

Annotated Bibliography – Health & Nature Research

Alcock, I., White, M. P., Wheeler, B. W., Fleming, L. E., & Depledge, M. H. (2013). Longitudinal Effects on Mental Health of Moving to Greener and Less Green Urban Areas. *Environmental Science & Technology*, 48(2), 1247–1255. doi:10.1021/es403688w

A European study observing the long-term mental health effects on individuals who move to a more or less green neighborhood. This study found that individuals who moved to a greener area had significantly better mental health each year after the move. Individuals who moved to a less green area had significantly worse mental health in the year after the move, but then returned to the baseline. Mental health was self-reported using the General Health Questionnaire.

Almanza, E., Jerrett, M., Dunton, G., Seto, E., & Ann Pentz, M. (2012). A study of community design, greenness, and physical activity in children using satellite, GPS and accelerometer data. *Active Living Research*, 18(1), 46–54. doi:10.1016/j.healthplace.2011.09.003

This study measured the relationship between how much time is spent outdoors and how much physical activity a child engages in. A positive relationship was found: the more time a child spent in a green space, the higher his/her levels of physical activity. Also, children who spent more than 20 minutes daily in a green space engaged in nearly 5 times the amount of physical activity as a child who had no exposure, or less exposure, to a green space. The children studied were between the ages of 8 and 14.

Atsell-Burt, T., Feng, X., & Kolt, G. S. (2013). Does access to neighbourhood green space promote a healthy duration of sleep? Novel findings from a cross-sectional study of 259 319 Australians. *BMJ Open*, 3(8). doi:10.1136/bmjopen-2013-003094

Researchers surveyed people with different amounts of neighborhood green space about their sleeping habits. While more green space was not correlated with a longer duration of sleep, the study did find that greener neighborhoods lowered the risk of short sleep sessions.

Barton, J., & Pretty, J. (2010). What is the Best Dose of Nature and Green Exercise for Improving Mental Health? A Multi-Study Analysis. *Environmental Science & Technology*, 44(10), 3947–3955.

Physical inactivity results in 1.9 million deaths annually, which equates to about 1 in every 25 deaths. This study found that individuals who engaged in just 5 minutes of green exercise showed great positive changes in self-esteem and mood. Levels of self-esteem and mood showed few changes after the 5-minute mark, with the exception of an increase seen when spending the whole day doing green exercise. Self-reported, standardized surveys were used to track mood and self-esteem.

Beil, K., & Hanes, D. (2013). The Influence of Urban Natural and Built Environments on Physiological and Psychological Measures of Stress— A Pilot Study. *International Journal of Environmental Research and Public Health*, 10(4), 1250–1267. doi:10.3390/ijerph10041250

This survey was conducted in the Portland area to observe the relationship between different outdoor spaces and stress levels. The study included four test sights (very natural, mostly natural, mostly built, and very built) and used measurements of salivary cortisol levels, as well as a self-reporting stress survey before and after each exposure. The final results showed that individuals experienced lower stress levels when in the natural areas compared to the built areas. The difference was significantly greater for females.

Beil, K. (2011). *Physical activity and the Intertwine: A public health method of reducing obesity and health care costs*. Portland, OR: Metro.

The Intertwine is composed of 1,250 miles of bike and pedestrian trails, 12,000 acres of parks, 24,000 acres of natural area, with over 8.3 million users. With 24% of people in the region obese and another 36% overweight, this equals about \$1 billion in healthcare costs annually. The Intertwine offers a place to improve cardiovascular health, bone and joint health, and mental health while reducing risk of stroke, stroke, diabetes and more. The Intertwine allows for an avoided 17 million pounds per year among residents, which is about \$155 million averted for healthcare costs every year.

Besenyi, G. M., Kaczynski, A. T., Stanis, S. A. W., Bergstrom, R. D., Lightner, J. S., & Hipp, J. A. (2014). Planning for health: A community-based spatial analysis of park availability and chronic disease across the lifespan. *Health & Place*, 27(0), 102–105. doi:10.1016/j.healthplace.2014.02.005

A study done in Kansas City, Missouri, to determine the relationship between proximity to parks and the amount of chronic disease a person has. Eleven-page questionnaires were mailed out across the Metro area and received a 27.4% response rate. From the survey, they found that among people aged 40-59, those without a park within a half mile were twice as likely to have two or more chronic health conditions than those with a park closer.

