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Does Access to Green Space Impact the Mental Well-being of Children: A Systematic Review

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ABSTRACT

Problem: An increasing body of research is showing associations between green space and overall health. Children are spending more time indoors while pediatric mental and behavioral health problems are increasing. A systematic review of the literature was done to examine the association between access to green space and the mental well-being of children.
Eligibility Criteria: Articles were limited to English language, ages 0–18 years, and publish date 2012–2017.
Sample: The search yielded 341 articles in Ovid, 81 in Pub Med and 123 in Scopus. Articles that were not original research and that were not a pediatric population were excluded. Twelve articles fit the selection criteria.
Results: Twelve articles relating to green space and the mental well-being of children were reviewed. Three articles outside the date criteria were included as they are cited often in the literature as important early research on this topic.
Conclusions: Access to green space was associated with improved mental well-being, overall health and cognitive development of children. It promotes attention restoration, memory, competence, supportive social groups, self-discipline, moderates stress, improves behaviors and symptoms of ADHD and was even associated with higher standardized test scores.
Implications: Scientific evidence demonstrating the mental health benefits of access to nature for children can guide policy and urban planning, while nursing interventions and initiatives can enhance health by promoting outdoor play, educating patients and families, advocating for recess times and green environments at school as well as healing gardens in hospital settings.

Background

There is a rapidly growing body of research examining the relationship between green space and mental and physical well-being. Green space is defined as "an area of grass, trees, or other vegetation set apart for recreational or aesthetic purposes in an otherwise urban environment" (Oxford University Press, 2017). Green space has been associated with health promoting benefits for adults and children including enhanced mood and self-esteem (Barton & Pretty, 2010), a buffer for daily stress (Wells & Evans, 2003), greater self-discipline (Taylor, Kuo, & Sullivan, 2002), lower levels of depression, anxiety and stress (Beyer et al., 2014), improved mental and social health, increased physical activity (Cox et al., 2017), reductions in violence and crime (Bogar & Beyer, 2016), and lowering health related inequalities (Mitchell & Popham, 2008). Literature suggests that developing access to nature could be an important investment in the health and well-being of communities.

Recently, research has focused on the relationship between green space and child development, mental well-being, behaviors and cognition. In 2016, researchers from the Center for Disease Control reported that one out of seven children in the United States ages two to eight years old suffers from a mental, behavioral, or developmental disorder (Bitsko et al., 2016). Disorders include attention-deficit/hyperactivity disorder (ADHD), depression, anxiety problems, behavioral or conduct problems, and learning or developmental delays. Evidence that children are spending less time in nature than previous generations (Clements, 2004) has prompted researchers to explore the connection between exposure to green spaces and rising mental and behavioral problems.

Children living in disadvantaged urban areas have a greater chance of having an emotional disorder (Rudolph, Stuart, Glass, & Merikangas, 2014) and being diagnosed with depression/anxiety or ADHD/disruptive behavior (Butler, Kowalkowski, Jones, & Raphael, 2012). At risk children are more likely to live in neighborhoods that are in poor condition without amenities such as sidewalks and libraries (Bitsko et al., 2016). Children in deprived neighborhoods may lack access to green space for a variety of reasons including long walking distances (Aggio, Smith, Fisher, & Hamer, 2015) and parental safety concerns that keep children inside (Clements, 2004).

In general, children are spending more of their free time indoors with television, video games and computers (Arundell, Fletcher, Salmon, Veitch, & Hinkley, 2016), but children who have to walk >20 min to reach green space are watching greater than 2 hours more

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television weekly than children living within a five minute walk from green space (Aggio et al., 2015). A national study in 2010 reported that children aged 8–18 spend an average of 7.5 hours daily in front of media and in a typical week only 6% of children age 9–13 play outside on their own (Rideout, Foehr, & Roberts, 2010). A sedentary lifestyle places children at risk for obesity, asthma, ADHD and vitamin D deficiency (McCurdy, Winterbottom, Mehta, & Roberts, 2010).

Environmental Inequality research has examined the relationship between race and class-based inequalities including the disproportionate concentration of pollution, waste, and toxic industries in minority and impoverished communities (Brulle & Pellow, 2006; Downey & Hawkins, 2008; Pastor, Sadd, & Hipp, 2001). Although some studies do not find a difference in the total number or area of parks based upon socioeconomic neighborhoods (Timperio, Ball, Salmon, Roberts, & Crawford, 2007), public open spaces in higher socioeconomic communities tend to have better amenities such as picnic tables, drinking fountains, trees for shade, walking paths and lighting that may invite more activity and usage (Crawford et al., 2008). Perception of neighborhood safety can be an important factor in the willingness of a community to access nature. Communities where members did not feel safe had difficulty reaping the positive health benefits of green spaces (Weimann et al., 2017). Knowledge of a rape or assault near a park has been shown to decrease outdoor and green space physical activity (Ou et al., 2016).

