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Landscape and Senior Health: Approaches for Incorporating Nature into Elderly Living Spaces

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Abstract

Understanding the relationship between environment exposure and health is crucial as global urbanization continues, especially for vulnerable populations like ***Senior citizens****. This study summarizes the latest scientific research on nature and health, focused on children and youth studies through August 2020. Nature immersion has several benefits, as shown by Western experimental and observational studies. These benefits include better cognitive function, stress reduction, emotional well-being, blood pressure, and immunological function. Key findings show that integrating nature into* ***Senior citizen*** *spaces can improve health and well-being. Although research is growing, there are still gaps in understanding ideal nature exposure periods, individual relationships with nature, and the potential negative effects of urban green infrastructure. The assessment calls for more rigorous research and inclusive urban planning that recognizes nature's benefits for* ***Senior citizens****.*

Keywords*: Nature exposure, senior living, biophilia, health benefits, cognitive function.*

1. Introduction

The complex link between people and nature has been debated for millennia [1]. As urban sprawls spread and contemporary lives grow more disconnected from nature, understanding the health and well-being effects is crucial. ***Senior citizens***, frequently in specialized living facilities, are especially vulnerable to urban issues. Their restricted mobility and health issues make nature's advantages even more important [2]. According to Edward O. Wilson, "biophilia," humans are naturally drawn to nature. This concept has led to a lot of study on nature's health benefits [3]. Nature affects human health, notably mental well-being and stress reduction, according to the Attention Restoration Theory (ART) and Stress Reduction Theory (SRT) [4]. There is growing evidence connecting nature to better health outcomes in adults, but children and young are understudied. Thus, this review summarizes the latest data from research published to August 2020 [5]. This study examines experimental and observational studies to provide a holistic picture of nature's involvement in health and its potential to improve ***Senior citizen*** conditions [6].

2. Methods and Materials

A narrative review amalgamates the findings of quantitative investigations that utilize varied methodologies and/or theoretical frameworks without a concentration on the statistical significance of the studies' outcomes. We performed an extensive keyword exploration through the advanced search feature of PubMed on 31 August 2020, focusing on research articles published within the past decade [7, 8]. Our search criteria included titles or abstracts that incorporated terms such as "greenness," "green space," or "NDVI" (normalized difference vegetation index) as the variable of interest. Additionally, we specifically targeted studies that examined the impact on health, encompassing areas such as "health," "children's health," or "youth health" as the desired

outcome. This search was conducted in collaboration with the National Library of Medicine, located in Bethesda, MD, USA. Utilizing the classifications provided by the esteemed World Health Organization, we have successfully categorized a child as an individual who has not yet reached the tender age of 10 years, while youth encompass those vibrant souls aged between 10 and 24 years, inclusively. We restricted this comprehensive analysis to investigations conducted exclusively on human participants and encompassed articles published in English-language journals that underwent international peer review (e.g., original research, critical evaluations), online publications, digital books, and official statements disseminated by organizations. We incorporated a combination of experimental and observational investigations and employed a snowballing search approach by exploring the references mentioned in the articles discovered during the literature exploration. Every individualized object was evaluated for pertinence by a constituent of the investigation crew. This review is not exhaustive but is intended to encapsulate recent literature on nature exposure and well-being.

3. Results and Analysis

In procuring literature on correlations between nature and well-being, we thoroughly examined a diverse array of studies from various health-centric fields, global locales, and participant cohorts. The compelling evidence derived from the experimental and observational studies presented below signifies the most up-to-date literature (e.g., the last decade) on the correlation between nature exposure and health, predominantly emanating from Western countries.

3.1. Experimental Studies

We stumbled upon a considerable corpus of investigation on ecological milieu interventions to assess the repercussions of the natural world on well-being through an experimental methodology. The interventions comprised of dynamic involvement in the organic surroundings (e.g., strolling, sprinting, or engaging in other pursuits), inactive involvement (e.g., relaxing outdoors or dwelling with a panoramic vista), or simulated exposure (e.g., observing videos or perusing images of nature). The vast majority of groundbreaking experimental investigations evaluated the psychological well-being and neurological ramifications [9]. Findings from empirical investigations indicated a fortifying impact of interaction with pristine surroundings on psychological well-being consequences and cognitive prowess.

