

An Update of the Literature Supporting the Well-Being Benefits of Plants: A Review of the Emotional and Mental Health Benefits of Plants¹

Charles Hall and Melinda Knuth²

Abstract

Consumers have historically shown an inclination to purchase plants that enhance their quality of life, meaning they will purchase items that positively influence their social, physical, psychological, cognitive, environmental, and spiritual well-being. Plants in native and improved landscapes (and interiorscapes) have been documented to influence each of six quality of life constructs. This paper summarizes publications regarding the emotional and mental health benefits associated with plants, addressing reduced anxiety and stress, attention deficit recovery, fractals and visual response, decreased depression, enhanced memory retention, greater happiness and life satisfaction, mitigation of post-traumatic stress disorder (PTSD), increased creativity, enhanced productivity and attention, reduced effects of dementia, and improved self-esteem. This research should be strategically incorporated into both industry-wide and firm-specific marketing messages that highlight the quality of life value proposition in order to maintain the industry's sense of value and relevance to consumers of the future.

Index words: benefits of plants, emotional health, mental health.

Significance to the Horticulture Industry

This paper is the first of a four-part series that provides a review of the substantial body of peer-reviewed research that has been conducted regarding the economic, environmental, and health and well-being benefits of green industry products and services. This article focuses specifically on the health and well-being benefits. This research should be strategically incorporated into both industry-wide and firm-specific marketing messages that highlight these quality of life dimensions in order to enhance the perceived value and relevance of green industry products for gardening and landscaping consumers in the future.

Introduction

In 2011, Hall and Dickson published a forum article in the *Journal of Environmental Horticulture (JEH)* that summarized the economic, environmental, and health and well-being benefits associated with people-plant interactions. The proposition put forth in that article was that green industry firms needed to focus on these types of functional benefits in their marketing messages to consumers rather than simply base their value proposition on the features and benefits of the plants themselves (e.g. aesthetic aspects, disease resistance, cold/heat tolerance, salt tolerance, etc.). By doing so, the end consumer would see the inherent ways in which plants improve the quality of their lives and begin perceiving plants to be a necessity in their lives rather than a mere luxury they could cast aside during economic downturns, as they did during the “Great Recession” of 2008-2009.

Since 2011, there has been a plethora of additional research conducted regarding these functional plant benefits and these voluminous studies provide compelling evidence that warrants further attention. Thus, this new series of forum articles attempts to update the findings summarized in the original article by Hall and Dickson by presenting a summary of the research on plant benefits that has been conducted since 2011. By doing so, this new information provides the basis for future innovative green industry marketing efforts, which may, in turn, positively influence the elasticity of demand for plants in general.

The first topic in the four-part series, *Emotional and Mental Health Benefits of Plants*, is one that has been shown to resonate with consumers of all demographic segments (Hall and Dickson, 2011). These benefits are segmented and discussed using the following categories: anxiety and stress reduction, attention deficit recovery, fractals and visual responses, decreased depression, enhanced memory retention, greater happiness and life satisfaction, mitigation of PTSD, increased creativity, enhanced productivity and attention, reduced effects of dementia, and improved self-esteem.

Reduced anxiety and stress

Significant correlations have been found between the use of open spaces and reduced stress. Time spent in natural settings can help reduce mental fatigue recovery time and improve concentration levels (Entrix 2010, Keniger et al. 2013, Kjellgren and Buhrkall 2010, White et al. 2017, Wolf and Housley 2014). Increased access to green spaces also reduces psychological distress, depression symptoms, clinical anxiety, and mood disorders in adults (Astell-Burt et al. 2013, Beyer et al. 2014, Brown et al. 2013, de Vries et al. 2013, Fan et al. 2011, Nutsford et al. 2013, Stigsdotter 2015, Triguero-Mas et al. 2015, White et al. 2013).

The term “stress recovery theory” was coined by van den Berg and Custers (2011) and includes the benefits derived when individuals immerse in nature, including

¹Received for publication January 17, 2019; in revised form April 8, 2019.

²Professor and Graduate Student, respectively, Texas A&M University, College Station, Texas 77843-2133. Corresponding author: Charles Hall c-hall@tamu.edu.

decreased anxiety, lower heart rates, skin conductance recovery, lower concentrations of cortisol, and positive changes in nerve activity (Alvarsson et al. 2010, Bowler et al. 2010, Park et al. 2010, Park et al. 2017, Russell et al. 2013). Controlling for socio-economic and demographic characteristics, positive relationships between green space and overall health and stress reduction have been reported (de Vries et al. 2003) and the effects are transcendent to viewing images of nature (Ryan et al. 2014). For patients in hospitals, exposure to real plants or even posters of plants, resulted in lower levels of experienced stress (Beukeboom et al. 2012). Exposure to natural scenes mediates the negative effects of stress; one can recover faster from the decrease of cognitive performance associated with stress, especially reflected in attention tasks. (Berto 2014).

Stress reduction and mental restoration occur when individuals live near green areas, have a view of vegetation, or spend time in natural settings (Abraham et al. 2010, Carrus et al. 2015, Watts 2017, Wolf and Housley 2014). The amount of green space in the neighborhood, and in particular access to a garden or allotment, were significant predictors of stress (Thompson et al. 2016). In fact, the amount of green space in residential areas is positively related to resident overall health (Groenewegen et al. 2012). White et al. (2013) also found that individuals have both lower mental distress and higher well-being when living in urban areas with more green space.

Women also seem to experience more stress than men do when away from nature. Roe et al. (2013b) found that there was a significant inverse relationship between green spaces and stress levels with higher levels of green space resulting in lower stress levels. Women were found to display higher stress levels than men when exposed to the same amount of (or less) green space. Coincidentally, the percentage of green space effects showed a positive outcome on women by decreasing the mean cortisol concentration. Women who lived more than 1 km away from green spaces reported higher stress levels and perceived poorer health and quality of life than those who lived near of green spaces (Stigsdotter et al. 2010). Beil and Hanes 2013 also found there is greater benefit from exposure to natural settings as measured by pre-and-post changes in salivary alpha-amylase and self-reported stress with more of a significant reduction in females than in males.

Thompson (2012) found that those who lived in green spaces experienced less stress and participated in more physical activity. Thompson also found self-reported decreases in stress, diurnal patterns of cortisol secretion, and quantity of relative green space in the living environment to all be positively correlated.

