No Child Left Inside

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When Richard Louv (2005) introduced the term Nature-Deficit Disorder as "the human costs of alienation from nature, among them diminished use of the senses, attention difficulties and higher rates of physical and emotional illness" (p. 36), he inspired a movement to encourage and cultivate children's unstructured play in nature. This movement continues to gain notice and support, but has yet to permeate most educational environments and meets resistance in this technology-driven world.

Louv is one of many authors to emphasize the importance of children playing in nature. In 1998, White and Stoecklin encouraged *biophilia*, a love of outdoors—especially apparent during childhood—and explained how the cookie-cutter design of children's playgrounds threatens *biophilia*. Gardener (1999), who introduced the theory of multiple intelligences, described the "naturalistic intelligence" as an intrinsic ability in human beings—especially in children—for understanding and learning about the natural world.

Statistics show a decline in the amount of time children spend playing in nature and outdoors; a variety of research supports the implications of limited contact with nature (Karsten, 2005; Lester & Maudsley, 2006; Louv, 2005; Moore, 1997; Nabhan & Trimble, 1994; Valentine & McKendrick, 1997; White, 2006; White & Stoecklin, 1998).

However, a variety of research provides sizeable evidence of the *benefits* of repeated and prolonged immersion with nature, especially in the past 20 years. According to these studies, play in natural environments improves children's health and physical development, cognitive development, behaviors, social and emotional development, and understanding of nature.

This literature review provides evidence of the importance of children's play in natural environments. While not an exhaustive review of the topic, the works included in this literature

review highlight the variety and quality of studies in this area and some of the progress that has been made in recent years. It is also a call for further research and education on this topic.

Literature Review

Health and Physical Development

Most people agree that physical activity and exposure to nature are important to good health. Several studies (Burdette & Whitaker, 2005; Fjørtoft, 2001; Fjørtoft, 2004; Pretty et al., 2009) provide substantive evidence that children who play in natural environments have improved motor function and better health over children who do not.

Health benefits. Pretty et al. (2009) examined how physical activity and contact with nature affect health and well-being, focusing on children. They listed the health benefits of contact and exercise with nature, including natural therapies for children with special needs. The researchers recommended increasing children's outdoor free play and encouraging urban designs to incorporate nature. Physicians Burdette and Whitaker (2005) stressed the importance of unstructured outdoor play for all ages, and especially young children. They noted that the health benefits outdoor play are significant—combating obesity, reducing asthma, reducing diabetes risks, boosting immune systems, improving cardiovascular health—but also emphasized myriad other benefits of outdoor free play.

Physical development. Fjørtoft (2001) examined how the diverse play options of a natural landscape and outdoor play activities impact children's motor abilities. She studied two groups of kindergarten children: one with daily play in a forest and the other with daily play in a traditional playground. After 9 months, children who played in the forest had considerably more improvement in their motor skills than the children with access to only the traditional playground.

In 2004, Fjørtoft expanded upon her previous research. She researched the impact of children's play environments on their motor development. The experimental group of 46 children played in a nearby forest for one to two hours a day, while the other group, (29 children), played on traditional playgrounds for 1 to 2 hours a day. The children were ages 5 to 7 years old and attended one of three kindergartens. She established a baseline through a pre-test using the European Test of Physical Fitness (EUROFIT) Motor Fitness Test, observed the children's functional, symbolic, and constructive play in the experiment for 9 months, and then conducted a post-test with the EUROFIT Motor Fitness Test. The children who played in the natural environment improved all motor abilities except flexibility. However, in the control group, children's motor fitness improved in only three of the nine motor tests. Fjørtoft found the balance and coordination of the experimental group to be significantly better than the children who only had access to the traditional playground. She also found a positive correlation between the number of natural features on a playground (trees, water, sand, hills, etc.) and the amount of gross motor activity with children.

Fjørtoft's 2001 and 2004 research provides evidence that children who play in natural environments have improved motor development over children who play on traditional playgrounds. It supports the findings of Moore and Wong (as cited in Fjørtoft, 2004) that children's physical development grows more readily when they play in outdoor environments. While these studies might encourage schools, communities, and families to push for play in more natural environments, they also illustrate the need for more research on this topic. Since Fjørtoft's studies were limited in scope to only kindergartens in Norway, a study in a variety of regions and among different ages might show more universally applicable results.

