PHARMACY REVIEW

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Time in Nature: A Prescription for the Prevention or Management of Hypertension

Abstract: *Growing evidence suggests time in nature may positively influence a broad range of health outcomes including blood pressure. The mechanism(s) by which nature exerts this influence is not fully understood, but it has been proposed that nature or natural environments promote health due to opportunities for physical activity and stress reduction. Experimental and observational studies suggest that time in forests or other green spaces is associated with reduced blood pressure, lower prevalence of hypertension, and reduced odds of using antihypertensive medications. Therefore, prescribing time in nature for patients at risk or diagnosed with hypertension may have substantial benefits.*

Keywords: nature therapy; nature; greenspace; blood pressure; cardiovascular disease

Introduction

Hypertension is the leading cause of cardiovascular disease and premature death worldwide.[1]

Modifiable risk factors for hypertension include both lifestyle (stress, nutrition, smoking, alcohol, sleep, physical activity) and environmental factors (air pollution, urban heat, noise).[2] A growing body of evidence suggests nature therapy may exert influence on a broad range of health outcomes including cardiovascular disease.[3,4] A systematic review and meta-analysis published in 2022, found that individuals residing in areas with more greenspace have a reduced incidence/prevalence of stroke and are less likely to die of cardiovascular disease.[3] Reductions in ischemic heart disease mortality and cerebrovascular disease mortality were also found. Two-thirds of the studies included in the meta-analysis were published in or after 2019, indicating a growing interest in the field. The purpose of this article is to explore the underlying mechanism(s) through which nature positively influences blood pressure, and describe findings from studies that evaluate the impact of time in nature on systolic and diastolic blood pressure, specifically.

> "The analysis found a significantly lower systolic and diastolic blood pressure in the forest environment compared to the non-forest environment."

Mechanism of Action

The biological mechanism(s) underlying the association of exposure to nature with improved blood pressure is not fully understood. However, a number of plausible hypotheses have been proposed. Among the most documented include nature's influence on the promotion of physical activity as well as nature's ability to reduce psychological stress. Physical activity is widely

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recognized for its efficacy in lowering blood pressure and natural environments provide an excellent venue for exercise. Numerous studies have found a positive association between proximity to or time spent in green spaces and physical activity in adults and children.[5-10] These studies suggest that residential proximity to greenspace or regular use of greenspace is positively associated with walking time, walking maintenance and an increased likelihood of meeting physical activity recommendations. The benefits of nature on physical activity may go beyond providing a space to exercise. There is some evidence which suggests that compared to exercising indoors, exercising in a natural environment is associated with greater feelings of enjoyment, energy, and positive engagement as well as greater reductions in tension and anger.[10] This enhanced satisfaction with exercising in nature also led to increased intent to repeat the activity at a later date.

A second potential mechanism involves nature's ability to reduce psychological stress. It is well documented that stress can lead to the development of hypertension through repeated blood pressure elevations as well as stimulation of the nervous system to produce vasoconstricting hormones.[11] Further many non-pharmacologic interventions which manage stress have been found to reduce blood pressure and development of hypertension.[11] A systematic review of more than 40 experimental studies found that exposure to nature or natural outdoor environments reduces stress.[12] Literature suggests that time in nature improves both reported or perceived stress as well as biological markers of stress, namely, cortisol.[12,13] Interestingly, substances released from plants and trees ("phytoncides") have been shown help to lower stress hormone levels in the body and increase relaxation.[14] It is also known that exposure to stimuli from natural sources induces a state of hyperawareness and hyperactivity of the parasympathetic nervous system that renders a person in a state of relaxation.[13]

Clinical Trial Data

A number of studies have evaluated the effect of nature therapy on blood pressure. A review and a meta-analysis of studies evaluating the effect of nature on blood pressure found exposure to natural environments reduced both systolic and diastolic blood pressure.[13,15] Song et al.[13] reviewed data from 52 studies conducted in Japan. The review found that "forest bathing" or time spent exercising in or passively taking in the forest environment reduces both systolic and diastolic blood pressure in normotensive and hypertensive participants compared to urban environments. A meta-analysis by Ideno et al.,[15] pooled data from 20 trials involving 732 participants in Japan, Korea, and China. All of the studies used a forest environment for their exposure to nature. The analysis found a significantly lower systolic and diastolic blood pressure in the forest environment compared to the non-forest environment. Decreases in systolic blood pressure were observed regardless of age or hypertension status.

A study conducted by Shanahan et al.[16] aimed to assess the relationship between frequency and duration of exposure to nature and health benefits. The study administered a survey to 1538 people aged 18–70 years who resided in Australia. The survey collected data on the frequency of outdoor green space visits across a year, the average duration of visits to green space across a week, as well as self-reported information on mental health, physical health, social health, and health behavior. Multivariate analysis revealed that a longer duration of time spent in nature (at least 30 minutes per week) was associated with a lower prevalence of hypertension. In fact, the authors concluded that up to 9% of high blood pressure cases could be prevented if all residents were to visit green spaces at least one time each week for 30 minutes or more. The study also found that both duration and frequency of visits to greenspace showed a significant positive relationship with higher levels of physical activity.

A second study by Turunen et al., employed a self-administered questionnaire to evaluate different types of nature exposure with antihypertensive medication use.[17] The cross-sectional study conducted in Finland compared the duration and frequency of nature exposure in urban environments with the use of antihypertensives in 7321 residents aged 25 and older. The survey collected information on a number of exposure variables. First, the survey assessed the amount of residential green and blue spaces the participant might have exposure to using addresses and land use or land cover data. The amount of green or blue space (provided as a %) within a 1 km radius of the residence was documented. The survey also assessed the frequency of green space visits. Participants were asked how often they spent time or exercised outdoors in green spaces. Response options were (1) never; (2) <1 time per week; (3) 1–2 times per week; (4) 3–4 times per week; and (5) ≥5 times per week. Lastly, the questionnaire assessed for time spent looking at green or blue space from the windows of their home. Participants were asked if they had a view of green or blue space from their windows. Response options included (1) no; (2) yes, I look at it seldom; (3) yes, I look at is occasionally; (4) yes, I

look at it often. The study found that amounts of residential green or blue spaces or green and blue views from the home were not associated with the use of antihypertensives. However, people who visited green spaces 3–4 times/week were 36% less likely to use antihypertensives and those who visited green spaces five or more times per week were 41% less likely to use antihypertensives than those who visited green spaces less frequently. This study is particularly important because the majority of evidence on the association between green space and health is derived from objectively measured residential green space rather than actual active or passive use of green space.

Conclusion

Time in nature may be helpful in the prevention and treatment of hypertension. Our understanding of the relationship between nature and blood pressure is limited by the methods employed in the studies published to date. More prospective analyses with individual-level information on exposure and outcomes are needed to establish a causal relationship between nature therapy and blood pressure. Despite these limitations, literature suggests that visiting or exercising in green space at least once a week for 30 minutes is associated with lower rates of hypertension and at least 3 visits to greenspace per week is associated with reduced rates of antihypertensive use. It appears these benefits may be mediated, in part, through increased physical activity and stress reduction, however, the mechanism is not fully understood. Prescribing time in nature for patients at risk or diagnosed with hypertension may have substantial benefits; therefore, providers are encouraged to add this approach to their treatment regimens.

Declaration of Conflicting Interests

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