

5-23-2019

Examining the Effects of Exposure to Nature on Well-Being: Implications for College Campuses

Fatimah T. Majors

Follow this and additional works at: https://digitalcommons.pace.edu/honorscollege_theses

Part of the [Psychology Commons](#)

Recommended Citation

Majors, Fatimah T., "Examining the Effects of Exposure to Nature on Well-Being: Implications for College Campuses" (2019). *Honors College Theses*. 204.

https://digitalcommons.pace.edu/honorscollege_theses/204

This Thesis is brought to you for free and open access by the Pforzheimer Honors College at DigitalCommons@Pace. It has been accepted for inclusion in Honors College Theses by an authorized administrator of DigitalCommons@Pace. For more information, please contact nmcguire@pace.edu.

Examining the Effects of Exposure to Nature on Well-Being:
Implications for College Campuses

HONORS THESIS

Presented to the Pforzheimer Honors College at Pace University
In Partial Fulfillment of the Requirements for University Honors

By
Fatimah T. Majors
Applied Psychology/Human Relations
Thesis undertaken in the Department of Psychology

May 2019

Approved by:

Fatimah Majors, Student

Dr. Paul Griffin, Faculty Advisor

Susan E. Dinan, Pforzheimer Honors College Director

Table of Contents

Abstract	2
Introduction	3
Literature Review	4
The Biophilia Hypothesis	4
Stress Reduction Due to Nature	6
The Attention Restoration Theory	8
Horticultural Therapy, Landscapes and Well-Being	9
Weather and Well-Being	13
Nature Sounds and Well-Being	15
Intrinsic, Extrinsic Aspirations and Immersion	16
Urban versus Rural and Suburban Environments	18
Exposure to Nature and Mental Health	20
Nature, College Populations and Well-Being	23
Recommendations	25
Conclusion	26
References	28

Abstract

Humans attraction to the natural environment stems from our evolutionary tendencies. Biophilia is defined by E.O. Wilson as the “innate tendency to focus on life and lifelike processes (Wilson, 1984, p. 1).” Recent studies have shown that spending time outside in nature is beneficial to physical and mental health as well as well-being. Nature is filled with intriguing things such as animals, plants, fresh air and other aspects which can help an individual replenish. Some of these benefits include stress reduction, opportunities and motivation to complete tasks. Research indicates that adults who work in offices would perform better if they had views of natural landscape painting or even a window which faced nature. This paper will provide a review of research on how nature affects human well-being and mental health. The findings in this paper can be beneficial to college students and those assisting them in a number of ways. Based on the available research literature, this paper concludes with a set of recommendations of how attention to the influence of nature can enhance the quality of campus life and the literature. As mostly young individuals transitioning into the adult world, it would help influence their well-being in a positive way that will promote creativity and motivation.

Keywords: well-being, nature connectedness, happiness, life satisfaction, biophilia

Examining the effects of exposure to nature on well-being:
Implications for College Campuses

Even if humans often forget it or even abuse it, nature matters to people. Natural environments, sometimes identified as green spaces, are defined as “open, underdeveloped land with natural vegetation” which include parks, forests, rivers, and playing fields (Mitchell & Popham, 2008, p. 1655). Natural scenes have a powerful aesthetic appeal because of their association with life and survival. Biophilia is a powerful affinity for the natural and the living that is rooted in our evolutionary history (Kotabe, Kardan & Berman, 2017). If natural elements are not readily available, people often find either ways to incorporate them into their indoor environment, from the living (e.g., plants, flowers, pets) to the inanimate (e.g., paintings depicting natural scenery) (Weinstein, Prybylski, & Ryan, 2009). Big trees and small trees, glistening water, chirping birds, budding bushes, colorful flowers—these are important ingredients in a good life (Frumkin, 2001). An important element of many good lives is health, defined by the World Health Organization (WHO) as “a state of complete physical, social and mental well-being” (Grahn & Stigsdotter, 2003, p. 3). One factor that plays an important but often neglected role in humans’ health is their relationship with nature. Exposure to natural elements has been linked to a variety of benefits, such as recovery from mental fatigue, stress reduction, neighborhood social cohesion, and reductions in violence and aggression (Beyer et al., 2014). Some research suggests that it is possible that those who are highly connected to nature derive a sense of meaningful existence from their closeness with nature, and that in turn boosts well-being (Howell, Passmore, & Buro, 2013). Conversely, a disconnection from nature may have detrimental effects on human happiness, as well as contribute to an unhealthy environment (Nisbet, Zelenski, Murphy, 2011).

The following paper will review the literature on how exposure to nature and its elements impacts different aspects of human well-being. Numerous studies, including a large body of experimental work in the field of environmental psychology, have empirically linked nature exposure with attention restoration, stress reduction, and a number of well-being outcomes. Besides providing a comprehensive review of the literature, the other objective of this paper is to consider how these findings might be applied to improving the lives of college students. The mental health of college students is an increasingly important topic on college campuses across the country. Yet one factor that might have demonstrable effects on their well-being is hardly discussed—the very environments they live in.

Literature Review

The Biophilia Hypothesis

The famous biologist, Edward O. Wilson's hypothesis about biophilia is very important when discussing nature and its effects on human beings. It's one of the most popular theories that is discussed in many studies and research papers. The evidence about the influence of nature on the health and well-being of individuals has emerged from a number of traditional disciplines such as psychology and biology (St Leger, 2003). Wilson calls biophilia as an "innate tendency to focus on life and lifelike processes" or it can be perceived as an interesting manifestation of the greening of science, in this case evolutionary biology (Krčmářová, 2009, p. 5). It can also be understood as "inborn affiliations with the rest of life." From E.O. Wilson himself, he stated, biophilia, if it exists, "is the innately emotional affiliation of human beings to other living organisms. Innate means hereditary and hence part of ultimate human nature" (Kellert & Wilson, 1995, p. 1). The main theme that Wilson was trying to spread was that human beings have a phylogenetic or evolutionary relationship with all life on Earth. While other researchers agreed

with E.O. Wilson's hypothesis, they expanded the concept to suggest that humans have an innate bond with nature more generally. Researchers have postulated that the affinity for nature goes beyond just living things, but it includes wind, rivers, ocean waves and streams (Frumkin, 2001). Wilson's hypothesis was further developed by Rozak who stated that the sense of belonging extends beyond our city limits and includes a sense of belonging to the natural world. This argument suggests that when people are in nature and meet this need to belong, they will experience psychological benefits (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009).

