

Putting it into Practice: Pediatric Environmental Health Training Resource

Children and Nature Initiative: Rx for Outdoor Activity User Guide



Children's
Environmental
Health
Network

April, 2014



Children and Nature Activity: Rx for Outdoor Activity

User Guide

The Benefits of Getting Kids Back Into Nature: Where is the Evidence?

Children and Nature Initiative: Rx for Outdoor Activity is project of the National Environmental Education Foundation, which aims to prevent serious health conditions like obesity and diabetes related to indoor sedentary lifestyles, and connects children and families with nature to promote good health, enjoyment and environmental stewardship.

The initiative is led by an Advisory Committee which includes the Children's Environmental Network, and involves several partners.

I. Introduction

Children spend less time outdoors than the previous generation. Rates of obesity are rising in the US. Children are now distracted by an ever increasing array of electronic devices. Rates of attention deficit hyperactivity disorder/attention deficit disorder (ADHD/ADD) are also on the rise. This module reviews the relationship between these various issues and suggests that the common denominator is that time spent outdoors in a natural environment may have significant physical and mental health benefits.

II. Burden of Obesity and ADHD in Childhood

Obesity is a problem of epidemic proportions in the United States and despite numerous attempts to curb the problem, the percentage of children who are classified as overweight or obese continues to rise. Perhaps more concerning is that children who are obese are much more likely to be overweight or obese as adults. Poor eating habits that begin in childhood tend to persist in adulthood, posing a bigger problem as the metabolic rate decreases with age. Likewise, physical activity is a learned behavior, and those who are sedentary as children will often be sedentary adults. In fact, data from the Center for Health Statistics demonstrated that 40 percent of adults reported no physical activity. Children growing up in a home mimic their parents in nearly every way, and a lack of physical activity and unstructured play is one of many habits they are likely to acquire.

Obesity comes with a myriad of other medical problems. Obese kids are more likely to have type II diabetes mellitus, high blood pressure, metabolic syndrome, and heart disease. No longer known as adult onset diabetes, type II diabetes affects more and more children each year. It has been estimated that if the current obesity trends are not reversed, 1 in 3 children will



develop type II diabetes. Sleep apnea is also related to obesity.¹ Children who are overweight or obese are more likely to have more of a problem with severe exacerbations of asthma. The shift in sedentary activity and an increase in the use of various forms of electronic media is staggering. Data from the 2005 Youth Risk Behavioral Surveillance (YRBS) demonstrated that only 35% of HS students met the recommended level of physical activity. Only 31% of children have PE class 5 days per week, a number that decreased from 1991-1995, and thereafter has not changed. Meanwhile, children spend more and more time using computers, smart phones, and tablets. The average child watched more than 3 hours per day of television, and when all forms of electronic media are considered, the total average number of hours of screen time was more than 7 hours. Data from the 2011 YRBS indicated that 32% of children watched more than 3 hours a day of television.

Attention deficit/hyperactivity disorder (ADHD), as well as the non-hyperactive attention deficit disorder (ADD), which is primarily the inattentive subtype. Collectively, both are referred to ADHD for the purposes of simplicity for this module. ADHD is the most common by far of mental health/behavioral disorders in children, affecting between 5-10%, depending on the population studied. ADHD may persist into adult hood in many cases. Some children/ young adults eventually can learn to compensate without medication, although there are a growing number of adults now on ADHD medication. These children are easily distracted by external and internal stimuli, and can frequently have great difficulty concentrating in the classroom. Lead poisoning is known to contribute to ADHD. Video games and other multimedia are thought to worsen a child’s attention span.^{2,3}

III. Established Therapy for Obesity and ADHD

Obesity. Many clinicians attempt to use the 5,2,1,0 approach, which consists of recommendations for 5 fruits and vegetables per day, 2 hours (or less) of screen time per day, 1 hour per day of physical activity per day, and 0 sugary beverages. This process aims to reduce the excessive caloric intake, improve the balance of good and poor, and get the child off the couch and on their feet. The AAP has endorsed the need for unstructured outdoor play.