Another study found that when comparing a group of elderly women who spent 15 sessions outside participating in gardening activities versus staying inside, those who had gone outside had improved muscle mass and hand dexterity, and decreased waist circumference, whereas the women who spent the same time indoors had decreased muscle mass and agility and increased symptoms of depression (Park et al. 2016).

Stress reduction through green environments has been achieved in office settings as well. When employees were

exposed to roses in the workplace, they had significantly less heart rate variability than those who weren't exposed to roses (Callaghan and Mallory-Hill 2016, Ikei et al. 2014, Ikei et al. 2013, Smith and Pitt 2011). Interior plants can lead to healthy, productive workplaces through enhanced attention capacity, lower stress levels, and higher job satisfaction from viewing plants (Gilchrist et al. 2015, Hartig et al. 2014, Raanaas et al. 2011). This concept also carries over to break areas within the workplace (Berto 2014).

Biophilia is defined as humans' innate tendency to seek connections with nature and other forms of life. Biophilic design is the incorporation of biophilia into the built environment. There is a growing body of literature documenting the benefits of implementing plants on a large scale to capture the positive psychophysiological and cognitive benefits afforded by biophilia in architecture (Ryan et al. 2014). This type of architecture can reduce stress, enhance creativity and clarity of thought, and improve well-being in urbanized communities (Browning et al. 2016). This theory is also backed by Pouya (2016), who found that if these concepts were applied more widely, we would see more of a positive impact. The perceptual and physiological stress responses are correlated to the complexity of fractals in nature, art and architecture, and the predictability of the occurrence of design flows and patterns in nature (Bejan and Zane 2012, Salingaros 2012).

When young people, particularly students, have a view of green spaces during school, students exhibit significantly better performance on attention tests and stress recovery (Li and Sullivan 2016). Kelz et al. (2015) validated Li and Sullivan's findings by having children play on different types of playgrounds with varied levels of green space. The playground with high green space significantly reduced students' physiological stress levels and enhanced their psychological well-being. They also perceived the environment as being more restorative.

Lee et al. (2014) studied forest activities of Japanese citizens and found significant differences between the responses of the subjects in forest settings compared with those in urban environments in salivary cortisol concentration (an index of stress response), diastolic blood pressure, and pulse rate. Further, subjects felt more comfortable, soothed and refreshed when viewing a forest landscape than an urban landscape.

Mennis (2018) found urban green spaces are associated with lower stress when subjects are away from home, which is speculated to be due to the properties of stress reduction and attention restoration associated with exposure to natural areas, and to the influence of other family dynamics affecting stress levels within the home. Subjects may also seek out urban greenspaces at times of lower stress or explicitly for purposes of stress reduction.

Tree cover is also associated with stress reduction. Jiang et al. (2016) found a positive correlation between urban street tree density and self-reported stress recovery. Song (2015) also found that physiological effects of a forest environment can differ depending on a subject's initial levels of stress and that subjects with high initial blood pressure and pulse rate showed a decrease in these values

after walking in a forested area, whereas those with low initial values showed an increase. There was no physiological adjustment effect observed in an urban area; thus, these effects are specific to a forest environment.

Aspinall et al. (2015) also documents that forest-bathing can cause stress reduction by using an EEG headset to measure brain waves by amplitude and frequency. Participants were asked to walk through an urban shopping center to a 25-ha (62 acres) green space and a busy commercial district with heavy traffic. The walk took participants approximately 25 minutes each. When comparing the urban shopping center to the green space, frustration, engagement, and arousal all decreased which is consistent with restoration theory but meditation increased, which was novel. When participants moved from the greenspace to the busy commercial district, their arousal/engagement increased, indicating that stress/fear also increased.

Horiuchi et al. (2014) took another approach and used real viewings of forests and non-forested areas and compared near-infrared spectroscopy (NIRS) as well as mood state scores, heart-rate, blood pressure, and sAMY concentration (marker for stress). They found that the NIRS signal, cerebral oxygenation levels, and mood state levels were lower in forest settings than in non-forest conditions, but blood pressure, heart rate variability, and salivary amylase levels were similar. Interestingly, being in the forest also caused a spike in cerebral activity.

This is reinforced by results of Im et al. (2016), who looked at the effects of spending two hours in a forest in Japan. To test neurological effects, they collected blood and saliva samples and found that there was a significant change in the level of cytokines that contributing to the hyperactivity of the inflammatory response which is physiological reaction of a stress response.

Joung et al. (2015) showed through NIRS that total Hb (hemoglobin) concentration was significantly lower of forest scenery over urban scenery. A lower concentration of total Hb and oxy-Hb indicates that the quantity of oxygen transmitted to the prefrontal cortex tissue is small. In other words, the prefrontal cortex activity in a forest area is more stabilized than in an urban area.

Vedder et al. (2015) took a different approach. They used fMRI and asked individuals to imagine beautiful and non-beautiful environments. Functional magnetic resonance imaging (fMRI) showed significantly more cortical activations when subjects imagined non-pleasant environments than when they imagined pleasant environments. The results of this study show that a positive and a negative frame of reference elicit distinct neural patterns of environmental cognition. This means that non-beautiful and non-pleasant environments demand more mental processing than beautiful and pleasant environments. The results correlate with previous propositions to explain the experience of negative environments as characterized by the demand on more mental resources than the experience of positive environments. In other words, interacting with a negative environment requires an additional investment in emotion processing, cognitive control, and motor function. These results support Aspinall et al. (2015), Horiuchi et al.

(2014), and Joung et al. (2015) with their claims of reduction in delta waves (brainwaves for agitation and excitement). Kim et al. (2010) found similar results when looking at stress reactions using fMRI.

Students were recruited from Edinburgh University by Roe et al. (2013a) to undergo an EEG study on natural settings (fields, forests, and parks) versus urban sceneries (buildings, roads, and walls). To control the effect of people and animals, both were withheld from being included in the pictures presented to the subjects. Subjects were asked to rate each slide on four criteria based on how attractive they found the scene, how likely are they to visit the scene, how the scene made them feel from sad to happy and also from calm to excited. The results for the ranking questions showed that the landscape scenes were perceived as more attractive, more inviting (willingness-to-visit), and greater valence. Arousal was strongly correlated to the urban scenes while interest was correlated to landscape scenes. This confirms restorative theory, indicating a positive psychological effect of natural scenes.

