Challenges of urban life

More than 50% of the world’s population now live in cities, and in some nations, such as the United States, the proportion is above 80%. Further concentration in urban areas is forecast. Cities are the centers of economic activity, innovation, and complex social networks. People have to be at their best to compete, even survive, in the urban context. As more people move into urban centers, they live within places and conditions that impose demands that can compromise health, including mental health and function. This includes such challenges as daily commuting and work tasks, digital connections that link one to the world 24/7, and money worries. Urban life is complicated and includes many stressors. In addition to the health consequences of major stress events (such as loss of a job or loved one), the medical community now recognizes that the constant pressure of urban life generates chronic stress and anxiety, with potentially debilitating effects. Everyday stressors, combined with other factors, can lead to both physical and mental health issues.

Mental health significance

Mental health is fundamental to good health and quality of life, is an essential personal resource, and contributes to effective functioning of individuals, families, communities, and society. The International Mental Health Research Organization claims that one in five people is afflicted by a mental health disorder, and that mental illness is the number one cause of adult disability worldwide. It is estimated that by the year 2020 mental health disorders will rise to 15% of the global burden of disease, and depression will constitute one of the largest health problems worldwide (Murray and Lopez, 1996). The World Health Organization has recognized the need to address mental health as an integral part of improving overall health and well-being throughout the world, noting that ‘there is no health without mental health’ (Barry, 2009).

Health promotion

The biomedical approach to health has tended to concentrate on the individual’s genetic and biological makeup, and their personal lifestyle choices and safety practices as causal underpinnings of health problems. The focus is thus on what an individual can do to reduce or eliminate problems. A more recent health promotion outlook considers the physical and (especially) social factors that may be beyond the individual’s control yet contribute to their level of well-being. Health promotion programs encourage key factors for positive health, while reducing risk factors for poor health. Such programs aim to improve the full range of personal, social, economic, and environmental determinants that influence the health status of individuals and populations. Both social and physical environments play a role in a person’s response to daily challenges.

Metro nature experience and mental health

Everyday spaces and places within cities are important for improved public health. In addition to meeting basic needs like clean air and water, a rapidly expanding research literature indicates that metro nature promotes the state of mind that can both help people cope with the complexities of urban living and be more productive (Wolf and Rob-
Metro nature is an inclusive term describing the diverse expressions of nearby nature in cities, including parks, gardens, street trees, native ecosystem patches, community gardens, and engineered nature, such as green walls and green roofs.

The horticulture sciences and associated industries support improved development of food, ornamental, and ecological plant materials. The practices and products of horticulture contribute directly to metro nature, as plants appear to be an essential element in outdoor settings that heal, restore, and support urban residents. A recent research review and benefits analysis evaluated the health promotion role of landscape and plants in many urban settings, and concluded that metro nature can potentially reduce national and local health care costs (Wolf et al., 2015).

The purpose of this article is to provide a brief overview of the research literature concerning metro nature experiences and mental health promotion. One perspective is that nearby nature experiences may alleviate diagnosed disorders or illness. In addition, having nature in one’s everyday environment potentially supports general functioning and productivity. Having quality landscaping and vegetation in and around the places where people live, work, learn, and play is a low cost investment for disease prevention and health promotion.

State of the science

Natural systems in cities, if well planned and designed, generate a wide range of environmental services that are the foundation for healthy urban living, such as clean air, clean and plentiful water, climate stabilization, and reduced hazards. Social and public health scientists are now partnering with biophysical scientists to learn more about the socio-ecological systems of cities. This evolution of scale and outlook includes research engagement concerning questions of environments, nature, and human response. The integrated research employs the science conventions of research design, sampling, data collection or secondary data use, evaluating confounds, and statistical analysis or modeling, as well as social qualitative methodologies. The result is an extensive scientific literature about the multiple, somewhat intangible co-benefits and urban ecosystem services provided by metro nature. Green Cities: Good Health is a web portal that summarizes thousands of scientific studies that have been published internationally about the human health benefits associated with views of nature and activities within green spaces (Wolf, 2015). A critical mass of scientific evidence suggests that nature in the city is not just nice to have, but is essential for quality human habitat. Scientific methods have evolved. Several general trends are observed. In the 1970s to 1980s numerous studies of landscape preference and perception, and self-reports of mood and reduced stress, initiated the realization of subconscious nature dependence. Soon to follow was the emergence of evidence-based theories, including Attention Restoration Theory and Stress Reduction Theory. In the 1990s through the first decade of the century ‘big data’ studies combined vegetation remote sensing and public health records to establish population level correlations between nature presence (e.g. trees, parks) and health outcomes (e.g. physical activity, stress response, infant birth weight, cardiovascular and respiratory events). In recent years all methods are in use, plus experimental research about inequitable distribution of urban natural resources with health consequences; understanding causal mechanisms, such as neurology, cognition, allergy and inflammatory response, endocrine origins, immune function, and bioaccumulation; and efforts to determine nature dose response (e.g. experience frequency, nature type and character, demographic variability). Greater understanding of causal mechanisms is a key interest at this time.