Cognitive Development

Wells (2000) studied the effects of living near and playing in natural settings on children's cognitive functioning and ability to focus their attention. She questioned parents before and after their move from low-income apartments to single-family homes, asking about their proximity to nature and about their children's behavior. The results showed that children find it easier to concentrate and pay attention after spending time in nature. Burdette and Whitaker (2005) corroborated Wells' (2000) findings. They broadened the research and found that play in nature increases creativity and problem-solving skills. According to Børsting, Mørk, and Nielsen (as cited in Mikkelsen, 2011), their 2006 study in Denmark found that indoor kindergartens stimulated children's creativity better than indoor schools. The results showed that 58% of children who were in close touch with nature often invented new games; just 16% of indoor kindergarten children did. In addition, Taylor, Kuo, and Sullivan (2001) found that children not only showed improved cognitive development when they play in or near nature, but that the "greener" the area, the more marked the improvement.

According to a 2004 national survey of 500 public school teachers and 800 parents by the Healthy Schools Network (as cited in Burdette, 2005), 90% of teachers and 86% of parents believed that physically-active children are better able to learn and are better behaved in the classroom.

Behavioral Development

Over the past 11 years, Taylor, Kuo, and Sullivan narrowed the focus of their research to Attention Deficit/Hyperactivity Disorder (ADD/ADHD). According to the United States Department of Education (as cited in Taylor & Kuo, 2011), an estimated 4.4 million children in the United States suffer from ADD or ADHD. However, safe and effective methods for treating ADD/ADHD symptoms have not increased.

Taylor, Kuo, and Sullivan (2001) questioned whether play in nature alleviated ADD symptoms, both immediately after playing outdoors and over time. The researchers developed a 34-minute questionnaire for parents of children with ADD and they received 96 responses. The questions addressed their children's abilities to listen, focus, complete tasks, and pay attention to non-preferred work. The results showed that ADD symptoms will be more manageable than usual after activities in green settings and that the *greenness* of a child's play area is inversely related to his or her attention deficit symptoms. A nationwide study with the same focus showed corroborating evidence of a connection between free play in nature and attention in children with ADHD (Kuo & Taylor, 2004). Hartig, Mang, and Evans (as cited in Taylor & Kuo, 2002) found that children who walk in green spaces are able to concentrate on their work more than children who walk in built areas. A subsequent study (Taylor & Kuo, 2009) had similar findings. In 2011, Taylor and Kuo expanded their research to include more activities in a variety of settings; they studied more than 400 children diagnosed with ADHD. They found that outdoor activities in green settings reduced ADHD symptoms in children across age, gender, socioeconomic classes, communities, geographies, and diagnoses.

Taylor, Kuo, and Sullivan (2002) also researched the effects of access to green spaces on inner-city youth. Through tests of concentration, delay of gratification, and inhibition of impulsive behavior, the researchers found that simply having a view of green settings fosters self-discipline, peace, and self-control. While the results showed a direct and significant connection between views of nature and test scores for girls, they did not show a connection for boys. The fact that the boys typically played away from their homes could explain the differing results. While this study involved 7 to 12-year olds, the results substantiate previous studies in

which the researchers found that younger children showed milder ADHD symptoms in those who regularly played outdoors.

This research provides considerable evidence that children with ADD or ADHD who play regularly in green play settings have milder symptoms than children who play on traditional playgrounds or indoor settings. They also suggest a need to initiate clinical trials to test the possibility of contact with nature as a treatment for ADD/ADHD.

Social and Emotional Development

Burdette and Whitaker (2005) also found a few emotional benefits to outdoor play: (a) stress reduction, (b) reduced aggression, and (c) increased happiness. As they noted, outdoor play "encourages children to compromise and to cooperate. This process can cultivate a range of social and emotional capabilities such as empathy, flexibility, self-awareness, and self-regulation" (p. 48).