Rosenbaum used electroencephalogram (EEG) in a replication-type study with eye-tracking. Given the lack of neuroscience data in previous studies on consumer responses and biophilic design in retail settings, they had participants watch a video of a retail mall or lifestyle center (e.g. an upscale shopping center or mixed-use commercial development) with and without plants (biophilic and non-biophilic). Those participants who viewed the biophilic video were more enthused and interested and experienced a higher state of mental relaxation than participants who viewed the non-biophilic video. Participants who viewed the biophilic video also reported lower levels of stress, more attractiveness/focus, and were more emotionally involved. This finding confirms previous results that suggest that shoppers are becoming bored in their excursions to enclosed malls while lifestyle centers continue to proliferate.

Attention Deficit Recovery (Attention Restoration Theory or ART)

Natural landscapes, such as beaches, waters, forests, parks, and mountains, and availability of public open spaces used for public entertainment and sports reduce attention deficit disorders (ADD/ADHD) (Coutts and Hahn 2015, Frumkin 2013, Keniger et al. 2013). Green restoration improved preschooler spatial working memory (Schutte 2017) and cognitive functioning improved when participants walked in nature (Berman et al. 2008). Children with ADHD concentrated better after a walk in a park than after a downtown neighborhood walk (Taylor and Kuo 2009). Wilson (2015) showed that children who play in greenspace for 30 minutes had increased sustained mental ability and found greenspace to be restorative. Taking micro-breaks to view nature can help with attention restoration (Lee et al. 2015).

Fractals & Visual Response

We are so separated from nature that we make up for its lack by imbuing our surroundings with those geometric

qualities found in nature (Salingaros 2012). We try to shape our immediate vicinity so that those qualities reproduce our response to natural environments. From biophilia, natural forms have inherent qualities, reducible to a mathematical description, that induce a healing effect. Complex biophilic environments dramatically increase brain size and performance on intelligence tests (Salingaros 2012).

Decreased Depression

Being immersed in nature and vegetation were used as active components in a therapeutic horticulture intervention for clinical depression (Beute and de Kort 2018, Gonzalez et al. 2010). Garden walking and reflective journaling decreased depression scores in older adults (McCaffrey et al. 2010). With patients who have major depressive disorder (MDD), those who walked in nature exhibited significant increases in memory span after the nature walk relative to the urban walk. Green spaces also reduced stress and pain, and increased attention performance (McCaffrey et al. 2010). Participants also showed increases in mood, but the mood effects did not correlate with the memory effects, suggesting separable mechanisms (Berman et al. 2012). Bezold (2018) put extensive numbers to this idea, with a 6% lower incidence of high depressive symptoms associated with greenness and found this relationship to be stronger with highly populated areas. Comparing household medical records and natural amenities, those residents with only 10% green space within about half a mile had a 25% greater risk of depression and a 30% greater risk of anxiety disorders versus those with the highest degree of green space near the home (Wolf and Housley 2014).

In a Korean study involving patients with moderate to severe depression, participants were assigned to cognitive-behavioral therapy in either a hospital setting or a forest setting (arboretum), while a third group acted as a control and were treated using standard outpatient care in the community (Wolf and Housley 2014). Overall, depressive symptoms were reduced most significantly in the forest group, and the odds of complete remission were 20-30% higher than typically observed from medication alone. Moreover, the forest therapy group had more pronounced reductions in physiological markers of stress, including lower levels of the stress hormone cortisol and improvements in heart rate variability, a marker of adequate circulatory system response to stress. It appears that the settings where psychotherapy is conducted can actually become part of the therapy (Wolf and Housley 2014).

Enhanced Memory Retention

A 2012 experiment in Michigan found that people were better able to perform a test of working memory (which measures one's ability to focus or concentrate) after walking through a green arboretum, compared to those who walked on traffic-heavy urban streets (Berman et al. 2012). Subjects who walked through the arboretum had a 20% improvement in working memory. Another study determined that people who went for a 50-minute walk in nature, compared to those who went for a similar length

walk in an urban environment, experienced less anxiety and rumination, along with increased working memory performance (Berman et al. 2012).

Being in nature and greenspace can also help improve memory retention of patients suffering from strokes and dementia (Detweiler and Warf 2005). In children, nature exposure can influence cognitive development through improved working memory and a reduction in inattentiveness (Dadvand et al. 2015).

Greater Happiness/Life Satisfaction

Interacting with nature, especially with the presence of water, can increase self-esteem and mood, reduce anger, and improve general psychological well-being with positive effects on emotions or behavior (Barton and Pretty 2010, Keniger et al. 2013, Mensah et al. 2016, Windhager et al. 2011, Wolf and Housley 2014). In fact, moving to homes with greener areas positively influences mental health even after three years post-move (Alcock et al. 2014). Moving to a less-green area significantly worsens mental health within one year post-move, but returns to pre-move mental health status thereafter (Alcock et al. 2014). This is true for public green spaces as well. City park area quantity and accessibility is a strong predictor of physical and community well-being (Larson et al. 2016). Similarly, studies in Perth, Australia found that people in neighborhoods with high-quality public open spaces had better mental health than those with low-quality public open space (Francis et al. 2012a). Features that made an open space "high quality" included irrigated lawns, walking paths, lighting, water features, playgrounds, and birdlife. Mental health was assessed based on symptoms of psychological distress such as nervousness and feelings of hopelessness (Francis et al. 2012b). Findings were not affected by the quantity of open space in the neighborhood, nor by how frequently residents used the open space (Francis et al. 2012a).

Pro-environmental behavior and subjective well-being are positively associated. Those who are more connected to nature and exhibit environmentally-conscious behaviors tend to experience more positive vitality and life satisfaction compared to those less connected to nature (Capaldi et al. 2014).

Van Dillen (2012) determined, through meta-analysis, that quality and quantity of green space was correlated to good health. Greater species diversity positively affects personal well-being (Dallimer et al. 2012) and neighborhood well-being (Luck et al., 2009). Visiting protected natural sites (e.g. state parks) improves perceptions of psychological, emotional, and social benefits (Lemieux et al. 2012). Results from a meta-analysis in Toronto, Canada suggest that people who live in neighborhoods with a higher density of trees on their streets report significantly less cardio-metabolic conditions. Having 10 or more trees in a city block, on average, improves personal health perceptions in ways comparable to a \$10,000 increase in annual personal income or being 7 years younger (Kardan et al. 2015). The study also found that having 11 more trees in a city block, on average, decreases cardio-metabolic conditions in ways comparable to an increase in annual

personal income of \$20,000 and moving to a neighborhood with \$20,000 higher median income or being 1.4 years younger (Kardan et al. 2015).