Illness or disorders and nature response

Several topics about mental illness and disorders are presented here, each represented by several to tens of studies in the scientific

<table>
<thead>
<tr>
<th>Likely setting</th>
<th>Best</th>
<th>Worst</th>
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<tbody>
<tr>
<td>Green (e.g. fishing, soccer)</td>
<td>85% (17)</td>
<td>15% (3)</td>
</tr>
<tr>
<td>Ambiguous (rollerblading, playing outside)</td>
<td>56% (43)</td>
<td>44% (34)</td>
</tr>
<tr>
<td>Not green (video games, TV)</td>
<td>43% (53)</td>
<td>57% (69)</td>
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</tbody>
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Numbers in parentheses indicate the number of respondents by category for outcomes.
All income groups and for both boys and girls, outdoor and indoor settings. This was true for symptoms than children who played in built environments. Children with Attention Deficit Disorder (ADD) can be the source of salutary effects. From ‘cradle to grave’ metro nature can be an important supplement to established drug-based and behavioral treatments in a U.S. national study parents recorded that children with Attention Deficit Hyperactivity Disorder (ADHD) who played regularly in green play settings had milder symptoms than children who played in built outdoor and indoor settings. This was true for all income groups and for both boys and girls (Faber Taylor and Kuo, 2009).

Attention Deficit Disorder (ADD)
As of 2011, approximately 11% of children 4-17 years of age (6.4 million) in the U.S. have been diagnosed with attention disorders, conditions that have detrimental effects on social, cognitive, and psychological growth. Childhood Attention Deficit Disorder (ADD) symptoms can be reduced through activities in green settings and “green time” may be an important supplement to established drug-based and behavioral treatments in a U.S. national study parents recorded that children with Attention Deficit Hyperactivity Disorder (ADHD) who played regularly in green play settings had milder symptoms than children who played in built outdoor and indoor settings. This was true for all income groups and for both boys and girls (Faber Taylor and Kuo, 2011).

The discovery was consistent with an earlier finding that the “greenness” of a child’s home did not significantly affect ADD expression, but “greenness” of play setting was related to a reduction of symptom severity (see Table 3) (Taylor et al., 2002). Activity was not solely the source of benefit, as children with ADHD concentrated better after a walk in a park than after a downtown walk or a neighborhood walk, and twenty minutes in a park setting was sufficient to elevate attention performance relative to the same amount of time in the other settings (Faber Taylor and Kuo, 2009). Children with attention disorders may benefit from spending more time in green settings on a daily basis, and during attention demanding activities (for instance, while in school or doing homework).

Illness and cognition
As people get older they may be more inclined to experience serious illnesses. Clinical reports have noted the loss of ability to concentrate and increased distractibility in adult patients experiencing serious illness. A diagnosis of cancer is a life-changing event. Studies have tested the correlation between stress and cognitive function under various conditions in women diagnosed with breast cancer. Cognitive impairment (including memory and ability to process information) may be experienced even before the start of a cancer treatment (Cimprich et al., 2005). This is likely due to the mentally-demanding and stressful nature of diagnostic tests and treatment planning. Participation in activities and/or interacting with natural environments has been shown to ameliorate and help improve mental fatigue both before and after breast cancer treatment or surgery (Cimprich and Ronis, 2003).