Chawla, L., Keena, K., Pevec, I., & Stanley, E. (2014). Green schoolyards as havens from stress and resources for resilience in childhood and adolescence. *Health & Place*, 28(0), 1–13. doi:10.1016/j.healthplace.2014.03.001

Children in elementary, middle, and high school were observed and interviewed after being allowed access to some form of nature during school hours. Some were allowed recess in the woods, and some partook in gardening. The youth reported that the woods allowed them a place where they could relax, and often used words like “sanctuary.” From this study, the authors have concluded green schoolyards were successful in reducing anger and effective in teaching young people to cope with stress.

Faber Taylor, A., & Kuo, F. E. (Ming). (2011). Could Exposure to Everyday Green Spaces Help Treat ADHD? Evidence from Children’s Play Settings. *Applied Psychology: Health and Well-Being*, 3(3), 281–303. doi:10.1111/j.1758-0854.2011.01052.x

An estimated 4.4 million children in the United States suffer from ADHD. An internet survey was taken of 421 parents with children ages 5-18 who had been diagnosed with ADHD or ADD. Children who regularly played in green spaces showed milder symptoms, and this was true regardless of socioeconomic status and gender. Children exposed to open grass areas had the mildest symptoms for both ADHD and ADD children.

Francis, J., Giles-Corti, B., Wood, L., & Knuiaman, M. (2012). Creating sense of community: The role of public space. *Journal of Environmental Psychology*, 32(4), 401–409. doi:10.1016/j.jenvp.2012.07.002

A study done to investigate the connection between a sense of community and spending time in public open spaces, community centers, schools, and shops in Australia. Results showed that public open spaces and shops had the strongest positive impact on an individual’s sense of community. An individual’s sense of community has been linked to improved well-being, increased feelings of safety, and increased civic participation.

Hartig, T., Mitchell, R., de Vries, S., & Frumkin, H. (2014). Nature and Health. *Annual Review of Public Health*, 35(1), 207–228. doi:10.1146/annurev-publhealth-032013-182443

This article is a comprehensive review of most of the literature over the last couple decades that linked health benefits to nature. Four major benefits were selected for exploration: air quality, physical activity, social cohesion, and stress reduction. Included within the article was a logic model linking nature to health and well-being.

Kuo, F.E., Sullivan, W.C., Coley, R.L., & Brunson, L. (1998). Fertile ground for community: Inner-city neighborhood common spaces. *American Journal of Community Psychology*, 26(6), 823-851.

Residents were surveyed for feelings of safety, adjustment, and well-being in nearby green spaces. This study showed that the more vegetation in an open space, the stronger the neighborhood social ties were near that space when compared to

residents who lived in more barren spaces. The residents in the greener areas also reported higher levels of social interactions, knew their neighbors, reported their neighbors were concerned with helping and supporting them, and had a higher sense of belonging.

Kuo, F.E. & Sullivan W.C. (2001). Aggression and violence in the inner city: Impacts of environment via mental fatigue. *Environment & Behavior*, 33(4), 543-571.

145 urban residents were surveyed for levels of aggression at varying levels of nearby vegetation. The results showed that residents without green spaces nearby had higher levels of aggression and more fatigue.

Kuo, F.E. (2001). Coping with poverty: Impacts of environment and attention in the inner city. *Environment & Behavior*, 33(1), 5-34.

Urban residents with or without nearby green spaces were surveyed. "Residents living in buildings without nearby trees and grass reported more procrastination in facing their major issues and assessed their issues as more severe, less soluble, and longer standing than did their counterparts living in greener surroundings. Mediation tests and extensive tests for possible confounds supported the attention restoration hypothesis—that green space enhances residents' effectiveness by reducing mental fatigue. These findings suggest that urban public housing environments could be configured to enhance residents' psychological resources for coping with poverty."