Park et al. (2017) found that when subjects observed plants, Oxy-Hb (oxyhemoglobin) concentrations in the right prefrontal cortex were significantly lower, indicating a physiological state of relaxation. Subjects also reported more positive emotions (feeling more comfortable and relaxed) when viewing foliage plants.

Mitigation of PTSD

Veterans with PTS (post-traumatic stress) treated with Nature Adventure Rehabilitation (NAR) experienced an improvement in emotional and social quality of life, post-traumatic cognitive inventory, and hope and functioning (Gelkopf et al. 2013). NAR seems to work through a process of behavioral activation, desensitization, gradual exposure to anxiety evoking situations, and gaining control over symptomatology.

When victims of natural disasters, who are at a high risk of PTSD, participated in horticulture therapy (HT) programs, they showed an increase in regional gray matter volume (rGMV) of the left subgenual anterior cingulate cortex and left superior frontal gyrus compared with the stress education (SE) group (Kotozaki et al. 2015, Sekiguchi et al. 2015). They showed greater salivary cortisol and alpha amylase levels, which are all significantly reduced in individuals experiencing PTSD (Kotozaki 2014, Kotozaki et al. 2015, Sekiguchi et al. 2015). The HT group also showed improvement on PTSD reactions, post-traumatic growth, and positive states of mind (Kotozaki et al. 2015). Post-traumatic growth refers to the positive outcome of people who have experienced traumatic events through recovering their quality of life. People identified themselves with plant growth and gaining a chance to be happy once more (Kotozaki et al. 2015).

Increased Creativity

Ling and Dale (2011) found a link between landscape plants and creativity and considered how this may reflect the potential for cultural diversity and thus sustainable community development. Taking short walks in attractive green environments can boost creativity and vitality (Tyrvaainen et al. 2014). These same areas can also be used for 'walking meetings' which help boost creativity (Oppedizzo and Schwartz 2014).

Enhanced Productivity and Attention

Biophilic workplaces with views of nature and daylight can lead to higher productivity and attention with employees (Elzeyadi 2011, Windhager et al. 2011). Workers in offices with poor light quality and views used more sick leave hours and this effect contributes as much as 6.5% to sick leave use. Moisture released into the air by plants helps with a dry atmosphere, reducing headaches and improving concentration. Visible greenery, both indoors and out, reduces stress and increases the ability to concentrate (Alker et al. 2014, van Duijin et al. 2011). In one such concentration test, employees who had a view of

plants completed the test 19% faster than employees in a room without a view of plants (Nieuwenhuis et al. 2014). Offices in the Netherlands and Great Britain experienced a 15% increase in worker productivity when plants were included in office space (Korpela et al. 2017, Nieuwenhuis et al. 2014).

The Heschong-Mahone Group studied productivity at the Sacramento Municipal Utility District Call Center where employees were either seated with views of vegetation through large windows or were excluded from the vegetation view. Employees who had a vegetation view made 6-7% more calls per hour than those with no view. The initial investment of installing the windows was recovered in 4 months by improved productivity (Alker et al. 2014).

Jumeno and Matsumoto (2013), however, did not find that plants in the workplace had a significant effect on productivity or attention but found a significant difference in the employee perceptions of friendliness, comfort, freshness, and cleanliness of the workplace. Erzsebet et al. (2014) suggests that improved employee productivity and attention can be positively affected by the air-purifying qualities of plants in the workplace by reducing various allergies, irritations, hypersensitivity, asthma, drowsiness, and eye problems, while also improving mood. Jumeno and Matsumoto (2016) sought to quantify the number of plants in a room that it would take to generate positive results and found the more plants in a room, the better the mood of the subjects. Their study also found that the number and the size of plants affected the perceived air quality and reaction times and as few as three small-to-medium sized plants can make a positive difference. Even a brief view of a green roof can have positive effects on mood and productivity (Lee and Maheswaran 2011).

When asked about plants in the workplace, 97% of employees would like to have more plants (Husti et al. 2015) because they perceive plants provide a sense of relaxation, make the work environment more similar to space at home, cheer up the image of the office, give a sense of relief, and improve work motivations. Employees without an outdoor view from their desk are five times more likely to put a plant in their office than those with an outdoor view (Bringslimark et al. 2011). Office employees with an outdoor green view were happier and had positively associated higher productivity and job satisfaction levels (Lottrup et al. 2015).

In elementary-level classrooms, green walls (described as a wall with green plants) can provide restorative impacts to school children. Results show that children in classrooms where a green wall was placed scored better on tests for selective attention (van den Berg et al. 2017). The green wall also positively influenced children's classroom evaluations. When integrating a school garden into the curriculum, children's physical activity was increased and sedentary behavior decreased (van den Berg et al. 2017). Children who received breaks and time outside exhibited improved concentration (Duvall and Sullivan 2016). Just placing plants in the classroom improved performance, with children progressing through school curriculum 20-26% faster (van Duijin et al. 2011).

Reduced effects of dementia

Participants in outside horticultural therapy activities such as gardening or landscaping are more actively engaged, have reduced incidents of aggressive behavior, and improved cognitive capacity (Gigliotti and Jarrott 2005).

Improved Self-Esteem

Natural green space has long been used in the promotion of human well-being through green exercise (exercise in a greenspace or outdoors) for improvements on mental health and self-esteem (Townsend and Weerasuriya 2010). A multi-study analysis assessed the best regime of green exercise that is needed to improve self-esteem and mood (Barton and Pretty 2010). Dose responses for both intensity and duration showed large benefits from short engagements in green exercise, and then diminishing but still positive returns (Barton and Pretty 2010). Every green environment improved both self-esteem and mood and the presence of water generated greater effects. Both men and women exhibited similar improvements in self-esteem after green exercise, though men showed a more positive difference in mood.

Summary

Consumers have historically shown an inclination to purchase products that enhance their quality of life (Hall and Dickson 2011), meaning they will purchase items that positively influence their social, physical, psychological, cognitive, environmental, and spiritual well-being. Plants in native and improved landscapes (and interiorscapes) have been documented to influence each of six quality of life constructs. This paper focused on providing evidence from the literature regarding the emotional and mental health benefits associated with plants, thereby influencing the psychological and cognitive well-being constructs of quality of life. This research should be strategically incorporated into both industry-wide and firm-specific marketing messages that highlight the quality of life value proposition in order to maintain the industry's sense of value and relevance to consumers of the future.