The biophilia hypothesis contends that nature is innately relaxing, healing, and stress relieving for present day humans because of the positive relationship between man and nature in primitive times (Largo-Wight, Chen, Dodd & Weiler, 2011). From the beginning of time, human biology has been embedded in the natural environment. Our *Homo sapiens* ancestors began to form settlements, cultivate crops, dig mines and even create unique art pieces. Those who could hunt for food and gather materials needed for survival experienced advantages in the evolutionary process across time (Frumkin, 2001). According to this hypothesis, natural scenes would have powerful aesthetic appeal because of their association with life and survival (Kotabe & Berman, 2017). Evidence of the biophilia hypothesis lies in the popularity of outdoor activities such as gardening, zoo visits, our relationship with animals and our fondness of natural scenery (Nisbet, Zelenski, & Murphy, 2011).

Stress Reduction Due to Nature

Stress is the process by which an individual respond psychologically, physiologically, and behaviorally to a situation that challenges or threatens well-being (Ulrich et al., 1991). The physiological changes that accompany stress can be protective, ultimately preparing the body to respond to danger or hazards, or in other words fight or flight (Kondo, Jacoby, & South, 2018).

Stress reactions include increased blood pressure, reduced melatonin, increased muscle tension and increased pulse (Grahn & Stigsdotter, 2003).

One of the types of stress that is very common is job stress. Extensive job stress is a threat to employees' health. In fact, it has been reported that about 40% of North American workers perceive their job as very or extremely stressful and approximately 25% of North American workers stated that their job is the main source of stress in their life (Caloguri et al., 2016). Work in modern settings has been epidemiologically linked to a variety of diseases. Many of these are stress-related illnesses such as depression, anxiety, hypertension, and gut ailments (An et al., 2016). A workplace should be healthy in order to promote good employee health through biological and stress-related pathways. If the workplace is unhealthy it could create building-related toxins that could lead to illnesses and respiratory conditions such as Sick Building Syndrome. Places of work that contain crowding and noise increase the likelihood of perceived stress (Largo-Wight et al., 2011). Nevertheless, the healing effects of a natural view has been recognized in stressful environments such as hospitals, nursing homes, space ships and space stations (Maller et al., 2005). Mental fatigue is both a result and a source of stress that can affect those who work in office-based occupations. Mental fatigue is associated with the feelings of "tiredness" and "lack of energy" that leads to impairment of cognitive and physical performance (Caloguri et al., 2016). Natural elements have a restorative effect on mental fatigue. Exposure to nature involves indirect attention, characterized by fascination. It has a restorative effect on the mind, countering fatigue – much like rest has on a fatigued muscle (An et al., 2016).

Work settings are prone to have stress-inducing stimuli such as role conflict, time demands and heavy workload. Exposure to natural elements has calming effects that can counter

these negative effects (An et al., 2016). Research has shown that unwinding from one's job demands is important for reducing the negative effects of job stress (Bloom et al., 2014). Office staff, which represent more than about 70 percent of the American workforce, are a priority stress population due to the high psychological demands and low resources. Stress is a critical health issue among office staff (Largo-Wight et al., 2011). Outside of their home, they spend most of their waking time inside the buildings that they work in. Therefore, the indoor environments in which people work are important contributing factors to employees' health and wellbeing. For individuals who work in windowless offices, studies have shown that seeing nature is important to people to relieve stress. Office workers with a window view looking out to nature have been found to report less stress, lower tension and anxiety, greater job satisfaction and greater overall subjective wellbeing (Dreyer et al., 2018).

The Stress Reduction Theory (SRT) was brought to attention by Dr. Roger Ulrich who specialized in how gardens, nature and art can reduce pain and healthcare costs. The stress reduction theory postulates that:

Landscapes with views of water and/or vegetation and that contain modest depth, complexity, and curvilinearity would have been most beneficial to survival (allowing for the plotting of food sources, predators, etc.) These landscapes, according to SRT, help moderate and diminish states of arousal and negative thoughts within minutes, through psychophysiological pathways. (Baxter & Pelletier, 2018, p. 2).

Hence when exposed to stress over a long period of time can have deleterious effects with increased risk for poor mental health, sleep disorders, cardiovascular disease, cancer and premature aging (Caloguirri et al., 2016). It is said that people with access to

nearby natural settings have been found to be healthier overall than other individuals as well (Maller et al., 2005).

The Attention Restoration Theory

The complimentary theory to the SRT is called the Attention Restoration Theory (ART). Restoration could pertain to recovery influences that extend to the anabolic recharge of energy (Ulrich, Simons, Losito, Fiorito, Miles, & Zelson, 1991). This theory was originally conceived by Kaplan and Kaplan (1989). The theory suggests that being in nature is what allows humans to replenish their capacity for directed attention. In other words, it promotes recovery from mental fatigue that occurs during the performance of cognitive tasks that require the prolonged maintenance of direct attention (Cox, 2017). The attention restoration theory posits that nature opportunities for reflection (Cox & Gaston, 2016). Directed attention requires cognitive effort, as individuals must consciously use their facilities to focus on stimulus that may or may not otherwise attracted their attention (Baxter & Pelletier, 2018). Directed attention "...is a form of focused concentration that can become depleted in urban environments through unconscious cognitive processes" (Dean et al., 2018, p. 2). The attention restoration theory argues that by interacting with environments rich with inherently fascinating stimuli, such as sunsets, it invokes involuntary attention that allows the directed attention mechanisms to replenish. Therefore, after an interaction with the natural environment, one is able to perform better on tasks that depend on direct-attention abilities (Berman, Jonides & Kaplan, 2008). The concept is wholly different in an urban environment due to bottom-up stimulations such as car horns, traffic and advertising. Bottom-up stimulations capture your attention dramatically and additionally requires more attention to overcome the stimulation. Therefore, the directed attention mechanisms will be

working instead of replenishing. The mechanisms would be working to overcome that simulation to avoid traffic and ignoring the advertisements (Berman, Jonides & Kaplan, 2008).

Berman et al. (2008) have conducted an experiment to test these theories and their effect on peoples' mood and cognitive skills. This experiment was conducted to examine how the interactions with nature and urban areas would affect cognitive performance as measured by a backwards digit-span task. Thirty-eight participants asked to listen to a digit sequence and then repeat them in backwards order. To measure the participants' mood, the Positive Affect Negative Affect Scale (PANAS) was used. To be specific, the task was to listen to a digit sequence and then repeat them in backwards order. The sequences were three to nine digits in length and were presented in increasing length. This backwards digit span task requires directed-attention abilities because participants must move items in and out of their attentional focus (Berman, Jonides & Kaplan, 2008). Results was that the performance on backwards digit-span significantly improved when participants walked in nature, but not when they walked downtown (Berman, Jonides & Kaplan, 2008). This relates back to the discussion of the attention restoration theory which makes it difficult for people to concentrate and perform well on tasks if they are required to draw their attention to a mechanism instead of allowing their abilities to replenish. When the participants walked in nature, it allowed their directed-attention ability to rejuvenate leaving them to better remember the digits in backwards order.

