TWELVE STUDIES SHOWING RELATIONSHIPS BETWEEN NATURE AND WELL-BEING

1. Branas CC, Cheney RA, MacDonald JM, Tam VW, Jackson TD, Ten Have TR. 2011. A difference-in-differences analysis of health, safety, and greening vacant urban space. Am. J. Epidemiol. 174:1296–306

   This is a decade long study on health and safety outcomes following a lot greening program in Philadelphia. The study found that vacant lot greening was associated with reduced gun assaults across the entire city and reductions in vandalism in one section of the city. Results also indicated that greening was associated with stress reduction in neighbors as well as increased physical activity. "Greening" included creating a park-like setting with trees, grass, and benches with maintenance several times a year. This article doesn't discuss what in particular about the greening may have led to these improvements.

2. Faber Taylor, A. Kuo, F. (2009). Children with Attention Deficit Disorders Better After Walk in the Park. *Journal of Attention Disorder,* 12, 402-409.

   Children diagnosed with Attention Deficit/Hyperactivity Disorder went on twenty-minute individual guided walks of a city park, a well-kept urban neighborhood, and a well-kept urban downtown. The walks took place at one-week intervals. The children in the study concentrated better after the walk in the park than after the downtown walk or the neighborhood walk: "Twenty minutes in a park setting was sufficient to elevate attention performance relative to the same amount of time in other settings. These findings indicate that environments can enhance attention not only in the general population but also in ADHD populations. 'Doses of nature' might serve as a safe, inexpensive, widely accessible new tool in the tool kit for managing ADHD symptoms." The researchers also suggest: "These findings raise the possibility that incorporating trees and grass into schoolyards could play an important role in the classroom. Perhaps after spending breaks in green schoolyards, children return to their classroom better prepared to pay attention, to suppress disruptive impulses, and to wait patiently for future breaks."

3. Faber, Taylor, A., Kuo, F., Sullivan, W. (2002). Views of Nature and Self-Discipline: Evidence from Inner-city Children. *Journal of Environmental Psychology, Special Issue: Environment and Children,* 22, 49-63.

   For girls, the more that a view from the apartments where they lived contained natural elements as opposed to man-made ones, the higher their self-discipline related to concentration, impulse- inhibition, and delay of gratification was found to be. Attention Restoration Theory is offered as an explanatory mechanism for this connection.

   No connection between view and self-discipline was found for boys in this study. The researchers suggested this might result from the fact that boys usually play farther from home than girls. "Consistent with this, findings from a previous study indicated that boys' attentional functioning was not related to the level of nature immediately around their homes, but was related to the level of nature in their usual play space.

4. Kuo, F. Sullivan, W. (2001). Aggression and Violence in the Inner City: Effects of Environment Via Mental Fatigue. *Environment and Behavior,* Special Issue 33(4), 543-571.

   A study of residents of an urban housing development shows a correlation between aggression and urban environment—particularly, aggression is less when there is vegetation nearby than if it is more barren: "Nearby nature was systematically related to lower scores on multiple indices of aggression against partners and one index of aggression against children." The research suggests that this effect relates to the attention restoration effect of nature, which combats chronic mental fatigue and fatigue-related aggression: "At this juncture, **attention restoration theory** provides the best explanation for the link between nature and aggression.

5. Kuo, F. (2001). Coping with Poverty: Impacts of Environment and Attention in the Inner City. *Environment and Behavior,* 33(1), 5-34.

   When residents of housing with low levels of nearby vegetation (some grass and trees) were compared to residents of similar housing with no nearby vegetation (just concrete and asphalt), "Individuals who had some nearby vegetation were significantly more effective in managing major life issues than were their counterparts living in barren environments." Because the more effective residents were also more successful at tests that measure the ability to pay attention, the difference is ascribed to Attention Restoration Theory. The author states "Research and theory on coping has focused almost exclusively on social support as an external resource for coping; this work suggests that the physical context matters as well and points to a possible new focus for intervention efforts…This study suggests that, in poor inner-city neighborhoods, planting a few trees may help provide individuals and families the psychological resources needed to 'take arms against a sea of troubles.'"