Literature Cited

Abraham, A., K. Sommerhalder, and T. Abel. 2010. Landscape and well-being: a scoping study on the health-promoting impact of outdoor environments. *Intl. J. Public Health* 55 (1): 59–69.

Alcock, I., M.P. White, B.W. Wheeler, L.E. Fleming, and M.H. Depledge. 2014. Longitudinal effects on mental health of moving to greener and less green urban areas. *Environ. Sci. Tech.* 48 (2): 1247–1255.

Alker, J., M. Malanca, C. Pottage, and R. O'Brien. 2014. Health, wellbeing & productivity in offices. The next chapter for green building. Rep. World Green Building Council. 87 p.

Alvarsson, J.J., S. Wiens, and M.E. Nilsson. 2010. Stress recovery during exposure to nature sound and environmental noise. *Intl. J. Environ. Res. Public Health* 7 (3): 1036–1046.

Aspinall, P., P. Mavros, R. Coyne, and J. Roe. 2015. The urban brain: analysing outdoor physical activity with mobile EEG. *Br. J. Sports Med.* 49 (4): 272–276.

Astell-Burt, T., X. Feng, and G.S. Kolt. 2013. Does access to neighborhood green space promote a healthy duration of sleep? Novel findings from 259, 319 Australians. *BMJ Open* 3 (8): e003094.

Barton, J. and J. Pretty. 2010. What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environ. Sci. Tech.* 44 (10): 3947–3955.

Beil, K. and D. Hanes. 2013. The influence of urban natural and built environments on physiological and psychological measures of stress - a pilot study. *Intl. J. Environ. Res. Public Health* 10 (4): 1250–1267.

Bejan, A. and J.P. Zane. 2012. Design in nature. *Mechanical Engineering Mag. Select Articles* 134 (06): 42–47.

Berman, M.G., J. Jonides, and S. Kaplan. 2008. The cognitive benefits of interacting with nature. *Psych. Sci.* 19 (12): 1207–1212.

Berman, M.G., E. Kross, K.M. Krpan, M.K. Askren, A. Burson, P.J. Deldin, S. Kaplan, L. Sherdell, I.H. Gotlib, and J. Jonides. 2012. Interacting with nature improves cognition and affect for individuals with depression. *J. Affective Disorders* 140 (3): 300–305.

Berto, R. 2014. The role of nature in coping with psychophysiological stress: A literature review on restorativeness. *Behav. Sci.* 4 (4): 394.

Beukeboom, C.J., D. Langeveld, and K. Tanja-Dijkstra. 2012. Stress-reducing effects of real and artificial nature in a hospital waiting room. *J. Alt. Compl. Med.* 18 (4): 329–333.

Beute, F. and Y.A.W. de Kort. 2018. The natural context of wellbeing: Ecological momentary assessment of the influence of nature and daylight on affect and stress for individuals with depression levels varying from none to clinical. *Health Place* 49: 7–18.

Beyer, K., A. Kaltenbach, A. Szabo, S. Bogar, F. Nieto, and K. Malecki. 2014. Exposure to neighborhood green space and mental health: evidence from the survey of the health of Wisconsin. *Intl. J. Environ. Res. Public Health* 11 (3): 3453–3472.

Bezold, C.P., R.F. Banay, B.A. Coull, J.E. Hart, P. James, L.D. Kubzansky, S.A. Missmer, and F. Laden. 2018. The association between natural environments and depressive symptoms in adolescents living in the United States. *J. Adolescent Health* 62 (4): 488–495.

Bowler, D.E., L.M. Buyung-Ali, T.M. Knight, and A.S. Pullin. 2010. A systematic review of evidence for the added benefits to health of exposure to natural environments. *BioMed Center Public Health* 10 (1): 456.

Bringslimark, T., T. Hartig, and Grindal Patil G. . 2011. Adaptation to windowlessness: Do office workers compensate for a lack of visual access to the outdoors? *Environ. Behavior* 43 (4): 469–487.

Brown, D.K., J.L. Barton, and V.F. Gladwell. 2013. Viewing nature scenes positively affects recovery of autonomic function following acute mental stress. *Environ. Sci. Tech.* 47 (11): 5562–5569.

Browning, W., C. Ryan, and J. Clancy. 2016. Patterns of biophilic design. New York: Terrapin Bright Green, LLC. 64 p.

Callaghan, A. and S. Mallory-Hill. 2016. Biophilia and nature-based features to support stress reduction in knowledge workers. 12 p.

Capaldi, C.A., R.L. Dopko, and J.M. Zelenski. 2014. The relationship between nature connectedness and happiness: a meta-analysis. *Frontiers Psych.* 5: 976.

Carrus, G., M. Scopelliti, R. Laforteza, G. Colangelo, F. Ferrini, F. Salbitano, M. Agrimi, L. Portoghesi, P. Semenzato, and G. Sanesi. 2015. Go greener, feel better? The positive effects of biodiversity on the well-being of individuals visiting urban and peri-urban green areas. *Land. Urban Plan.* 134 (0): 221–228.

Coutts, C. and M. Hahn. 2015. Green infrastructure, ecosystem services, and human health. *Intl. J. Environ. Res. Public Health* 12 (8): 9768.

Dadvand, P., M.J. Nieuwenhuijsen, M. Esnaola, J. Fornes, X. Basagaña, M. Alvarez-Pedrerol, I. Rivas, M. López-Vicente, M.D.C. Pascual, and J. Su. 2015. Green spaces and cognitive development in primary schoolchildren. *Proc. Nat. Acad. Sci.* 112 (26): 7937–7942.

Dallimer, M., K.N. Irvine, A.M. Skinner, Z.G. Davies, J.R. Rouquette, L.L. Maltby, P.H. Warren, P.R. Armsworth, and K.J. Gaston. 2012.

Biodiversity and the feel-good factor: understanding associations between self-reported human well-being and species richness. *BioSci.* 62 (1): 47–55.

de Vries, S., S. van Dillen, P. Groenewegen, and P. Spreeuwenberg. 2013. Streetscape greenery and health: Stress, social cohesion and physical activity as mediators. *Social Sci. Med.* 94: 26–33.

de Vries, S., R.A. Verheij, P.P. Groenewegen, and P. Spreeuwenberg. 2003. Natural environments—healthy environments? An exploratory analysis of the relationship between greenspace and health. *Environ. Plan.* 35 (10): 1717–1731.