Horticultural Therapy, Landscapes and Well-Being

People feel good around plants. The practice of plants being indoors have been around for centuries. There was evidence that the Egyptians brought plants indoors in the 3rd century BC (Bringslimark, Hartig, & Patil, 2009). When the 20th century came, the practice of indoor plants was still spread widely across social classes and the world. In today's society, people are

bringing plant indoors at home, at work, in waiting areas, shopping centers, hotels, and more public places other than the home. Results from the 1989 National Gardening Survey of more than 2000 randomly selected households, indicated that - 50.1% of the respondents agreed that “Flowers and plants at theme parks, historic sites, golf courses, and restaurants are important to my enjoyment visiting there.” In addition, 40% of respondents agreed that being around plants makes them feel calmer and relaxed (Frumkin, 2001). There is quite substantial evidence that plants do have a positive effect on peoples’ well-being such as office employees reporting that plants makes them feel calmer and more relaxed, and that an office with plants is a more desirable place to work (Frumkin, 2001).

A view of natural elements such as plants helped people in the workplace buffer the impact of job stress. It lowered employees’ intentions to quit and marginally improving general well-being (Russell et al., 2013). Individuals who took walks in nature or even gazed upon natural landscapes in photographs were said to have greater vitality than individuals who weren’t exposed to nature (Zhang, Howell, & Iyer, 2014). However, natural environments tend to engage a broader range of sense in humans than photographs or videos (Mayer et al., 2009).

A study (Mayer et al., 2009) examined if the natural environments gave the same psychological benefits as viewing natural landscapes in photographs or videos. The participants of the study were randomly assigned to one of three conditions. One group of participants took a walk outside in actual nature for 10 minutes through a wooded area. Another group took a walk in the virtual nature video for 10 minutes. The virtual nature video replicated the same walk that the outdoor group completed. The last group was exposed to a virtual urban scenario -- 10 minutes of footage of a busy metropolitan street on a partially cloudy day. Both of the videos were equivalent in terms of length. The results from this study demonstrated that in contrast to

those in virtual environments, participants in actual nature experienced higher levels of self-awareness and awareness in their immediate environment. The group that participated in the virtual walk through nature video, were only feeling somewhat positive about themselves. The participants who watched the urban video felt worse off than when they started.

Plants have been incorporated into mental health which has been beneficial on many levels. Horticultural therapy has evolved as a form of mental health treatment, based on the therapeutic effects of gardening (Frumkin, 2001). The method of therapy is used in community-based programs, geriatrics programs, prisons, developmental disabilities programs, and special education. The value of horticultural therapy is witnessed by the fact that, for survival, humans have sought aspects of nature such as open views and closeness to water (Söderback, Söderström & Schäländer, 2004). Horticultural therapy includes nature-oriented views and space such as gardens and everything associated with them, the plants and material related to them and garden tools. There's a famous passage from Oliver Sacks' quoted by Frumkin (2001) that discusses his recovery from a serious leg injury and how it leads back to his rejoicing in nature after more than two weeks of being inside:

This was a great joy—to be out in the air—for I had not been outside in almost a month. A pure and intense joy, a blessing, to feel the sun on my face and the wind in my hair, to hear birds, to see, touch, and fondle the living plants...Some part of me came alive, when I was taken to the garden, which had been starved, and died, perhaps without my knowing (p. 236)

Oliver Sacks credited the garden contact with an important role in his recovery. He was very moved by his experience that he suggested that hospitals should have gardens or even should be located near the countryside (Frumkin, 2001). A 'hospital healing garden' or a

therapeutic garden is a nature-oriented space, indoors or outdoors, that has therapeutic or rehabilitative potential for well-being (Söderback, Söderström & Schäländer, 2004).

Plants have also been incorporated into prisons as well. The United States has the largest prison population in the world. (van der Linden, 2015). There are over two million Americans are incarcerated in United States today (Lindemuth, 2007). Prison environments are often bleak, chaotic, overcrowded and isolating, with little access to nature (van der Linden, 2015). In 1981, there was a study conducted by the State Prison of Southern Michigan and an architect by the name of Ernest Moore took advantage of that experiment. The prison was a massive depression-era structure with several different views for inmates. Half of the prisoners occupied cells along the outside wall with a view of a large rolling farmland and trees, while the other half of the prisoners occupied cells facing the prison courtyard. The results from that experiment demonstrated that the prisoners who were located in the inside cells demonstrated twenty-four percent higher frequency of sick-call visits, rather than those in the exterior cells (Frumkin, 2001).

Since the 1990s, there have been programs within prisons across the United States that involved prisoners engaging in so-called green programs. Examples of those programs include the Insight Garden Program (IGP) in San Francisco, CA, the Sandusky County Jail Gardening Program in Ohio and the 'GreenHouse' program in Riker's Island, New York City (van der Linden, 2015). Though there might be differences in the programs, the green prison programs essentially provide a form of eco-therapy for the prisoners. It's a prescribed physical and psychological therapy through nature-based methods such as gardening, horticultural, landscaping, and caring for animals and nature. The different nature-based methods cannot solve

all the health and stress-related issues associated with incarceration, however they can soften some of the harmful effects that may come with it (Lindemuth, 2007).

Weather and Well-Being

An aspect that can affect a person's well-being is weather. Although it is one of the lesser determinants of well-being and happiness, we are exposed to it on a daily basis. When discussing natural environments, weather has to be incorporated because of its impermanence. The weather is always changing consistently and there is a common belief that poor weather conditions decreases people's happiness, well-being and mood. The term "weather" is describing weather conditions that includes sunshine, temperature, precipitation and humidity (Lucas & Lawless, 2013). As stated by Kämpfer and Mutz (2013), "In several studies, seasonal mood fluctuations were analyzed. As these fluctuations can become particularly strong among individuals, they are discussed within the scope of Seasonal Affective Disorder or Seasonal Depression (p. 581-582)."

There have been studies that have examined peoples' behaviors and sunny days versus on any other days. A researcher named Simonsohn (2009) explained that people are more likely to enroll in an academically rigorous college if they visited that college on a cloudy day as compared to a sunny day. To further explain his notion, it was stated that:

Academic related activities and goods are more likely to be more appealing under cloudier weather for at least two reasons. First, cloudiness induces sad moods making mellow activities such as reading and studying more appealing. Secondly, sunny weather increases the appeal of outdoor activities such as practicing sports or hiking, increasing the opportunity cost of engaging in academic activities (Simonsohn, 2009, p. 272)

The study mentioned previously was conducted to examine the relationship between a college visit and the weather on the day of the visit. The results of the study demonstrated that the hypothesis was correct. Prospective students visiting the campus of a very competitive university showed a greater tendency to enroll in such university the cloudier the weather was during their visit. If such decisions were made during a cloudy day, then what other life decisions are being made based on the changes in the natural environment? It is likely that warmer weather will lead to people becoming more open to socialize with their friends and family and engage in outdoor activities which can lead to positive behaviors and moods (Schmiedeberg & Schröder, 2014).