Attention Restoration Theory (ART) asserts that people can concentrate better after spending time in nature, or even looking at scenes of nature. Natural environments abound with "soft fascinations" which a person can reflect upon in "effortless attention," such as clouds moving across the sky, leaves rustling on a breeze, or flowers and other elements. The theory was developed by Rachel and Stephen Kaplan in the 1980's in their book *The Experience of Nature: A Psychological Perspective,* and has since been found by others to hold true in medical outcomes as well as intellectual task attention. Berman et. al. discuss the foundation of the Attention Restoration Theory (ART): "ART is based on past research showing the separation of attention into two components: involuntary attention, where attention is captured by inherently intriguing or important stimuli, and voluntary or directed attention, where attention is directed by cognitive-control processes.

6. Kuo, F. Sullivan, W., Coley, R., Brunson, L. (1998). Fertile Ground for Community: Inner-city Neighborhood common spaces. *American Journal of Community Psychology*, 26(6), 823-851.

In a study of residents of an inner-city housing development, it was found that neighborhood social ties—a measure of sense of community—where stronger among residents who lived close to greener open spaces: "[T]he more vegetation in a common space, the stronger the neighborhood ties near that space—compared to residents living adjacent to nearly barren spaces, individuals living near to greener common spaces had more social activities and more visitors, knew more of their neighbors, reported that their neighbors were more concerned with helping and supporting one another, and had stronger feelings of belonging." The article includes an extensive discussion of the importance of neighborhood social ties, particularly for lower-income individuals.

7. Pasanen, T. P., Tyrväinen, L., & Korpela, K. M. (2014). The relationship between perceived health and physical activity indoors, outdoors in built environments, and outdoors in nature. Applied Psychology: Health and Well-Being, 6(3), 324-346.

A study conducted in Finland shows evidence that both physical activity and exposure to nature are connected to improved general and mental health. Results showing positive effects of physical activity in nature compared with built environments were consistent in improving three health categories perceived: general health, emotional well-being, and sleep quality. The results indicate that nature provides an added value to the known benefits of physical activity. Repeated exercise in nature is, in particular, connected to better emotional well-being.

8. Sturm, R, Cohen D (2014) Proximity to Urban Parks and Mental Health. *The Journal of Mental Health Policy and Economics* 17(1): 19-24

Mental health is significantly related to residential distance from parks, with the highest mental health scores among residents within short walking distance from a park (400 meters) and decreasing significantly over further distances. Having a nearby urban park is associated with the same mental health benefits as decreasing local unemployment rates by two percentage points, suggesting at the least a potential of environmental interventions to improve mental health.

9. de Vries, S., Verheij, R., Groenewegen, P., Spreeuwenberg, P. (2003). Natural Environments—Healthy Environments? An Exploratory Analysis of the Relationship between Green Space and Health. *Environment and Planning*, A35, 1717-1731.

In a Dutch study of more than 10,000 people, living in green environments was positively related to all three health indicators in the study: recently-reported symptoms, overall self-assessment, and the score on a general health questionnaire. The researchers state: "[P]eople living in a greener environment appear to be significantly more healthy than others…Assuming a causal relation between greenspace and health, 10% more greenspace in the living environment leads to a decrease in the number of symptoms that is comparable with a decrease in age by 5 years."

10. Wells, N. (2000). At Home with Nature- Effects of "Greenness" on Children's Cognitive Functioning. *Environment and Behavior,* 32, 775-795:

Seventeen children of low-income families that moved into new housing were assessed for the quality of their cognitive functioning—their capacity to focus or direct their attention. The researcher concluded: "Children whose homes improved the most in terms of greenness following relocation also tended to have the highest levels of cognitive functioning following the move."

11. Wolch, J., M. Jerett, et la. Childhood obesity and proximity to urban parks and recreational resources: A longitudinal cohort study. (2011) *Health & Place* Volume 17, Issue 1, Pages 207-214

    After observing 3173 children for eight years, researchers observed that body mass index (BMI), a measure of weight and obesity, was significantly lower (healthier) at age eighteen for those who lived within 500 meters of a park. The effects were larger for boys than for girls. Recreational programs within six miles from the children's homes also were significantly associated with healthier BMI at age eighteen, with effect sizes for boys also larger than those for girls. "We conclude that children with better access to parks and recreational resources are less likely to experience significant increases in attained BMI.

12. Wolf, K. and Housley, E. "Feeling Stressed: Take a Time Out in Nature." (2013) TKF Foundation; Annapolis, MD

    More than 100 studies now confirm that stress reduction and mental restoration are significant benefits associated with living near green areas, having a view of vegetation, and spending time in natural settings. Even watching images on a computer monitor has been found to be restorative. Green spaces, including those located within the most built-up areas of cities, provide restorative settings that offer people respite and recovery from daily and chronic stressors.