Moore and Wong (1997) redesigned their elementary school's landscape into a natural playground. They explained that the children replaced boredom and antisocial behavior with peace and teamwork. Children who regularly play outdoors exhibit more flexibility and cooperation, according to Burdette and Whitaker (2005). K.L. Hesser (personal communication, October 9, 2012 & November 16, 2012) from Nature Explore, a division of the Arbor Day Foundation and the Dimensions Educational Research Foundation, supported these findings. According to Hesser, "Nature Explore provides educators, designers, and families with comprehensive resources to connect children with the natural world on a daily basis." She explained that children who play in natural environments play more cooperatively with others and exhibit fewer tendencies towards bullying.

Environmental Awareness

Bixler, Floyd, and Hammitt (2002) studied how the amount of time children play in various physical environments affects their environmental preferences, recreational preferences, and preferences for modern comforts later in life. They surveyed middle school students from urban, suburban, and rural environments—in two groups—about these preferences and about where they played outdoors before the age of ten. The children who had more frequent play in natural environments during early childhood reported a greater preference for outdoor experiences and were less likely to prefer indoor activities.

Summary

As if play in the outdoors did not offer children enough wonder, excitement, and importance, an abundance of research shows myriad additional reasons why children should regularly play outdoors in nature.

According to research, the health benefits of outdoor play include a lower risk of obesity in children, preventing and alleviating asthma, reducing diabetes risks, boosting immune systems, and improving cardiovascular health (Burdette & Whitaker, 2005; Pretty et al., 2009). Pretty et al. also note that opportunities abound for effective therapy in nature, especially for children with special needs.

In 2001 and 2004, Fjørtoft showed that kindergarteners who played in a forest environment during "recess" had better motor function over kindergarteners who played in a traditional playground during the same 9-month testing period. The EUROFIT Motor Test used as both a pre and post-test showed significantly improved balance and coordination for the children who played in the forest, while the control groups did not. Her 2004 study also showed a direct correlation between the number of natural landscape features (water, hills, trees, sand, etc.) and children's motor functions.

Burdette and Whitaker (2005) and Mikkelson (2011) showed the children's creativity and problem-solving skills improved with play in nature. Wells (2000) and Taylor, Kuo, and Sullivan (2001) found that children with views of nature improved their cognitive functioning and ability to concentrate; Taylor, Kuo, and Sullivan noticed that greener the views, the more marked the improvement.

Taylor, Kuo, and Sullivan conducted several studies (Kuo & Taylor, 2004; Taylor & Kuo, 2009; Taylor & Kuo, 2011; Taylor, Kuo, & Sullivan, 2001; Taylor, Kuo, & Sullivan, 2002) in the past 11 years that showed statistically and theoretically-significant correlations between the amount of time spent in nature with lessened and more manageable ADD and ADHD symptoms. They researched the affects of play, views, and walks in nature on children with ADD/ADHD; all had positive results. Their work provides hope and encouragement for people looking for less-toxic treatments for their symptoms and merits further research and possible clinical trials.

The social and emotional benefits to play in nature find support in the work of Moore and Wong (1997) and Burdette and Whitaker (2005). Their research showed that play in natural environments reduced stress, aggression, boredom, and antisocial behavior (Moore & Wong). It also increased happiness, compromise, teamwork, peace, empathy, flexibility, self-awareness, and self-regulation (Moore & Wong; Burdette & Whitaker).

In 2002, Bixler, Floyd, and Hammitt researched the affect of early childhood experiences in nature with later interest in nature; the study focused on middle school students. The students who played in natural environments more frequently during early childhood reported a greater preference for outdoor experiences and were less likely to prefer indoor activities. What

adventures and learning experiences are children going to miss if they are not allowed to play in and explore nature at an early age?

According to research, children who play in nature will be healthier, happier, smarter, more connected with nature, and better able to get along with others. Further research in other areas of the world would lend more support for the current research on this topic. The information in this literature review, however, should be sufficiently motivating for others to educate themselves and those around them about the importance of giving our children ample opportunities to explore and play in nature. One day, society might recognize the need for children to connect with nature as much as they stress the importance of reading.

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