Weather is also thought to effect mood negatively or positively. It is suggested that this effect is due to the links between cloudiness, mood and the value that people place on academic activities. When the weather is nicer, it could increase mood by stimulating thoughts of swimming, picnics and other outings whereas cloudy days are associated with the disappointment of canceled plans and dealing with rain and/or snow (Lucas & Lawless, 2013). This relates back to the study by Schmiedeberg about people being more open to socializing when the weather gets nicer because it's easier to meet up and have fun with outdoor activities. When individual experience good weather that leads to being in a good mood and then that leads to altruistic behaviors and affect over other behavior such as socializing or thinking about a specific task to accomplish. Even though mood seems to be linked with weather, there are still debates about how reliable it is when asking individuals how satisfied they are with their lives.

To conclude all of the studies, it's evident that weather has some type of effect on people. Even though mood seems to be linked with weather, there are still debates about how reliable it is when asking individuals how satisfied they are with their lives (Lucas & Lawless, 2013).

Sometimes, the effect may not be very noticeable but there are little changes. These mixed findings indicate that the effects are a subtle and depend on the individual and context.

Nature Sounds Contribute to Well-Being

Sound can contribute to a more holistic experience of a given surrounding because of its restorative potential. To test this idea, one study examined the effects, of any, of natural and urban soundscapes (Krzywicka & Byrka, 2017). The authors predicted that natural soundscapes (e.g., howling wolves, insects, the sea, crows, and a thunderstorm) would be perceived as more favorable and more restorative to well-being than those from the urban environment (e.g., airplane landing, an ambulance, a parade, and a traffic jam), due to the fact that urban stimuli, as previous discussed have more bottom-up simulations. The authors also predicted that the natural environments would be rated at a higher number than the urban environments (Krzywicka & Byrka, 2017).

The study (Krzywicka & Byrka, 2017) consisted of 88 students from a university between the ages of 19 and 44. The participants were randomly selected for the natural or urban condition. Each person listened to and evaluated 22 recordings from natural or urban environments played via headphones. As predicted, the natural sound recordings were viewed more positively than the urban recordings, - and they found the natural recordings to be more restorative as well. In other words, the evaluation of the sounds was positively correlated with their perceived restorative qualities, both for the natural and urban conditions (Krzywicka & Byrka, 2017).

It is thought that the natural sound recordings established soft fascination while, on the other hand, the urban sounds evoke hard fascination (Krzywicka & Byrka, 2017). The preference for natural soundscapes might linked back to the psycho-evolutionary approach mentioned

earlier. We have a natural interest in the natural environment and its elements. As discussed in (Abbott et al., 2016), an important aspect of the natural environment is the auditory experience. The primary source of motivation for visitors to national parks is the enjoyment of natural quiet and the sounds of nature. It was stated in Abbott et al. (2016), that the natural sounds such as “...birdsong, water, and wind can provide more than a pleasant listening experience; they may improve cognitive performance and replenish the mind (p. 7).

Intrinsic, Extrinsic Aspirations and Immersion

Intrinsic aspirations concern the pursuit of goals that in themselves satisfy psychological needs such as personal growth, intimacy and community. Extrinsic aspirations focus on the externally goods that are not inherently rewarding but are sought to derive rewards from others such as money, image and fame. There has been questions about nature immersion and its relationship to facilitating value of more prosocial and less self-focused values. The hypothesis was that when people are in contact with natural scenes or living objects, they will demonstrate a more intrinsic value set, orienting them to greater connection and a focus on others (Weinstein, Przybylski, & Ryan, 2009). When individuals have more exposure to non-natural and artificial environments, it will elicit more extrinsic goals and behaviors. Examining the natural environment benefits on well-being and aspirations also encompasses the aspects of autonomy and individuality. O’Donnell, Chang, and Miller (2013) defined autonomy as “...reflecting an ability to govern oneself, make decisions, and choose one’s own pathways and think for oneself” (p. 229). The modern sense of individuality is that of a “bounded, coherent, stable, autonomous, ‘free’ entity that is disconnected from its surroundings (Frantz et al., 2005, p. 428).” Individuality is not the root of the environmental problem though. The problem arises when people view themselves as being separate and distinct from the natural world around them.

Therefore, the individual no longer feels the connectedness to nature as he or she would feel if they believed that they are connected with the world.

Being outside in nature offers the individuals the chance to follow their interests and reduce pressures, fears and any insecurities regarding societal expectations (Weinstein et al., 2009). There is research that demonstrates that contexts supporting autonomy are strongly linked to happiness which means that the higher experience of autonomy also predicts the value of intrinsic aspirations. Meanwhile the extrinsic aspirations will be devalued at some point. A research study (Weinstein et al., 2009) was able to examine the relationship between intrinsic and extrinsic aspirations with exposure of nature by exposing participants to natural or man-made environments. An imagery script was also included in the experiment in order to increase the experience. The study was composed of 98 individuals (70 women and 28 men, ages 19 to 54). There were four individual nature slides that was shown to the participants. The slides either depicted urban settings or natural scenes. The participants were randomly assigned to either a nature or non-nature condition. They completed a package of questionnaires including assessments about intrinsic and extrinsic aspirations. While the slides were being shown to the participants, they were also listening to the script designed to enhance the experience.

Results demonstrated that the participants exposed to natural environments valued intrinsic aspirations and devalued extrinsic aspirations. The authors stated, “As expected, the effect of exposure to natural versus human-made environments on change in intrinsic aspirations was moderated by level of immersion (Weinstein et al., 2009, p. 1320).” The results further prove the notion that humans are more immersed in natural settings and they experienced greater increases with intrinsic aspirations. Exposure to the non-natural environment slides led to the valuing of extrinsic aspirations and the devaluing of the intrinsic ones.