Green space is an important social determinant of health as it is part of "the conditions in which people are born, grow, live, work, and age" (World Health Organization, 2017). A systematic review of the literature was undertaken to address the question: does access to green space impact the mental well-being of children?

Methods

Ovid was searched using the term "green space" with the following categories related to green space: city planning, environmental design, residence characteristics, and urban health. This search yielded 75,904 results. This search was combined with "mental health" yielding 1107 results. The search was further limited to English language, humans and children age 0–18 which yielded 341 results. Pubmed was searched with the terms "green space" and "mental health" resulting in 81 articles. Scopus was searched with the terms "green space" and "mental health" with a result of 123 articles.

Selection criteria for this review was original research published between 2012 and 2017 in English focusing on the mental well-being of children in relation to access to green space. Three seminal studies dating back farther than five years were included (Kuo & Faber Taylor, 2004; Taylor et al., 2002; Wells & Evans, 2003). A total of 12 articles fit the selection criteria (Table 1).

Results

The articles reviewed indicate that access to green space impacts the mental well-being of children in a variety of ways. One qualitative study found that students learning and playing in school areas such as wooded playgrounds, natural habitats, and gardens were able to find relief from stress, improve focus, build confidence and form supportive social groups (Chawla, Keena, Pevec, & Stanley, 2014). The remaining 11 articles are quantitative research using a variety of surveys, tests and demographic information to measure mental well-being and cognitive development in children in relation to access to green space. Overall well-being and psychological distress were measured using the Strengths and Difficulties Questionnaire (SDQ) in three studies finding that high quality and quantity green space was associated with better child well-being (Feng & Astell-Burt, 2017), less total difficulties, emotional symptoms, and peer relationship problems (Amoly et al., 2014), and a >20 min walk to green space was associated with worse mental and overall health (Aggio et al., 2015).

Four studies examined the impact of exposure to green space on attention restoration, attention deficit/hyperactivity disorder (ADHD), and behavior problems. High school greenness was found to contribute to student perception of restoration (Akpinar, 2016), green outdoor settings were found to reduce the symptoms of inattention and hyperactivity in children diagnosed with ADHD (Kuo & Faber Taylor, 2004), and an inverse relationship was found between residential greenness and ADHD/DSM-IV total and inattention scores (Amoly et al., 2014). Poor access to urban green space was associated with behavior problems most consistent with hyperactivity and inattention in ten-year-old children (Markevych et al., 2014), and children performed better on attention tasks and spatial working memory after a walk in nature compared to a walk in an urban landscape (Schutte, Turquati, & Beattie, 2017).

A 12-month study measuring working memory, superior working memory and inattentiveness in seven to ten-year-old children revealed a beneficial association between exposure to green space and cognitive development (Dadvanda et al., 2015). This study employed the use of a high-resolution satellite to determine amount of local green space rather than parental reporting. Additionally, the researchers have made a link between improved cognitive development, greater amounts of green space and reduced exposure to air pollution (Dadvanda et al., 2015). There may be other benefits from green neighborhoods on the environment and overall health of communities that deserve further exploration. Data from 905 Massachusetts public schools were collected between 2006 and 2012 revealing a consistent positive association between "greenness" of schools and performance in English and Math on standardized tests (Wu et al., 2014). Again, data on greenness near schools was collected via satellite from NASA's Earth Observing System.

Three studies prior to 2012 have been included in this review as they are often cited in the literature as important early research on the topic of green space and the mental well-being of children. The 2004 article by Kuo and Faber Taylor was the first nation-wide study exploring green outdoor settings as a potential treatment for ADHD. Research on the attention restoration benefits of nature for individuals with and without the diagnosis of ADHD has increased following the publication of this study. Much attention is paid to the importance of urban green space, but in 2003, Wells & Evans found that nature was vital in moderating the impact of stressful life events on rural children as well. Additionally, Taylor, Kuo, & Sullivan published in 2002 that a view of green space outside the homes of inner city girls living in deprived neighborhoods can increase self-discipline as measured by tests of concentration, impulse control and delayed gratification. Self-disciple is an important quality for inner-city youth who are at a high risk for academic problems, teenage pregnancy and drug abuse.

Discussion

The results indicate that access to green space is important to the mental well-being, overall health and cognitive development of children. It promotes attention restoration, moderates the impacts of stress, improves behaviors and symptoms of ADHD and was even associated with higher standardized test scores. Children living in high risk neighborhoods and under stressful conditions need to be given more opportunities to interact with nature. Research examined the amount of green space near the home and in the school setting and both were found to be beneficial for children.

Schools are important environments to assess for quantity and quality of green space as children spend a large amount of time in these settings. Increased emphasis on academic subjects and standardized testing has caused many public schools to decrease recess times (American Academy of Pediatrics, 2013). Physical Activity Guidelines for Americans established by the Department of Health and Human Services, recommend 20 min daily for recess and 150 min/week of Physical Education (PE) (US Department of Health and Human Services, 2009). The odds of schools having 150 hours/