 345-352.

WHY TOYS ARE IMPORTANT

If play is the route to healthy development, toys are the pathway to play. Toys stimulate and prolong play. If children are to discover what they are good at, what they like, and what they are like, then they will need variety in their play, and a broad assortment of toys and games to make it possible.

Choosing Toys

If varied play is the key, then a number of inexpensive toys is more beneficial to a child than one very expensive toy, because the toys will lead to greater variety and duration of play. Toys should be chosen so that children can play alone and with others, in active as well as more passive play. Some toys and games, such as construction games, board games, ball games, and large light-weight blocks, will encourage or require cooperation among children. Others will encourage language development and literacy.

Parents with traditional attitudes tend to buy sex-typed toys. Being non-sexist in buying toys does not mean refusing your daughter a nurse's uniform or your son a Superman outfit. To encourage boys and girls to play together combine neutral with traditional boys' and girls' toys in play areas. Power (2000, p. 395) says the best way to facilitate solitary object play is to provide children with various materials or opportunities: some that elicit functional play and exploration, some designed for constructive play, and some that encourage symbolic play.

Many children's toys in ancient Rome resemble toys of today

'Animals on wheels, balls, dolls, hobby-horses, hoops, horsemen on wheels, knucklebones (dice), marbles, miniature utensils, nuts, rattles, spinning tops, weapons and yo-yos are among the toys of Roman girls and boys nearly 2000 years ago. Many of them are made in terracotta, bone, wood or textile, but very expensive materials were also used for the toys of very rich children... Age, sex and position in society of the child combined with the social and cultural environment determined what kind of toys a child possessed. Parents in all layers of society and in all parts of the Empire devoted time, money and love to this basic need of children.' -- Annemarieke Willemsen. (2003). Roman toys. Walburg Press.

Children will play longer when allowed to choose their own playthings

Two conditions were compared, those in which the teacher selected the toys for the 2-year-olds to play with, and those in which the child selected the toys. The amount of time children were engaged appropriately with toys was measured. Three 2-year-old boys with autism participated in the study. In the teacher-selected condition, the teacher gave the child a toy; and in the child-choice condition, the teacher gave the child a choice between two toys. The toys were selected from a pool of toys based on each child's frequency of contact with the toys from measures taken before the study started. The children were observed for 10 minutes, with focus on the child's engagement with the toys, non-engagement, and problematic behaviours. The teacher's behaviours (physical prompt, modeling, talking, silent observation) also were measured. The data suggest the child-choice condition resulted in more engaged time for each participant and fewer problematic behaviours for two of the three boys. – Debra Reinhartsen, Ann N. Garfinkle & Mark Wolery. (2002). Engagement with toys in two-year-old children with autism: Teacher selection versus child choice. Research & Practice for Persons with Severe Disabilities, 27, 175-187.

Both girls and boys showed the greatest play complexity when playing with female stereotyped toys

Early childhood assessment typically relies on the use of standardised assessment instruments that focus on children's cognitive skills. As an alternative, many practitioners in the United States have begun using an observational technique called Play Assessment, designed to tap into specific domains of development within the context of children's play. Play assessment is superior to more traditional methods, as a child's cognitive abilities are observed in a naturalistic setting. From very young ages, boys and girls show different play, such as selecting gender-specific toys, level of exploration in play, type of pretend play, and complexity of play. Perhaps the gender associated with toys influences how they are played with. In this study, 15 boys and 15 girls age 18 to 47 months were observed playing indoors for 30 minutes. Play complexity was taken as the level of symbolic and representational skills the child demonstrated during play. Boys showed a greater preference than girls for same-gender stereotyped toys, whereas girls preferred either female stereotyped or neutral toys. With regard to play complexity, both girls and boys showed the highest levels of play complexity when playing with female stereotyped toys than with neutral or male stereotyped toys. Therefore, it may be worthwhile to include female stereotyped toys such as dolls and kitchen sets, in addition to manipulative toy objects such as blocks, when using play to assess children's cognitive abilities. -- Isabelle D. Cherney & others. (2003). The effects of stereotyped toys and gender of play assessment in children aged 18-47 months. Educational Psychology, 23, 95-106.

Toys are important, but they are no substitute for warm, loving, dependable relationships

'Play is essential for learning in children. Toys are the tools of play. Which play materials are provided and how they are used are equally important. Adults caring for children can be reminded that toys facilitate but do not substitute for the most important aspect of nature – warm, loving, dependable relationships. Toys should be safe, affordable, and developmentally appropriate. Children do not need expensive toys. Toys should be appealing to engage the child over a period of time. Information and resources are provided in this report so pediatricians can give parents advice about selecting toys.'

-- D. Glassy & J. Romano. (2003). Selecting appropriate toys for young children: The pediatrician's role. American Academy of Pediatrics, 111, 911-913.

To be motivated to play, children must feel secure and comfortable in their surroundings and they must be free to direct their play as they choose. For children who experience safe and supportive relationships, toys are potent means for enlarging their social, intellectual and communication skills.