Urban versus Rural and Suburban Environments

We live in an urbanized world. The movement of humans from rural to urban environments across the globe within the last 200 years has facilitated their disengagement from the natural environment (St Leger, 2003). Over fifty percent of the population currently reside in urban areas and the proportion continues to increase (Larson, Jennings, & Cloutier, 2016). It is said that homo sapiens officially became an urban species approximately sometime in 2008 (Williams, 2017). In 2008, the World Health Organization (WHO) reported that more people throughout the world lived in urban areas than rural ones. In the United States, the cities were growing at a faster rate than suburban regions for the first time in about a hundred years. In other words, we were in the middle of the largest mass migration in modern history (Williams, 2017). It was predicted that by 2050, sixty-nine percent of humans will live in urban areas (Lederbogen, Kirsch, Haddad, Streit, Tost, Schuch, ... Meyer-Lindenberg, 2011).

People who live in urban environments do not experience the natural environmental stimuli as did our ancestors. Urban settings by definition have less nature than rural ones (Pretty, Peacock, Sellens, & Griffin, 2005). It would be difficult to encounter the natural stimuli amongst buildings of concrete, cars, noise, and pollution. The green spaces are shrinking as our cities grow out and up (Lambert, 2019). Many trees have been sacrificed to make way for airports, bridges, shopping malls and luxury apartments (Williams, 2017). As the natural green environments have increasingly come under pressure from economic development, so it seems our own wellbeing has suffered a consequence (Pretty et al., 2005). Factors such as cars, noise from traffic, pollution, fear of crime and crowding are called urban stressors. These stressors can motivate people to begin looking for greener grass areas, such as those found in the suburbs. People don't only view natural environments as more restorative than urban environments, but

they also perceive natural environments as more beautiful (van den Berg, Hartig & Staats, 2007). Urban environments cultivate a variety of environmental and social stressors that make individuals who live in them more susceptible to health problems (Larson, Jennings, & Cloutier, 2016). Cities contribute to a large extent of global environmental problems that threaten human life, while at the same time people living in cities are confronted with other problems such as pollution, health risks, and economic issues (van den Berg, Hartig, & Staats, 2007). Other features of urban infrastructure, such as roads, transportation, and social gathering places, affect commuting time and connectivity, which are linked to happiness. The increasing disconnection between people and the natural world is a result of more urbanized and sedentary lifestyles (Cox et al., 2017). People surrounded by concrete in urban communities may feel unhappy when deprived of natural spaces (Nisbet et al., 2011).

There was a survey given to a large number of residents in the nine Swedish towns and cities (Grahn & Stigsdotter, 2003). The results demonstrated that when asked what they would recommend to a friend who was feeling stressed or worried, most of the respondents stated that they would suggest taking a walk in the forest. The act of taking a walk in the forest is equivalent to the expression of needing to clear the mind or having an escape from civilization. A study conducted with the population of Swedish students examined the exposure of nature on attentional fatigue. Students participated in the experiment either in the morning before a lecture when they were fresh or after a long lecture, when they were fatigued. Students took a simulated “walk” through a forest or city center by watching a series of slides. As resulted, the attitude toward walking for an hour in the forest was more positive than the attitude walking for an hour in the city center. Urban trees and other natural systems provide a range of physical health

benefits. Trees are beneficial by improving air and water quality, mitigate the heat island effect, and alleviate noise. Trees can also shield people from ultraviolet radiation (United States, 2018).

Two of the most visible elements of nature are vegetation cover and bird communities. The presence of vegetation and birds have been found to have positive mental-health benefits, including but not limited to helping to reduce stress and restoring mental fatigue (Cox et al., 2017). There have been several studies that have shown that the urban green space is highly appreciated by residents and an important factor contributing to residential satisfaction (van den Berg, Hartig, & Staats, 2007).

Exposure to Nature and Mental Health

Mental health and psychological well-being positively influence us – helping to shape how we think, how we feel, how we learn and communicate, and how we form and sustain relationships (Pretty, 2004). Some argue that urban greenspaces are critical to healthy living, both physically and mentally (Houlden, Weich, Porto de Albuquerque, Jarvis, & Rees, 2018). Those who have low exposure to green space or nature have an increased chance of various mental health outcomes (Engemann, Pedersen, Arge, Tsirogiannis, Mortensen, & Svenning, 2019). Individuals living in greener urban areas display more positive indicators of mental health than those who live in green settings. They showed fewer symptoms of depression, and lower levels of self-reported and biologically-measured stress (Larson, Jennings, & Cloutier, 2016). Exposure to green space has been suggested to also improve children’s cognitive development, lower schizophrenia risk, and reduce neural activity linked to psychiatric disorders. The green space that is available to individuals can help increase mental health by supporting psychological restoration, encouraging exercise, and improve immune functioning (Engemann, Pedersen, Arge, Tsirogiannis, Mortensen, & Svenning, 2019).

The World Health Organization (WHO) estimates that depression and depression-related illnesses will become the greatest source of ill-health by 2020. Depression is known to be a risk factor for a range of chronic physical illnesses including heart disease, asthma and diabetes (Pretty et al., 2005). In some societies, urban residents have almost fifty percent higher risk of developing psychiatric disorders such as anxiety and mood disorders compared to their rural counterparts due to the traffic noises and other urban stressors (Engemann, Pedersen, Arge, Tsirogiannis, Mortensen, Svenning, 2019). Stress and mental ill-health are becoming more common and the costs associated with them are high. For many veterans the transition back to civilian life could be extremely difficult. Not only are veterans trying to cope with the physical injuries, but most are dealing with mental health issues including depression, anxiety, and post-traumatic stress disorder (PTSD). In the late 19th century, going out into nature was a standard medical treatment for those who were dealing with emotional distress and mental exhaustion (Duvall & Kaplan, 2014). A study conducted by Duvall and Kaplan (2014) consisted of 98 veterans to examine the exposure to multiday group-based outdoor experiences for non-active duty military personnel. The results indicated that veterans who participated in the various outdoor programs, in fact, experienced a number of important benefits with respect to social functioning, well-being and social outlook. These results were appearing after only a week of engaging with other veterans and the outdoor activities. Additional benefits such as improvements in attentional functioning and emotional tone are consistent with the research on restorative benefits that nature provides for overall well-being. Those who mentioned that they were having severe everyday health problems before the intervention of the outdoor programs were much more likely to report significant improvements in psychological well-being after just one week (Duvall & Kaplan, 2014). Overall, the interactions with nature did have significant

positive impacts on the veterans, including those who experienced more severe mental health issues.