ADHD. Stimulant medications are well established as an effective treatment option for ADHD, as well as the inattentive, non-hyperactive disorder of ADD. Stimulant options include methylphenidate and its long acting derivatives and mixed amphetamine salts, usually known under the brand name of Adderall. A pro-drug form is available, lisdexamphetamine, which requires activation in the liver.

Intuitively it makes sense to suggest that people should spend more time outside. Members of the generations who grew up before the time period that personal electronic devices dominated childhood activity will often discuss their experiences. “When I was a child, we were outside from dawn to dusk, and my mom had to call down the road (insert whistle, ring a bell,



etc) to tell me to come in for dinner”. Now parents often just text their child when dinner is ready. In some families it can be a challenge just trying to get kids to go outside. Frequently, loss of “electronic privileges” can be viewed as punishment. Richard Louv, author of “Last Child in the Woods”, coined the term “nature-deficit disorder” to describe children’s deficit of time spent out in nature. Spending time in outdoor natural environments is thought to improve mental, physical, and spiritual health. How do we know that spending time outside in the natural environment really has any tangible and reproducible health benefits? Is there any research that backs up that claim?

IV. Health Benefits of Nature & Outdoor Activity Part I: Physical Health

Natural environments are thought to support the increase of physical activity in children, and in at least one study, a positive effect on body mass index (BMI) has been reported. Being outdoors generally will result in an increase in physical activity, and certainly the type of environment can influence this. Cleland et al evaluated parental report of the time that children aged 5-6 years of age and 10-12 years of age spent outdoors. They collected data during the warmer and colder months as well as weekdays and weekends. They were able to quantify in a study of 10-12 year old children, that every hour spent outside resulted in an extra 27 minutes of physical activity per week, and they found that the prevalence of overweight and obesity was 27-41 % lower among the 10-12 year olds who spent more time outdoors compared to their more sedentary peers. The authors did not find any effect in the 4-5 year olds.⁴

Other researchers have surmised that the provision of sufficient outdoor space would act as a stimulus for an increase in outdoor play by school age children. In some schools in Canada, officials created a diverse school grounds with an emphasis on a natural environment, featuring trees, gardens, and nature trails. When the researchers surveyed the teachers, parents, and administrators they found that 70% agreed that there was an increase in students’ light to moderate physical activity. About half agreed it increased vigorous activity. Overall, survey respondents thought that the school grounds supported a wider variety of spontaneous play.⁵

Other research has examined the effects of the distance of children’s primary residence from community parks on the level of activity and BMI. One study compared children’s residences within 1 km of at least 1 of 13 specific parks in the study area in a medium sized city in the Canadian province of Ontario. These parks featured numerous natural environments including trails, playgrounds, meadows, wooded areas and sports facilities. Some of them also included playgrounds. After controlling for neighborhood, age, gender, and parental BMI, they found no relationship found between BMI and simply living near a park. However, for children who lived within 1 km of park with a playground, children were 5 times more likely to have a healthy weight (OR = 4.92, 95% CI = 1.36, 9.71).⁶

Another study conducted around the same time frame as the previous study included a larger sample park users and local residents that lived within 2 km of 1 of 8 public parks in the Los Angeles area. Researchers conducted face to face interviews of 713 park users and 605 residents. This study also utilized direct observation of physical activity in the parks. The



geographic area where the study took place was an area with high poverty levels (13.8% to 47.25) and a high percentage of minority residents (74% Hispanic, and 24% African-American). During the consecutive months of December through May, research assistants sat in the public parks four 1-hour time periods (7:30am, 12:30pm, 3:30pm, and 6:30 pm) per day, 7 days a week to record park activity and counted the number of people that visited the park. More than 2000 individuals were counted in each park. Males outnumbered females in park use, and were 2 times more likely to engage in vigorous activity. This was usually associated with sports courts and playgrounds. The proximity of residence to the park did predict park use and physical activity. Eighty-six percent of area residents visited their park at least monthly, and 35% of residents reported exclusive use of just the parks near their residence.⁷ These results imply that the closer parks are to places of residences, the more likely members of the public are likely to be physically active.