Detweiler, M.B. and C. Warf. 2005. Dementia wander garden aids post cerebrovascular stroke restorative therapy: a case study. *Alternative Therapies in Health & Medicine* 11 (4): 54–58.

Duvall, J. and Sullivan, W.C. 2016. How to get more out of the green exercise experience: Insights from Attention Restoration Theory. P 53–61 *In* J. Barton, R. Bragg, C. Wood, and J. Pretty (Eds.) *Green Exercise: Linking nature, health, and well-being*. Routledge/Taylor & Francis.

Elzeyadi, I.M. 2011. Daylighting bias and biophilia: Quantifying the impact of daylighting on occupants' health. US GBC, Eugene, OR. 9 p.

Enrix, I. 2010. Portland's green infrastructure: Quantifying the health, energy, and community livability benefits. City of Portland, Portland, OR. 101 p.

Erzsebet, B., M. Cantor, V. Singureanu, A. Husti, H. Denisa, and B. Mihai. 2014. Ornamental plants used for improvement of living, working and studying spaces microclimate. *ProEnviron./ProMed.* 6 (16): 562–565.

Fan, Y., K.V. Das, and Q. Chen. 2011. Neighborhood green, social support, physical activity, and stress: Assessing the cumulative impact. *Health place* 17 (6): 1202–1211.

Francis, J., B. Giles-Corti, L. Wood, and M. Knuiman. 2012a. Creating sense of community: The role of public space. *J. Environ. Psych.* 32 401–409.

Francis, J., L.J. Wood, M. Knuiman, and B. Giles-Corti. 2012b. Quality or quantity? Exploring the relationship between public open space attributes and mental health in Perth, Western Australia. *Soc. Sci. Med.* 74 (10): 1570–1577.

Frumkin, H. 2013. The evidence of nature and the nature of evidence. *American J. Prev. Med.* 44 (2): 196–197.

Gelkopf, M., I. Hasson-Ohayon, M. Bikman, and S. Kravetz. 2013. Nature adventure rehabilitation for combat-related posttraumatic chronic stress disorder: A randomized control trial. *Psychiatry Res.* 209 (3): 485–493.

Gigliotti, C.M. and S.E. Jarrott. 2005. Effects of horticulture therapy on engagement and affect. *Canadian J Aging/La Revue canadienne du vieillissement* 24 (4): 367–377.

Gilchrist, K., C. Brown, and A. Montarzino. 2015. Workplace settings and wellbeing: Greenspace use and views contribute to employee wellbeing at peri-urban business sites. *Land. Urban Plan.* 138: 32–40.

Gonzalez, M.T., T. Hartig, G.G. Patil, E.W. Martinsen, and M. Kirkevold. 2010. Therapeutic horticulture in clinical depression: a prospective study of active components. *J. Adv. Nursing* 66 (9): 2002–2013.

Groenewegen, P.P., A.E. van den Berg, J. Maas, R.A. Verheij, and S. de Vries. 2012. Is a green residential environment better for health? If so, why? *Annals Assoc. American Geographers* 102 (5): 996–1003.

Hall, C. and M. Dickson. 2011. Economic, environmental, and health/well-being benefits associated with green industry products and services: A review. *J. Environ. Hort.* 29 (June): 96–103.

Hartig, T., R. Mitchell, S. De Vries, and H. Frumkin. 2014. Nature and health. *Annual Review of Public Health* 35 207–228.

Horiuchi, M., J. Endo, N. Takayama, K. Murase, N. Nishiyama, H. Saito, and A. Fujiwara. 2014. Impact of viewing vs. not viewing a real forest on physiological and psychological responses in the same setting. *Intl. J. Environ. Res. Public Health* 11 (10): 10883–10901.

Husti, A.M., I. Ciobanu, R. Cicevan, I. Neacsu, and M. Cantor. 2015. Image of ornamental plants in work environments and their effect on employees. *Agricultura* 95 (3–4): 3–4.

Ikei, H., M. Komatsu, C. Song, E. Himoro, and Y. Miyazaki. 2014. The physiological and psychological relaxing effects of viewing rose flowers in office workers. *J. Physiol. Anthro.* 33 (1): 6.

Ikei, H., J. Lee, C. Song, M. Komatsu, E. Himoro, and Y. Miyazaki. 2013. Physiological relaxation of viewing rose flowers in high school students [Article in Japanese, English abstract]. *Jpn. J. Physiol. Anthro.* 18:97–103.

Im, S.G., H. Choi, Y.H. Jeon, M.K. Song, W. Kim, and J.M. Woo. 2016. Comparison of effect of two-hour exposure to forest and urban environments on cytokine, anti-oxidant, and stress levels in young adults. *Intl. J. Environ. Res public health* 13 (7): 625.

Jiang, B., D. Li, L. Larsen, and W. Sullivan. 2016. A dose-response curve describing the relationship between urban tree cover density and self-reported stress recovery. *Environ. Behav.* 48(4): 607–629.

Joung, D., G. Kim, Y. Choi, H. Lim, S. Park, J.M. Woo, and B.J. Park. 2015. The prefrontal cortex activity and psychological effects of viewing forest landscapes in autumn season. *Intl. J. Environ. Res. Public Health* 12 (7): 7235–7243.

Jumeno, D. and H. Matsumoto. 2016. The effects of indoor foliage plants on perceived air quality, mood, attention, and productivity. *J. Civil Eng. Arch. Res.* 3 (4): 1359–1370.

Jumeno, D. and H. Matsumoto. 2013. The effects of the number of indoor foliage plants on productivity, stress and attention, Proceedings of CLIMA. Prague, Czech Republic June 16-19, 2013. 8:1–9.

Kardan, O., P. Gozdyra, B. Misic, F. Moola, L.J. Palmer, T. Paus, and M.G. Berman. 2015. Neighborhood greenspace and health in a large urban center. *Scientific Reports* 5: 11610.

Kelz, C., G.W. Evans, and K. Röderer. 2015. The restorative effects of redesigning the schoolyard: A multi-methodological, quasi-experimental study in rural Austrian middle schools. *Environment and Behavior* 47 (2): 119–139.