The positive benefits are not only for veterans, but they are also witnessed in children with ADHD. Children with attention deficits tend to have poor academic performance and they have difficulties in the social aspect of life as well. Current treatments for attention deficit disorders include medication that helps sustain attention and provide temporary gains in academic productivity (Taylor et al., 2001). However, these medications lead to complications due to the side effects (e.g., disruption in sleep patterns, loss of appetite, and sometimes extreme depression). Children with ADHD are subject to attention fatigue and recovery, therefore the attention restoration theory (ART) would predict that different environments would have different effects on the attention of these children (Taylor & Kuo, 2008). In particular, the natural environments should improve attention in children with ADHD. This hypothesis was examined in a study (Taylor & Kuo, 2008) of 16 children who were diagnosed with attention deficits. Out of the 16 children, there were only 6 children who were diagnosed with ADD and 10 diagnosed with ADHD. The measure that was used in this study was the Digit Span Backwards (DSB) task. There was three settings of public outdoor environments: an urban park, a downtown area and a residential area. Each child experienced the three different areas in turn, over the course of three separate sessions. Before the children went on their walks through each of the three settings, they were prompted with a series of puzzles to solve to measure the degree of attentional fatigue. After the walks were completed, the scores of the Digit Span Backwards task were analyzed. The results showed that concentration after the park exposure was significantly better than after the exposure to the other two settings. The park was experienced significantly more positively than the other two settings, however, there was no substantial differences between the other two

settings. These findings are consistent with the ideas of the attention restoration theory to the extent that children with attention deficits who experience attentional fatigue and expose themselves to nature environments can show improvement in attention (Taylor & Kuo, 2008).

For both veterans and children diagnosed with ADHD or ADD, exposure to nature has been shown to create positive effects such as replenishing the effects of attentional fatigue, increasing the positive outlook on life and overall well-being. Attention is a crucial factor in academic performance; exposure to nature might improve such performance by restoring attention. Even psychiatric in-patients showed improvements in coping ability and locus of control following a wilderness adventure program (Frumkin, 2001).

Nature, College Populations and Well-Being

College students are a key population segment for determining the economic growth and success of a country (Auerbach et al., 2018). Given recent changes to the way young people are able to experience nature, it is not as surprising that epidemiological studies have found out a high prevalence of mental disorders among college students. Students are potentially experiencing a diagnosable mental health disorder when their adjustment problems begin to cause distress, interference with normal functioning, or disrupt their ability to meet the demands of academic work and interpersonal roles (Schwitzer & Vaughn, 2017; Vescovelli et al., 2017). “Epidemiological studies suggests that 12 to 50 percent of college students meet criteria for one or more common mental disorders (Bruffaerts et al., 2018, p. 97).” Even if not meeting the threshold of diagnosis, roughly about one-third of undergraduate students exhibit significant symptoms of a mental health problem, such as depression, generalized anxiety or suicidality (Vescovelli et al., 2017). In addition, 80% of students who died by suicide have never been seen by their campus mental health services (Ketchen Lipson et al., 2015).

Most college students are considered to be emerging adults, which range from 18 to 25 years old (Auebach et al., 2018). The stress of academics is not the only problem that is surfacing, but also the increase of autonomy from parents, shifts in social roles and relational instability. As a whole, college is characterized by substantial amount of instability such as changes in romantic status (including sexual orientation), peer groups, course selection (including major and concentration) and career choices (Auerbach et al., 2018). It's easy to forget how many aspects of college adjustment and adult development our students have to manage every day (Schwitzer & Vaughn, 2017). The current state of college students' mental health can be viewed not just as a major public health problem, but also as a unique opportunity. College campuses provide a unique opportunity to identify, prevent and treat mental illness during adolescence and young adulthood (Ketchen Lipson et al., 2015). Institutions of higher education are well positioned to develop, evaluate and disseminate best practices for mental health treatment and prevention.

In particular, this generation's nature alienation may pose dangers. As discussed, spending time in nature can reduce the severity of mental disorders, sharpen concentration, increase self-esteem, and reduce feelings of life stress (Arnold, 2012). Enhancing college students' exposure to natural environments seems like a particularly effective strategy for a population in need of restoration from the many daily stressors of student life and who crave directed attention due to the fact that they have assignments, lectures and other educational activities that they constantly engage in.

Recommendations

The research literature on the behavioral and psychological effects of nature suggest ways that public officials and college administrators might enhance the lives of their students. Based on this research, the following recommendations are made.

- College administrators should be more mindful of the aesthetic experiences found within the hallways of academic buildings, the classrooms, the library and other major areas on campus, and how such experiences might better simulate and stimulate the inherent of natural landscapes. For example, they should give greater attention to the use of indoor plants or pictures/paintings of natural landscapes. Although still removed from nature, the aesthetic appeal of internal environments that incorporate and simulate nature has been found to offer some of the same benefits provided by experiences outdoors (Bringslimark, Hartig, & Patil, 2009).
- The structure of academic buildings on campus should be taken into account. Renovations can be very costly; however, the availability of windows is important. Windows provide a great means to rest from the directed attention that is being used in classrooms. It would be helpful to glance up from work to look outside and see the natural world. Windows facing green, landscaped grounds are particularly important (Frumkin, 2001).
- College campuses should have a club organization dedicated to engaging with the natural world such as planting trees or plants around campus. It was examined in research that "...the amount of green space near the home and in the school setting and both were found to be beneficial..." (McCormick, 2017)."

- If a college has a gym course that is available to students, the exercise activities should take place outside in nature if the weather permits. Experiences of physical activity in natural environments such as walking or running in pleasant green spaces has been associated with higher ratings of perceived potential for restoration and improved cognitive performance (Calogiuri et al., 2016).
- College courses should consider ways to incorporate nature into its curriculum when possible. When there is a break during class, it could be suggested that the students take a walk outside, either as a group or individually. In cases where it is feasible, professors could hold class outdoors. It is said that visits to green outdoor environments may, apart from reducing stress, also be good for people's health in many other ways (Grahn & Stigsdotter, 2003).

Conclusion

The following paper should not only serve as a review of the literature, but as a challenge to the academic community to more seriously consider the effects of the natural environment. The research findings in this paper provide considerable evidence that the exposure to nature and its elements are beneficial to overall well-being. Exposure to nature has generally shown a positive relationship across different domains, including job performance, social relationships, and academic performance. Outdoor natural environments also provide health benefits by reducing stress, restoring mental fatigue, improving mood and mental health. By the tick of the clock, all too many college students spend their time in either urban or densely populated settings, working in concrete buildings, driving in motor vehicles, completely distant from the natural world. On college campuses, outdoor areas should not be only viewed as a place to hold barbecues and parties, but as environmental niches that help bolster the health, happiness, and

productivity of its populations. College administrators across the country should consider ways to further enhance students' exposure to natural settings and provide opportunities to engage in more outdoor activities with wide green open spaces, plants and trees.