V. Health Benefits of Nature and Outdoor Activity Part II: Mental Health

The data on physical benefits are especially related to any form of outdoor activity, including the presence of playgrounds in parks and sports courts, especially for vigorous physical activity. They are less specific for natural environments, but definitely imply that the closer someone lives to the park the more likely they are to engage in frequent physical activity. The data on the mental health benefits are more widespread, and more specifically related to the natural environment, as opposed to simply being outdoors. Studies demonstrate improvement with healing after surgical procedures, improved self-reports of stress, improved function in the classroom, and even a study that suggests there is less crime in areas with abundant natural environment.

Recovery from procedures. These were some of the earliest studies assessing the potential beneficial effects of some type of natural environment or natural stimulus on the effects of the mind and/or body. In the case of these studies, researchers evaluated the mind's tolerance and recovery following surgical procedures. One study looked at recovery following cholecystectomy. The study consisted of 23 matched pairs and subjects were randomized to either a room that faced a brick wall or a room that faced natural environments. While the staff obviously was not blinded to the recovery setting, there were fewer reported negative comments from the patients/participants. Likewise, those in the rooms facing nature took less pain medication and spent less time in the hospital.⁸ A separate study examined the effects of nature sights and sounds as a form of distraction therapy. Subjects were more than 4 times more likely to have better pain control by self-report and by pain medication use.⁹

Less crime. Perhaps one of the more interesting studies in this module is the one by Kuo et al, published in 2001. The premise of the study takes a contrary view to the belief that dense vegetation may provide numerous hiding places for perpetrators of criminal activity. In some communities this led to removal of vegetation around housing developments. The researchers hypothesized that the presence of dense and decorative vegetation promotes a positive home environment and may imply a sense of neighborhood vigilance and watchfulness. This cross sectional study examined crime rates for total crimes, property crimes, and violent crimes in 98



public housing units in Chicago) The study found that there was a successive decline in each crime category as the proportion of vegetation density increased.¹⁰

Reduced childhood stress. Wells et al developed a study to evaluate whether living in a natural environment reduces stress among elementary aged school children. They first evaluated a naturalness scale that was used to classify a child's home environment. They compared the child's home environment to measures of stress, including self-worth and psychological stress. The study took place in 3rd – 5th graders in a rural area of New York. The naturalness scale measures three features that would be found in what is often called a "green" environment, the view from their window, number of live plants inside room, and material of the outside yard. Researchers looked out the windows of their home and subjectively evaluated the amount of natural environ they observed, such as trees, plans, and grass. If half of the view was natural, they scored 3 points, no natural environmental features scored as a zero. If there were greater than 3 live plants inside a room, they received 2 points, and no plants received a score of zero. Finally they received the following scores based on the composition of material in their yard: grass = 3 points, dirt = 2 points, concrete= 1 point, and "other = zero.

Their home environment was compared to scores on three different measures of childhood stress. The Stressful Life Events Scale assesses the child for bullying, arguing with parents, trouble with peer pressure, and whether the family has recently moved. The scale measures how often these occur, but does not assess for severity of the event. The Rutter Child Behavior Questionnaire asks about behavioral conduct disorders, anxiety, and depression. The Global Self-Worth subscale evaluates the child's own perception of their psychological well-being.