Keniger, L., K. Gaston, K. Irvine, and R. Fuller. 2013. What are the benefits of interacting with nature? *Intl. J. Environ. Res. Public Health* 10 (3): 913–935.

Kim, T.H., G.W. Jeong, H.S. Baek, G.W. Kim, T. Sundaram, H.K. Kang, and J.K. Song. 2010. Human brain activation in response to visual stimulation with rural and urban scenery pictures: A functional magnetic resonance imaging study. *Sci. Total Environ.* 408 (12): 2600–2607.

Kjellgren, A. and H. Buhrkall. 2010. A comparison of the restorative effect of a natural environment with that of a simulated natural environment. *J. Environ. Psych.* 30 (4): 464–472.

Korpela, K., J. De Bloom, M. Sianoja, T. Pasanen, and U. Kinnunen. 2017. Nature at home and at work: Naturally good? Links between window views, indoor plants, outdoor activities and employee well-being over one year. *Land. Urban Plan.* 160: 38–47.

Kotzaki, Y. 2014. Medium- to long-term psychological support for women living in areas affected by the great East Japan Earthquake empirical studies on the impact of horticultural therapy. *J Trauma Treatment* 3 187–189.

Kotzaki, Y., H. Takeuchi, A. Sekiguchi, T. Araki, K. Takahashi, Y. Yamamoto, T. Nozawa, Y. Taki, and R. Kawashima. 2015. Positive effects of the victim by the growing of plants after great East Japan earthquake. *Intl. J. Recent Sci. Res.* 6 (2): 2850–2858.

Larson, L.R., V. Jennings, and S.A. Cloutier. 2016. Public parks and wellbeing in urban areas of the United States. *PLoS ONE* 11 (4): e0153211.

Lee, A.C. and R. Maheswaran. 2011. The health benefits of urban green spaces: a review of the evidence. *J. Public Health* 33 (2): 212–222.

Lee, J., Y. Tsunetsugu, N. Takayama, B.-J. Park, Q. Li, C. Song, M. Komatsu, H. Ikei, L. Tyrväinen, and T. Kagawa. 2014. Influence of forest therapy on cardiovascular relaxation in young adults. *Evidence-Based Compl. Alt. Med.* 1–7 doi: 10.1155/2014/834360.

Lee, K.E., K.J.H. Williams, L.D. Sargent, N.S.G. Williams, and K.A. Johnson. 2015. 40-second green roof views sustain attention: The role of micro-breaks in attention restoration. *J. Environmental Psychology* 42: 182–189.