Stress relief
Stress is a combination of physiological responses and self-perceptions about life situations. Stress can be experienced at any time in life, however, such responses are especially prominent at later age due to physical, psychological, and social changes, for example, in response to chronic disease, disability, death of loved ones, or financial hardship (Orsega-Smith et al., 2004). Stress can also negatively affect people’s perceptions of their well-being, including a poor perception of their own mental health. Both chronic and peak stress can contribute to depression, schizophrenia, anxiety, exhaustion, and fatigue syndromes (Grahn and Stigsdotter, 2010). Physical activity is linked to improvements in mental health and stress (USDHHS, 1996) and many studies connect urban park use to decreased stress levels and improved moods. In one study, the longer participants stayed in a park, the less stress they exhibited (Hull and Michael, 1995). Multiple studies have shown that relaxation and stress reduction are significant benefits associated with spending time in green areas (Davis, 2004). Given the consistent findings, how much nature is enough? A dose-response study revealed a positive, linear association between the density of urban street trees (ranging from 2 to 62% canopy cover) and self-reported stress recovery, so every tree matters (Jiang et al., 2014).

Depression
Depression also occurs at any age, but the rate of diagnosis and drug-aided treatment appears to increase in older people. The experience of depression can be helped through improved social connections (to decrease the feeling of isolation) and exercise, both of which are promoted by having nearby green outdoor spaces. In one study, adults with major depression were asked to take a 50 minute walk in either a park setting or a built setting in a city. Participants walking in the park setting exhibited significantly greater increases in memory span and mood, suggesting that interacting with nature may be useful as a supplement to clinical depression treatments for major depression disorder (MDD) (Berman et al., 2012). Another study investigated MDD and found that an exercise program can be just as effective as antidepressants in reducing depression among patients (Blumenthal et al., 1999). The presence of green spaces as a motivator to encourage exercise is promising in treating depression symptoms.

Alzheimer’s and dementia
As people age, they are more prone to loss of cognitive function, including Alzheimer’s disease. People with Alzheimer’s and other

Table 2: Post construction observations of dementia patient behaviors in residential care facilities (from Mooney and Nicell, 1992).

<table>
<thead>
<tr>
<th>Type of incident</th>
<th>Facilities with added gardens</th>
<th>Control-facilities with no gardens</th>
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<tbody>
<tr>
<td></td>
<td>pre</td>
<td>post</td>
</tr>
<tr>
<td>Violence</td>
<td>0.3333</td>
<td>0.2678</td>
</tr>
<tr>
<td>All incidents</td>
<td>2.6274</td>
<td>2.5357</td>
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</tbody>
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Morning and afternoon paired observations were conducted by nursing staff across facilities.
Well-designed outdoor environments and healing gardens can provide ambient support for older adults having reduced cognitive capabilities. Photo by TKF Foundation.

Experiences of natural environments provide opportunities for directed attention restoration for office workers. Photo by Guy Kramer.

dementia disorders experience memory impairment, intellectual decline, temporal and spatial disorientation, impaired ability to communicate and make logical decisions, and decreased tolerance to high and moderate levels of stimulation. Studies have found that nature experiences can be of particular benefit. Exposure to gardens can improve quality of life and function of dementia patients by reducing negative behaviors up to 19% (Table 2) (Mooney and Nicell, 1992). Those patients who have access to gardens that are designed to positively stimulate the senses and promote positive memories and emotions are less likely to express negative reactions and fits of anger. After gardening activities, dementia and stroke patients have exhibited improved mobility and dexterity, increased confidence, and improved social skills (Rappe and Kivelä, 2005; Ulrich, 2002).

The value of healing gardens is evidenced by numerous studies. Reduction in behavioral disorders such as agitation, aggressive behavior, and aimless wandering, improvement in appetite, better sleep, and increased regular sleep patterns, as well as improved general health and nutritional status (Jonveaux et al., 2013).

Well-designed outdoor environments and healing gardens can provide prosthetic support for dementia patients to compensate for reduced cognitive capabilities (Mooney and Nicell, 1992). For example, spaces that have dead-ends or are crowded can increase frustration and anxiety in Alzheimer’s-diseased residents. Supportive outdoor spaces include these design features: looped pathways, tree groves or sites to act as landmarks for orientation, non-toxic plants, even, well-lit paths with handrails; seating areas with the suggestion of privacy; and use of low-key fragrances and colors to soothe rather than negatively stimulate users of a space.

**Everyday function and needs**

In addition to the health benefits associated with disease or disorder, having a nature backdrop for everyday life is important. Both visual access and being within green space helps to restore the mind’s ability to focus. Encounters with nearby nature help alleviate mental fatigue by relaxing and restoring the mind. Within built environments, parks and green spaces are settings for cognitive respite, as they encourage social interaction and de-stressing through exercise or conversation, and provide calming settings.