Kuo, F. E., & Sullivan, W. C. (2001). Environment and Crime in the Inner City: Does Vegetation Reduce Crime? *Environment and Behavior*, 33(3), 343-367. doi:10.1177/0013916501333002

A Chicago survey was conducted to test the link between crime and proximity of vegetation for 98 apartment buildings. Using police reports, the study found that the closer vegetation was to a building, the lower the number of crimes reported. This link held for property crimes and violent crimes.

Kweon, B.-S., Ulrich, R. S., Walker, V. D., & Tassinary, L. G. (2008). Anger and Stress: The Role of Landscape Posters in an Office Setting. *Environment and Behavior*, 40(3), 355-381. doi:10.1177/0013916506298797

Nearly one in four American workers is chronically angry at work. This study was conducted to monitor stress and anger levels in office settings with abstract vs. nature paintings. Participants were given an anger-provoking computer task in an office with either four nature paintings or four abstract paintings. Results showed that men in an office with nature paintings had significantly lower anger and stress levels. There was no significant result for women.

Lachowycz, K., & Jones, A. P. (2013). Towards a better understanding of the relationship between greenspace and health: Development of a theoretical framework. *Landscape and Urban Planning*, 118(0), 62-69. doi:10.1016/j.landurbplan.2012.10.012

The authors completed a comprehensive review of literature and studies involving greenspace and health. They found contradictory information and proposed a uniform theoretical framework to be used. Three main areas were identified as crucial starting points to get to the health benefits: opportunity to use the greenspace, personal motivations and reasons to use, and ease of use. The authors also developed a logic model that illustrates their findings.

Li, Q., Otsuka, T., Kobayashi, M., Wakayama, Y., Inagaki, H., Katsumata, M., ... Kagawa, T. (2011). Acute effects of walking in forest environments on cardiovascular and metabolic parameters. *European Journal of Applied Physiology*, 111(11), 2845-2853.

Sixteen healthy males were taken on day trips to a suburban park and an urban area to test effects on cardiovascular and metabolic parameters. Participants were sampled before and after each trip. Results showed that day trips in the park reduced blood pressure and stress hormones, and had beneficial effects on blood adiponectin, DHEA-S levels, and NT-proBNP levels.

Lovasi, G. S., Quinn, J. W., Neckerman, K. M., Perzanowski, M. S., & Rundle, A. (2008). Short report: Children living in areas with more street trees have lower prevalence of asthma. *Journal of Epidemiology and Community Health* (1979-), 62(7), 647–649. doi:10.2307/40665963

Childhood asthma numbers have been on the rise, especially in low-income urban areas. This study measured the street tree density and compared it to the number of childhood asthma cases and hospitalizations. Results showed that increasing tree density was associated with a lower prevalence of asthma, but did not affect hospitalizations.

Maas, J., Spreeuwenberg, P., Winsum-Westra, M., Verheij, R., Vries, S., & Groenewegen, P. (2009). Is green space in the living environment associated with people's feelings of social safety? *Environment and Planning*, 41, 1763-1777.

Dutch citizens were interviewed about their feelings of social safety, and the percentage of green space in their neighborhood was calculated. The results suggest that more green space in a person's living environment is associated with enhanced feelings of social safety, except in very strongly urban areas.

Park, B.-J., Tsunetsugu, Y., Ishii, H., Furuhashi, S., Hirano, H., Kagawa, T., & Miyazaki, Y. (2008). Physiological effects of Shinrin-yoku (taking in the atmosphere of the forest) in a mixed forest in Shinano Town, Japan. *Scandinavian Journal of Forest Research*, 23(3), 278–283.

This study measured the relaxation effects of shinrin-yoku (forest bathing) by measuring heart rate variability, pulse, and salivary cortisol levels of 12 male participants. Participants spent one day in a built urban environment and one day in a forest. After 15 minutes of viewing the forest setting, participants had a significantly lower pulse and salivary cortisol levels, and higher heart rate variability.

Raanaas, R. K., Patil, G. G., & Hartig, T. (2012). Health benefits of a view of nature through the window: a quasi-experimental study of patients in a residential rehabilitation center. *Clinical Rehabilitation*, 26(1), 21–32.

Hospital patients being treated for heart or lung issues were given a room with either a panoramic nature view, partially blocked view, or fully blocked view. Physical and mental health were monitored by health conditions and a self-reported survey, respectively. The study found that females had worse physical health improvement when given the blocked nature view, and males had worse reported mental health. The study suggests that panoramic nature views can aid in recovery and satisfaction of patients.