The researchers found that nature appeared to act as a buffer to decrease stress in rural children. Specifically, they noted lower levels of stress in the children that had a higher score on the naturalness scale. The nature exposure effect was especially pronounced for children with the number of stressful events. Conversely, they also noted that higher natural scores resulted in higher scores on the scale for self-worth.¹¹

Mood and blood pressure. One study attempted to measure the association between physical activity in a natural environment ("green" exercise) and mood, self-esteem, and blood pressure. Notably, the study was performed indoors using a treadmill, however the researchers used themes of pictures to attempt to replicate the effect of nature. The researchers showed 4 different sets of themed photos while the subjects were running, rural pleasant, urban pleasant, rural unpleasant, urban unpleasant scenes. In addition, there was a control group who ran on the treadmill in front of a blank white screen.

Subjects demonstrated a significant reduction in blood pressure and a more positive effect on mood when they ran while viewing the rural and urban pleasant nature pictures, compared to just exercise alone. Subjects also demonstrate a more positive effect on mood after running under the same conditions. Participants in the rural pleasant group had the largest reduction in blood pressure.¹²



ADD/ADHD. Perhaps the most robust data occurs in the assessment of ADD/ADHD and the association with being in a natural environment. There were several preliminary or cross sectional studies that attempted to develop some hypotheses related to the benefits of natural environments.

The first was a survey of parents conducted by Taylor et al in 2001. This study compared parent reported symptoms when engaged in one of two settings—an indoor setting without windows v. a natural outdoor setting, which could vary as a park, farm, or outdoor neighborhood public space. There were 4 inattentive symptoms used as outcome measures: Inability to stay focused on unappealing tasks, Inability to complete tasks, Inability to listen and follow directions, and being easily distracted. The researchers found that activities performed in a natural setting were reported to reduce inattentive symptoms, particularly activities with increasing tree cover.¹³

A second study performed by the same study group used a national sample for their survey and also examined whether “green” settings reduced symptoms of ADHD. This study compared “green” outdoor after-school/weekend activities to activities in built indoor/outdoor settings. The authors reported that “green” outdoor activities reduced symptoms significantly more than did activities conducted in other settings, even when matched across all settings. While this study was not randomized or controlled and “green activities” are not uniformly defined, it did serve to generate a testable hypothesis, which led to a controlled study.¹⁴

One prospective study by Wells et al in 2000 did precede Kuo and Taylor’s work. They evaluated a low income, urban population of 17 children who relocated to new home. They Compared the two home environments (original home prior to the move and the new home several months after relocation) to assess for natural environments. The compared the natural elements in the yard, those with plants, and views of nature. This is the study that led to their development of the “naturalness scale”. Direct Attention Capacity was measured by Attention-Deficit Disorders Evaluation Scale.

The new home was more likely to have greater number of natural elements than the old one. This change in the natural environment was a significant predictor of the improvement in their attention score. While the general quality of the housing also improved after the move, this was not a predictor of improved attention.¹⁵

A second prospective study, by Taylor and Kuo was prompted by their 2004 study. Children with ADHD completed a series of puzzles designed to create mental fatigue. After completing the puzzles, the children were guided through 20 minute walks in 3 different environments, a city park, an urban area, and a residential area. They completed tests of concentration and impulse control after each of the three walks.

To clarify the sequence: 1) Child completed puzzle 2) 20-minute walk in one of the three environments 3) test of concentration and impulse control 4) repeat until this sequence completed in each of the three environments.



The authors reported that subjects exhibited significantly better concentration after a walk in the park, compared to other 2 settings.¹⁶

KEY RESOURCES FOR FURTHER READING

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Select Additional Resources

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Note: This User Guide is intended to accompany the PowerPoint module of the same name. It elaborates on some studies which may require more in-depth information than what is provided on the slides. However, the contents of all slides in the module are equally important to present.

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The Children's Environmental Health Network thanks the National Environmental Education Foundation for permission to reprint the PowerPoint module "Children and Nature Initiative: Rx for Outdoor Activity".

"Putting it into Practice: Pediatric Environmental Health Training Resource" made possible by support from the W.K. Kellogg Foundation