- Lemieux, C.J., P.F. Eagles, D.S. Slocombe, S.T. Doherty, S.J. Elliott, and S.E. Mock. 2012. Human health and well-being motivations and benefits associated with protected area experiences: An opportunity for transforming policy and management in Canada. *Parks* 18 (1): 71–85.
- Li, D. and W.C. Sullivan. 2016. Impact of views to school landscapes on recovery from stress and mental fatigue. *Land. Urban Plan.* 148: 149–158.
- Ling, C. and A. Dale. 2011. Nature, place and the creative class: Three Canadian case studies. *Land. Urban Plan.* 99 (3-4): 239–247.
- Lottrup, L., U.K. Stigsdotter, H. Meilby, and A.G. Claudi. 2015. The workplace window view: a determinant of office workers' work ability and job satisfaction. *Land. Res.* 40 (1): 57–75.
- Luck, G.W., L.T. Smallbone, and R. O'Brien. 2009. Socio-economics and vegetation change in urban ecosystems: patterns in space and time. *Ecosystems* 12 (4): 604–620.
- McCaffrey, R., C. Hanson, and W. McCaffrey. 2010. Garden walking for depression: a research report. *Holistic Nursing Practice* 24 (5): 252–259.
- Mennis, J., M. Mason, and A. Ambrus. 2018. Urban greenspace is associated with reduced psychological stress among adolescents: A Geographic Ecological Momentary Assessment (GEMA) analysis of activity space. *Landscape and Urban Planning* 174:1–9.
- Mensah, C.A., L. Andres, U. Perera, and A. Roji. 2016. Enhancing quality of life through the lens of green spaces: A systematic review approach. *International Journal of Wellbeing* 6 (1):142–163.
- Nieuwenhuis, M., C. Knight, T. Postmes, and S.A. Haslam. 2014. The relative benefits of green versus lean office space: three field experiments. *J. Experi. Psych. - Applied* 20 (3): 199–214.
- Nutsford, D., A. Pearson, and S. Kingham. 2013. An ecological study investigating the association between access to urban green space and mental health. *Public Health* 127 (11): 1005–1011.
- Oppezzo, M. and D.L. Schwartz. 2014. Give your ideas some legs: The positive effect of walking on creative thinking. *J. Experi. Psych: Learning, Memory, Cog.* 40 (4): 1142.
- Park, B.J., Y. Tsunetsugu, T. Kasetani, T. Kagawa, and Y. Miyazaki. 2010. The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing): evidence from field experiments in 24 forests across Japan. *Environmental health and preventive medicine* 15 (1): 18.
- Park, S., A. Lee, K. Son, W. Lee, and D. Kim. 2016. Gardening intervention for physical and psychological health benefits in elderly women at community centers. *HortTech* 26 (4): 474–483.
- Park, S., Song, C., Oh, Y., Miyazaki, Y. and K. Son. 2017. Comparison of physiological and psychological relaxation using measurements of heart rate variability, prefrontal cortex activity, and subjective indexes after completing tasks with and without foliage. *Int. J. Environ. Res. Public Health* 14:1087 doi:10.3390/ijerph14091087.
- Pouya, S., E. Bayramoğlu, and Ö. Demirel. 2016. Restorative garden as a useful way to relieve stress in megacities, a case study in Istanbul. *İnonu Üniversitesi Sanat ve Tasarım Dergisi* 6 (13): 355–369.
- Raanaas, R.K., K.H. Evensen, D. Rich, G. Sjøstrøm, and G. Patil. 2011. Benefits of indoor plants on attention capacity in an office setting. *Journal of Environmental Psychology* 31 (1): 99–105.
- Roe, J.J., P.A. Aspinall, P. Mavros, and R. Coyne. 2013a. Engaging the brain: the impact of natural versus urban scenes using novel EEG methods in an experimental setting. *Environ. Sci.* 1 (2): 93–104.
- Roe, J.J., C.W. Thompson, P.A. Aspinall, M.J. Brewer, E.I. Duff, D. Miller, R. Mitchell, and A. Clow. 2013b. Green space and stress: Evidence from cortisol measures in deprived urban communities. *Int. J. Environ. Res. Public Health* 10 (9): 4086–4103.
- Russell, R., A.D. Guerry, P. Balvanera, R.K. Gould, X. Basurto, K.M. Chan, S. Klain, J. Levine, and J. Tam. 2013. Humans and nature: how knowing and experiencing nature affect well-being. *Annual Rev. Environ. Res.* 38 473–502.
- Ryan, C.O., W.D. Browning, J.O. Clancy, S.L. Andrews, and N.B. Kallianpurkar. 2014. Biophilic design patterns: emerging nature-based parameters for health and well-being in the built environment. *International Journal of Architectural Research: ArchNet-IJAR* 8 (2): 62–76.
- Salingaros, N.A. 2012. Beauty, life, and the geometry of the environment. Chapter 2 63–103.
- Schutte, A. 2017. Impact of urban nature on executive functioning in early and middle childhood. *Env. and Behavior* 49(1):3–30. doi.org/10.1177/0013916515603095.
- Sekiguchi, A., Y. Kotozaki, M. Sugiura, R. Nouchi, H. Takeuchi, S. Hanawa, S. Nakagawa, C.M. Miyauchi, T. Araki, A. Sakuma, Y. Taki, and R. Kawashima. 2015. Resilience after 3/11: structural brain changes 1 year after the Japanese earthquake. *Molecular Psych.* 20 (5): 552–554.
- Smith, A. and M. Pitt. 2011. Healthy workplaces: plantscaping for indoor environmental quality. *Facilities* 29 (3/4): 169–187.
- Song, C.R., H. Ikei, M. Kobayashi, T. Miura, M. Taue, T. Kagawa, Q. Li, S. Kumeda, M. Imai, and Y. Miyazaki. 2015. Effect of Forest Walking on Autonomic Nervous System Activity in Middle-Aged Hypertensive Individuals: A Pilot Study. *International Journal of Environmental Research and Public Health* 12 (3): 2687–2699.
- Stigsdotter, U.K. 2015. Nature, health and design. *Alam Cipta* 8: 89–96.
- Stigsdotter, U.K., O. Ekholm, J. Schipperijn, M. Toftager, F. Kamper-Jørgensen, and T.B. Randrup. 2010. Health promoting outdoor environments-Associations between green space, and health, health-related quality of life and stress based on a Danish national representative survey. *Scandinavian J. Soc. Med.* 38 (4): 411–417.
- Taylor, A.F. and F.E. Kuo. 2009. Children with attention deficits concentrate better after walk in the park. *J. Attention Disorders* 12 (5): 402–409.
- Thompson, C.W., P. Aspinall, J. Roe, L. Robertson, and D. Miller. 2016. Mitigating stress and supporting health in deprived urban communities: the importance of green space and the social environment. *Int. J. Environ. Res. Public Health* 13 (4): 440.
- Thompson, C.W., J. Roe, P. Aspinall, R. Mitchell, A. Clow, and D. Miller. 2012. More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns. *Land. Urban Plan.* 105 (3): 221–229.
- Townsend, M. and R. Weerasuriya. 2010. Beyond blue to green: The benefits of contact with nature for mental health and well-being. University Australia Deakin, Melbourne, Australia. 152 p.
- Triguero-Mas, M., P. Davvand, M. Cirach, D. Martínez, A. Medina, A. Mompert, X. Basagaña, R. Gražulevičienė, and M.J. Nieuwenhuijsen. 2015. Natural outdoor environments and mental and physical health: relationships and mechanisms. *Environ. Intl.* 77: 35–41.
- Tyrväinen, L., A. Ojala, K. Korpela, T. Lanki, Y. Tsunetsugu, and T. Kagawa. 2014. The influence of urban green environments on stress relief measures: A field experiment. *Journal of Environmental Psychology* 38: 1–9.
- van den Berg, A. and M. Custers. 2011. Gardening promotes neuroendocrine and affective restoration from stress. *J. Health Psych.* 16 (1): 3–11.
- van den Berg, A.E., J.E. Wesseliuss, J. Maas, and K. Tanja-Dijkstra. 2017. Green walls for a restorative classroom environment: a controlled evaluation study. *Environ. Behav.* 49 (7): 791–813.
- van Dillen, S.M., S. de Vries, P.P. Groenewegen, and P. Spreeuwenberg. 2012. Greenspace in urban neighbourhoods and residents' health: adding quality to quantity. *J. Epidemiol. Community Health* 66 (6): e8. doi: 10.1136/jech.2009.104695.
- van Duijn, B., J. Klein Hesselink, M. Kester, and Jansen en Hilde Spitters. 2011. 'Planten in de klas' [plants in the classroom]. Productschap Tuinbouw (Product Board for Horticulture), Rapport Project.
- Vedder, A., L. Smigielski, E. Gutyrchik, Y. Bao, J. Blautzik, E. Pöppel, and E. Russell. 2015. Neurofunctional correlates of environmental cognition: an fMRI study with images from episodic memory. *Plos One* 10 (4): e0122470.

Watts, G. 2017. The effects of “greening” urban areas on the perceptions of tranquillity. *Urban Forestry Urban Greening* 26: 11-17.

White, M.P., S. Pahl, K. Ashbullby, S. Herbert, and M.H. Depledge. 2013. Feelings of restoration from recent nature visits. *J. Environ. Psych.* 35: 40-51.

White, M.P., S. Pahl, B.W. Wheeler, M.H. Depledge, and L.E. Fleming. 2017. Natural environments and subjective wellbeing: Different types of exposure are associated with different aspects of wellbeing. *Health place* 45: 77-84.

Wilson, M.R. 2015. Green play: Restorative neurobehavioral effects on ADHD children. Montreat College, ProQuest, Master of Science in Environmental Education. 65 p.

Windhager, S., K. Atzwanger, F.L. Bookstein, and K. Schaefer. 2011. Fish in a mall aquarium—An ethological investigation of biophilia. *Land Urban Plan.* 99 (1): 23–30.

Wolf, K. and E. Housley. 2014. Reflect & restore: urban green space for mental wellness. The TKF Foundation, Annapolis, MD. 14 p.