Rao, M., George, L. A., Rosenstiel, T. N., Shandas, V., & Dinno, A. (2014). Assessing the relationship among urban trees, nitrogen dioxide, and respiratory health. *Environmental Pollution*, 194(0), 96–104. doi:10.1016/j.envpol.2014.07.011

The Portland region sees 105,819 cases of asthma exacerbation in 4-12 year olds annually, 280 asthma-related ER visits, and 296 asthma-related hospitalizations annually – a cost of more than \$34 million every year on childhood asthma alone. With current tree density in the region, the potential annual respiratory health benefit of trees in Portland, due to reduction in NO₂, is 21,000 total fewer incidences, 7,000 fewer days of missed school, 43 fewer ER visits, and 46 fewer cases of hospitalization due to respiratory problems in the elderly. This adds up to \$7 million in savings per year for respiratory health-related issues.

Sahlin, E., Ahlborg, G., Matuszczyk, J. V., & Grahn, P. (2014). Nature-Based Stress Management Course for Individuals at Risk of Adverse Health Effects from Work-Related Stress—Effects on Stress Related Symptoms, Workability and Sick Leave. *International Journal of Environmental Research and Public Health*, 11(6), 6586–6611. doi:10.3390/ijerph110606586

A nature course in Sweden developed for employees was used to measure the effects nature has on extended sick leave, burn-outs, work ability, and stress-related symptoms. Participants were required to go to a class for three hours twice a week for 12 weeks, a total of 24 three-hour sessions, in which they partook in gardening, nature walks, group

conversations, relaxation techniques in nature, and more. Results found that those who took the nature course experienced a decrease in burn-outs and sick leave, as well as an increase in work ability.

Stark, J., Neckerman, K., Lovasi, G., Quinn, J., Weiss, C., Bader, M., Konty, K., Harris, T., & Rundle, A. (2014). The impact of neighborhood park access and quality on body mass index among adults in New York City. *Preventative Medicine, 64*, 63-68.

This study sampled New York residents for their Body Mass Index and compared that to their proximity to parks. They took into account size of the park, cleanliness, walkability, average homicides, and poverty. The results showed that individuals with park access and park cleanliness were associated with a lower BMI. Also parks with poor cleanliness had a significant association with homicide; the less clean the park, the more homicides occurred.

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

Residents in Los Angeles were surveyed to study the connection between proximity of urban parks and mental health. The survey revealed a significant association between these two variables. Mental health was highest among residents closest to the park and decreased significantly as distance grew from the park. This survey also found that the closer residents were to the park, the greater the increase in number of park visits and physical activity.

Ulrich, R. (1984). View through a window may influence recovery from surgery. *Science, 224*(4647), 420-421.

Surgical patients in a hospital were assigned a room with either a view of nature or a brick wall outside their windows, while everything else was identical. All patients had undergone the same type of gall bladder surgery. The results showed that patients with tree views had shorter hospital stays, fewer negative evaluative comments from nurses, took fewer analgesic doses, and had lower scores for minor postsurgical complications.

Won Sop Shin, Hon Gyo Kwon, Hammitt, W. E., & Bum Soo Kim. (2005). Urban forest park use and psychosocial outcomes: A case study in six cities across South Korea. *Scandinavian Journal of Forest Research, 20*(5), 441-447.

Structured surveys were given to 2,292 park visitors in South Korea to identify reasons for and benefits of their visits. The highest outcomes were "learning and self/other relations," "social and self-development," and "enjoying nature." Some differences were observed for people of higher income levels and/or those with more education.

Yamaguchi, M., Deguchi, M., & Miyazaki, Y. (2006). The Effects of Exercise in Forest and Urban Environments on Sympathetic Nervous Activity of Normal Young Adults. *Journal of International Medical Research, 34*(2), 152-159. doi:10.1177/147323000603400204

Researchers observed that salivary amylase was effective in measuring stress levels. In this study, salivary amylase activity was monitored in participants who engaged in forest bathing and walking (shinrin yoku). The results showed that being in the forest was effective for reducing stress.