**Attention fatigue and recovery**

In today’s lifestyles and work, we must focus our attention on critical information or tasks. To accomplish tasks and complete projects, a person must suppress mental distractions and impulses. More generally, urban environments heavily tax the voluntary attention control that is used to filter urgent but largely irrelevant stimuli as we go about our daily lives (such as paying attention at a crosswalk or dealing with smart phone texts). In no other time in human history has there been an equivalent demand on cognitive resources. A person’s psychological ability to sustain directed attention can be depleted. The result can be feelings of irritability and frustration and an inability to stay on task or bring up key ideas from memory.

Attention Restoration Theory describes the power of nature to replenish the capacity for attention through unconscious, cognitive processes in response to natural landscapes (Kaplan and Kaplan, 1989). Green spaces that are rich in certain qualities allow directed attention to recover. The inherent characteristics found in green spaces can provide stimulation that places little demand on a person’s ability to maintain concentration. The experience of interacting with natural environments provides opportunities for the restoration of one’s mental capabilities.

Ongoing research continues to test for the nature conditions that support cognitive restoration. The attributes of certain natural environments provide opportunities for involuntary attention. It is important to note that the restorative power of nature can play out in a matter of a few minutes and can be gained by simply viewing a green space as well as moving within it (Berman et al., 2008, Bratman et al., 2015). The best places have a sense of “fascination”, “being away”, “extent”, and “compatibility”, conditions that are rarely experienced in highly-built hardscapes (Kaplan and Berman, 2010). One doesn’t have to leave the city and travel to dramatic parks or landscapes to experience the cognitive enhancement that nature provides. Unless one is aware of the research, the dynamic interplay of attention fatigue and the restorative potential of metro nature may be below consciousness.

**Work and school**

Office workers may spend entire days indoors and at desks and computer screens. Some find that plants make for more attractive, pleasant, and healthy work environments (Grinde and Patil, 2009, Bringslimark et al., 2007), but what impact do plants and nature views have on work performance? Studies show improved employee morale, decreased absenteeism, and increased worker efficiency result from such workplace enhancements (Lohr et al., 1996). Having plants within view of workstations decreases both illness incidence (Fjeld et al., 1998), and the amount of self-reported sick leave (Kaplan, 1993). One study found that workers with workstation views that included green elements were more satisfied at work and had more patience, less frustration, increased enthusiasm for work,
Horticulture co-benefits are possible if landscapes are designed for multiple functions within urban settings. Photo by Kathleen Wolf.

and fewer health problems (Kaplan, 1993). Not having nature views or indoor plants is associated with higher levels of tension and anxiety in office workers (Chang and Chen, 2005). Such responses may be expressions of the connections between attention fatigue and nature-aided cognitive recovery.

Learning, like tasks at work, requires focused, directed attention and high-level cognitive functioning. When plants were added to a college computer lab, the study participants were more productive (with 12% quicker reaction times on tested computer tasks) and showed less stress – though there was no difference in number of errors made on the test. Additionally, participants reported feeling more attentive and better able to concentrate in the presence of plants (Lohr et al., 1996). College students with more natural views from their dorm windows scored higher on tests of capacity to direct attention (CDA) and rated themselves as able to function more effectively (Tennesen and Cimprich, 1995). In another study of college students, those who participated in a nature walk performed higher on a subsequent CDA test than those who went on an urban walk or relaxed in a comfortable room with magazines and light music prior to the test (Hartig et al., 1993).

Meditation and mindfulness

Increasingly, as people are feeling overwhelming demands in their lives, there is a growing interest in meditation and mindfulness. Benefits of meditation include improved cognitive functions, longer attention spans, and improved perceptual ability, memory, intelligence, and empathy (Slagter et al., 2011, Desbordes et al., 2012). Practicing meditation may also reduce stress-induced immune system decline and behaviors (Pace et al., 2009). Scientists are not yet sure why these responses occur, but generally agree on the benefits. Meditation is an act of intentional focus on any number of things, including repetition of a word or phrase, an object in the visual field, sensations, or specific thoughts or personal reflections. Nature offers unlimited opportunities as both setting and focal point for meditation and mindfulness.