References

- Abbott, L. C., Taff, D., Newman, P., Benfield, J. A., & Mowen, A. J. (2016). The Influence of Natural Sounds on Attention Restoration. *Journal of Park and Recreation Administration*, 34(3). doi:10.18666/jpra-2016-v34-i3-6893
- An, M., Colarelli, S.M., O'Brien, K., Boyajian, M.E. (2016). Why We Need More Nature at Work: Effects of Natural Elements and Sunlight on Employee Mental Health and Work Attitudes. *PLOS ONE*, 11(5). doi:10.1371/journal.pone.0155614
- Arnold, G. (2012). Enhancing college students' environmental sensibilities through online nature journaling. *Environmental Education Research*, 18(1), 133-150.
- Auerbach, R. P., Mortier, P., Bruffaerts, R., Alonso, J., Benjet, C., ... Kessler, R. C. (2018). WHO World Mental Health Surveys International College Student Project: Prevalence and distribution of mental disorders. *Journal of Abnormal Psychology*, 127(7), 623–638. doi:10.1037/abn0000362
- Baxter, D.E. & Pelletier, L.G. (2018). Is Nature Relatedness a Basic Human Psychological Need? A Critical Examination of the Extant Literature. *Canadian Psychology/Psychologie canadienne*. doi:10.1037/cap0000145
- Berman, M.G., Jonides, J., & Kaplan, S. (2008). The Cognitive Benefits of Interacting With Nature. *Psychological Science*, 19, 1207 – 1212.
- Beyer, K., Kaltenbach, A., Szabo, A., Bogar, S. Nieto, F., & Malecki, K. (2014). Exposure to Neighborhood Green Space and Mental Health: Evidence from the Survey of the Health of Wisconsin. *International Journal of Environmental Research and Public Health*, 11(3), 3453 – 3472. doi:10.3390/ijerph110303453

- Bloom, J., Kinnunen, U., & Korpela, K. (2014). Exposure to Nature Versus Relaxation During Lunch Breaks and Recovery from Work: Development and Design of an Intervention Study to Improve Workers' Health, Well-being, Work Performance, and Creativity. *BMC Public Health*, 14(1). doi:10.1186/1471-2458-14-488
- Bringslimark, T., Hartig, T., & Patil, G. G. (2009). The psychological benefits of indoor plants: A critical review of the experimental literature. *Journal of Environmental Psychology*, 29(4), 422–433. doi:10.1016/j.jenvp.2009.05.001
- Bruffaerts, R., Mortier, P., Kiekens, G., Auerbach, R. P., Cuijpers, P., Demyttenaere, K., ... Kessler, R. C. (2018). Mental health problems in college freshmen: Prevalence and academic functioning. *Journal of Affective Disorders*, 225, 97–103. doi:10.1016/j.jad.2017.07.044
- Caloguri, G., Evensen, K., Weydahl, A., Andersson, K., Patil, G., Ihlebæk, C., Raanaas, R.K. (2016). Green exercise as a workplace intervention to reduce job stress. Results from a pilot study. *Work*, 53(1), 99 – 111. doi:10.3233/wor-152219
- Cox, D.T.C & Gaston, K.J. (2016). Urban Bird Feeding: Connecting People with Nature. *PLOS ONE*, 11(7), e0158717. doi:10.1371/journal.pone.0158717
- Cox, D.T.C., Shanahan, D.F., Hudson, H.L., Plummer, K.E., Siriwardena, G.M., Fuller, R.A....Gaston, K.J. (2017). Doses of Neighborhood Nature: The Benefits for Mental Health of Living with Nature. *BioScience*, biw173. doi:10.1093/biosci/biw173
- Dean, J., Shanahan, D., Bush, R., Gaston, K., Lin, B., Barber, E., ... Fuller, R. (2018). Is Nature Relatedness Associated with Better Mental and Physical Health? *International Journal of Environmental Research and Public Health*, 15(7), 1371. doi:10.3390/ijerph15071371

- Dreyer, B.C., Coulombe, S., Whitney, S., Riemer, M., Labbé, D. (2018). Beyond Exposure to Outdoor Nature: Exploration of the Benefits of a Green Building's Indoor Environment on Wellbeing. *Frontiers in Psychology*, 9. doi:10.3389/fpsyg.2018.01583
- Duvall, J. & Kaplan, R. (2014). Enhancing the Well-Being of Veterans Using Extended Group-Based Nature Recreation Experiences.
- Engemann, K., Pedersen, C. B., Arge, L., Tsirogiannis, C., Mortensen, P. B., & Svenning, J.-C. (2019). Residential green space in childhood is associated with lower risk of psychiatric disorders from adolescence into adulthood. *Proceedings of the National Academy of Sciences*. doi:10.1073/pnas.1807504116
- Frumkin, Howard. (2001). Beyond Toxicity: Human health and the natural environment. *American Journal of Preventive Medicine*, 20 (3), 234 – 240.
[https://doi.org/10.1016/S0749-3797\(00\)00317-2](https://doi.org/10.1016/S0749-3797(00)00317-2)
- Grahn, P., & Stigsdotter, U. A. (2003). Landscape planning and stress. *Urban Forestry & Urban Greening*, 2(1), 1–18. doi:10.1078/1618-8667-00019
- Houlden, V., Weich, S., Porto de Albuquerque, J., Jarvis, S., & Rees, K. (2018). The relationship between greenspace and the mental wellbeing of adults: A systematic review. *PLOS ONE*, 13(9), e0203000. doi:10.1371/journal.pone.0203000
- Howell, A.J., Passmore, H.A., Buro, K. (2013). Meaning in Nature: Meaning in Life as a Mediator of the Relationship between Nature Connectedness and Well-Being. *Journal of Happiness Studies*, 14, 1681 – 1696.
- Kämpfer, S., & Mutz, M. (2013). On the sunny side of life: Sunshine effects on life satisfaction. *Social Indicators Research*, 110(2), 579-595.

Ketchen Lipson, S., Gaddis, S. M., Heinze, J., Beck, K., & Eisenberg, D. (2015). Variations in student mental health and treatment utilization across US colleges and universities.

Journal of American College Health, 63(6), 388-396.

Kellert, S. R., & Wilson, E. O. (Eds.). (1995). The biophilia hypothesis. Island Press.

Kondo, M.C., Jacoby, S.F., South, E.C. (2018). Does spending time outdoors reduce stress? A review of real-time stress to outdoor environments. *Health and Place*, 51, 136 – 150.

doi:10.1016/j.healthplace.2018.03.001

Kotabe, H.P., Kardan, O., & Berman, M.G. (2017). The nature disorder paradox: A perceptual study on how nature is disorderly yet aesthetically preferred. *Journal of Experimental Psychology: General*, 146(8), 1126 – 1142. doi:10.1037/xge0000321

doi:10.1037/xge0000321

Krčmářová, J. (2009). E.O. Wilson's concept of biophilia and the environmental movement in the USA. *Klaudyán: Internet Journal Historical Geography Environmental History*, 6(1/2), 4-17.