Mindfulness exercises include similar strategies of focus to rein in the wandering mind (James, 2015). In addition, mindfulness is the condition of ‘being attentive to and aware of what is taking place in the present’ with resulting benefits. Mindfulness enhances self-regulated functioning, that is, mindfulness sensitizes individuals to inner feedback signals, allowing people to better regulate and guide themselves toward meeting their needs (Brown and Ryan, 2003). Mindfulness enhances the richness and vitality of moment-to-moment experiences. Mindfulness training may also improve attention-related activities, such as work or study, by enhancing some specific brain areas that support attention (Jha et al., 2007). In one study, just four sessions of mindfulness meditation training significantly improved visuo-spatial processing, working memory, and executive functioning; study participants had greater ability to sustain attention (Zeidan et al., 2020).

Nature settings support meditation and mindfulness activities. Studies of Attention Restoration Theory find that nature is inherently interesting and supports “soft fascination”, thereby helping one to maintain focus with a low level of mental exertion. Nature, which is filled with intriguing stimuli, modestly grabs attention in a bottom-up fashion, allowing top-down directed-attention abilities a chance to replenish (Berman et al., 2008). Within even the smallest spaces, one can find a living thing, clouds, rustling leaves, or flitting birds that one can calmly observe. Often a bit of nature invites one to settle in and develop an appreciation as one begins to notice remarkable details.

Creativity

Creativity is another potential benefit of metro nature experiences. For instance, in one study people performed better on creative tasks in rooms having foliage plants, versus those without, and the authors proposed that nature may provide inspiration and a source of stimulation for creativity (Shibata and Suzuki, 2002). In a study of creative professionals in Denmark, it was found that experiences of nature enhance creativity. How? Nature can evoke creative ways of thinking by making a person more curious, inspiring new ideas, and introducing more flexibility in how one thinks about a problem. It was found that nature contact may be especially helpful in two early phases of the creative process (Plambech and Konijnendijk van den Bosch, 2015). Creative individuals reported finding novel ideas in the project preparation phase by observing the patterns and visual structures in nature. People used nature in the incubation phase as a space to reflect and develop more definition for a project or to take a break and regain perspective. Feelings of peace, quietness or serenity, and beauty within nature, enhanced by the suggestion of mystery, were the landscape traits that creative people identified.

Horticulture for health

Horticulture, at its core, is about selecting, growing, and managing intensively-produced plants for a wide range of human uses and benefits. The applications of horticultural science and best practices are endless, and have improved lives, places, and ecosystems. As the world’s population continues to concentrate in cities there are greater needs for plants...
and the many benefits and services that they provide, from food to shelter to aesthetics. Plants and landscapes are also penultimate multi-taskers, while selected and installed for one purpose, careful design of a site or collection of plants can generate co-benefits. Examples are permaculture or urban forestry. Scientific understanding of the relationship between public health and nearby nature is growing rapidly, adding another level of purpose to horticulture applications in cities. Within certain therapy or clinical situations, having quality landscapes may ease symptoms, perhaps even causes, of mental illness and disorders. And for the general populace

References


> Kathleen L. Wolf

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Dr. Kathleen Wolf is a Research Social Scientist with the College of the Environment, University of Washington, and is a key collaborator with the US Forest Service Pacific NW Research Station on a research program about Urban Forestry and Stewardship. Since receiving her Ph.D. from the University of Michigan, Dr. Wolf has done research to better understand the human dimensions of urban forestry and urban ecosystems. She has also worked professionally as a landscape architect and as an environmental planner. Kathy’s studies are based on the principles of environmental psychology, her professional mission is to discover, understand and communicate human behavior and benefits, as people experience nature in cities and towns. Moreover, Kathy is interested in how scientific information can be integrated into local government policy and planning. She is a member of, or has served with, national organizations that promote nature in cities: the Environmental Design Research Association, the International Society of Arboriculture, the Society of American Foresters, the Transportation Research Board national committee on Landscape and Environment, the Washington State Community Forestry Council, as well as a technical contributor on human well-being to the Sustainable Sites Initiative, and Research Advisor to the TKF Foundation’s Nature Sacred program. Dr. Wolf has presented her research throughout the United States, in Canada, Europe, Australia and Japan. An overview of Dr. Wolf’s research programs can be found at www.naturewithin.info, and a review of nature-based health benefits at Green Cities: Good Health. www.greenhealth.washington.edu. E-mail: kwolf@uw.edu

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