Krzywicka, P., & Byrka, K. (2017). Restorative Qualities of and Preference for Natural and Urban Soundscapes. *Frontiers in Psychology*, 8. doi:10.3389/fpsyg.2017.01705

Lambert, J. (2019). Greener Childhood Associated with Happier Adulthood. Retrieved from <https://www.npr.org/sections/health-shots/2019/02/25/697788559/greener-childhood-associated-with-happier-adulthood>

Largo-Wight, E., Chen, W.W., Dodd, V., & Weiler, R. (2011). The Nature Contact: A Measure of Healthy Workplace Exposure. *PsycTESTS Dataset*. doi:10.1037/t36363-000

Larson, L.R., Jennings, V., & Cloutier, S.A. (2016). Public Parks and Wellbeing in Urban Areas of the United States. *PLOS ONE*, 11(4), e0153211. doi:10.1371/journal.pone.0153211

- Lederbogen, F., Kirsch, P., Haddad, L., Streit, F., Tost, H., Schuch, P., ... Meyer-Lindenberg, A. (2011). City living and urban upbringing affect neural social stress processing in humans. *Nature*, 474(7352), 498–501. doi:10.1038/nature10190
- Lindemuth, A.L. (2007). Designing therapeutic environments for inmates and prison staff in the United States: Precedents and contemporary applications. *Journal of Mediterranean Ecology*, 8(1), 87–97
- Lucas, R.E. & Lawless, N.M. (2013). Does Life Seem Better on a Sunny Day? Examining the Association between Daily Weather Conditions and Life Satisfaction Judgments. *Journal of Personality and Social Psychology*, 45(5), 872 – 884.
- Maller, C., Townsend, M., Pryor, A., Brown, P., St Leger, L. (2005). Healthy nature healthy people: ‘contact with nature’ as an upstream health promotion intervention for populations. *Health Promotion International*, 21(1), 45–54. doi:10.1093/heapro/dai032
- Mayer, F. S., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why Is Nature Beneficial? *Environment and Behavior*, 41(5), 607–643. doi:10.1177/0013916508319745
- McCormick, R. (2017). Does access to green space impact the mental well-being of children: A systematic review. *Journal of Pediatric Nursing*, 37, 3-7.
- Mitchell, R., & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: an observational population study. *The Lancet*, 372(9650), 1655–1660. doi:10.1016/s0140-6736(08)61689-x
- Nisbet, E.K., Zelenski, J.M., & Murphy, S.A. (2011). Happiness is in our nature: Exploring nature relatedness as a contributor to subjective well-being. *Journal of Happiness Studies*, 12(2), 303 – 322. doi:10.1007/s10902-010-9197-7

- O'Donnell, S., Chang, K., & Miller, K. (2013). Relations among autonomy, attribution style, and happiness in college students. *College Student Journal*, 47(1), 228-234.
- Pretty, J. (2004). How nature contributes to mental and physical health. *Spirituality and Health International*, 5(2), 68–78. doi:10.1002/shi.220
- Pretty, J., Peacock, J., Sellens, M., & Griffin, M. (2005). The mental and physical health outcomes of green exercise. *International journal of environmental health research*, 15(5), 319-337.
- Russell, R., Guerry, A. D., Balvanera, P., Gould, R. K., Basurto, X., Chan, K. M. A., ... Tam, J. (2013). Humans and Nature: How Knowing and Experiencing Nature Affect Well-Being. *Annual Review of Environment and Resources*, 38(1), 473–502. doi:10.1146/annurev-environ-012312-110838
- Schmiedeberg, C., & Schröder, J. (2014). Does Weather Really Influence the Measurement of Life Satisfaction? *Social Indicators Research*, 117(2), 387 – 399.
- Simonsohn, U. (2009). Weather to go to college. *The Economic Journal*, 120(543), 270-280.
- Söderback, I., Söderström, M., & Schäländer, E. (2004). Horticultural therapy: the ‘healing garden’ and gardening in rehabilitation measures at Danderyd Hospital Rehabilitation Clinic, Sweden. *Pediatric rehabilitation*, 7(4), 245-260.
- St Leger, L. (2003). Health and nature—new challenges for health promotion. *Health Promotion International*, 18(3), 173–175. doi:10.1093/heapro/dag012
- Taylor, A.F., & Kuo, F. E. (2009). Children With Attention Deficits Concentrate Better After Walk in the Park. *Journal of Attention Disorders*, 12(5), 402–409.
doi:10.1177/1087054708323000

- Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2001). Coping with add. *Environment and Behavior*, 33(1), 54–77. doi:10.1177/00139160121972864
- Ulrich, R.S., Simons, R.F., Losito, B.D., Fiorito, E., Miles, M.A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, 11(3), 201 – 230. doi:10.1016/s0272-4944(05)80184-7
- United States. (2018). Urban nature for human health and well-being: A research summary for communicating the health benefits of urban trees and green space.
- Van den Berg, A. E., Hartig, T., & Staats, H. (2007). Preference for Nature in Urbanized Societies: Stress, Restoration, and the Pursuit of Sustainability. *Journal of Social Issues*, 63(1), 79–96. doi:10.1111/j.1540-4560.2007.00497.x
- Van der Linden, S. (2015). Green prison programmes, recidivism and mental health: A primer. *Criminal Behaviour and Mental Health*, 25(5), 338–342. doi:10.1002/cbm.1978
- Vescovelli, F., Melani, P., Ruini, C., Ricci Bitti, P. E., & Monti, F. (2017). University counseling service for improving students' mental health. *Psychological Services*, 14(4), 470–480. doi:10.1037/ser0000166
- Weinstein, N., Przybylski, A.K., Ryan, R.M. (2009). Can nature make us more caring? Effects of immersion in nature on intrinsic aspirations and generosity. *Personality and Social Psychology Bulletin*, 35(10), 1315 – 1329. doi: 10.1177/0146167209341649
- Williams, F. (2017). *The nature fix: Why nature makes us happier, healthier, and more creative.* WW Norton & Company.
- Wilson, E. O. (1984). *Biophilia.* Massachusetts.

“Woody” Schwitzer, A. M., & Vaughn, J. A. (2017). Mental Health, Well-being, and Learning: Supporting Our Students in Times of Need. *About Campus*, 22(2), 4–11.

doi:10.1002/abc.21287

Zhang, J.W., Howell, R.T., Iyer, R. (2014). Engagement with natural beauty moderates the positive relation between connectedness with nature and psychological well-being.

Journal of Environmental Psychology, 38, 55 – 63. doi:10.1016/j.jenvp.2013.12.013