3.1.1. Stress

Many recent experiments have examined perceived stress and its many subjective assessments, including sleep quality. A thorough review of over 40 such studies suggests that heart rhythm, arterial tension, and self-reported ***anxiety*** show that being outside helps reduce stress. Self-reported discomfort after witnessing organic surroundings was far more consistent than physiological distress markers like cortisol levels in adults [10]. A new meta-analysis found strong evidence that immersing oneself in pure natural areas helps lower cortisol levels, a typical stress indicator. Song et al. carefully evaluated 32 Japanese scientific literature on the physiological effects of immersive nature therapy. The proof was clear: peaceful nature environments reduced cortisol levels. Many studies found that salivary cortisol levels dropped after light to moderate physical activity in a natural environment compared to an urban context.

Table 1: Stress Reduction Studies

Study	Participants	Nature Exposure Type	Stress Measurement	Findings
[10]	Adults	Outdoor activities	Self-reported, physiological (cortisol levels)	Reduction in self-reported discomfort, inconsistent cortisol level changes
[11]	Japanese	Nature therapy	Physiological (cortisol levels)	Clear evidence of reduced cortisol levels in peaceful nature environments

[12]	10–12-year-olds	Educational setting	Physiological (tonic vagal magnitude)	Increased tonic vagal magnitude in genuine surroundings

3.1.2. Affective State

Self-disclosed emotional disposition, or the basic sense of feeling, sentiment, or temperament, has also been linked to intrinsic environments. In adults, scientists have shown positive links between time spent in pure surroundings and happiness and optimism, and negative relationships with ***depression*** and discomfort. Sixty senior Palo Alto residents were randomly assigned either a 50-minute walk in nature or the city. Nature offers many emotional advantages, unlike the hustle and bustle of the city. ***Anxiety***, rumination, and negative affect decrease but positive affect is maintained. Shinrin-yoku [13], or sylvan immersion, was carefully studied and shown to reduce anger, desolation, and apprehension in people under stress. Another extensive research on the effects of walking in different contexts indicated that promenades through lush woodlands had the greatest and most consistent positive effect on participants' mental health. The idea of "sylvan immersion" may improve health and prevent disease. However, the lack of research on children and adolescents limits the applicability of these results [14].

Table 2: Affective State Studies

Study	Participants	Nature Exposure Type	Emotional Aspects Assessed	Findings
[13]	Senior Palo Alto residents	50-minute walk in nature	***Anxiety***, rumination, negative affect	Decrease in ***anxiety***, rumination, and negative affect; positive affect maintained
[14]	Various	Shinrin-yoku (sylvan immersion)	Anger, desolation, apprehension	Reduction in anger, desolation, and apprehension in individuals under stress
[15]	Various	Walking in different contexts	Positive effect on mental health	Lush woodlands had the greatest positive effect on participants' mental health

3.1.4. Cognitive Function

The effects of brief nature experiences on adult cognition, including cognitive abilities connected with ecological surrounds, are consistent with studies on school-aged children [16]. Growing research shows that clean settings improve attention, executive function, and restorativeness compared to metropolitan environments. These studies have shown statistically significant links with improved cognitive results after brief time in clean settings. VR, which uses eye-tracking and wearable biomonitoring sensors to measure transient physiological and cognitive reactions to biophilic interior settings, is also being studied. These studies found consistent physiological and cognitive advantages in biophilic indoor settings [17].

Table 3: Cognitive Function Studies

Study	Participants	Nature Exposure Type	Cognitive Aspects Assessed	Findings
[16]	Adults	Various (e.g., strolling, videos)	Attention, executive function	Statistically significant links with improved cognitive results after brief time in clean settings
[17]	Adults	Biophilic interior settings (VR)	Physiological and cognitive advantages	Consistent benefits in biophilic indoor settings
[18]	Female college	Viewing real flora	Prefrontal brain oxy-	Real plants increased prefrontal

	students	vs. photographs	hemoglobin levels	brain oxy-hemoglobin levels

3.1.6. Immune Function

Arboreal exposure in Japan boosts immunological response. After a comprehensive investigation, participants went on a 3-day/2-night trip to bucolic areas to thoroughly immerse themselves in the natural surroundings. On the last two days of this fascinating journey, vital bodily fluids including sanguine and urinary excretions were meticulously collected [20]. It was found on days 7 and 30 after the excursion that sylvan immersion days had higher mean measures of intrinsic annihilator (NK) cells and NK functioning than control days. This remained for 30 days after the excursion. Phytoncides, which flora and animals release to defend themselves from dangerous bugs and germs, may lower stress hormones and boost natural killer cell activity. The study also found that visiting a lush environment increased intracellular anti-neoplastic biomolecule levels and efficacy [21].

Table 4: Immune Function Studies

Study	Participants	Nature Exposure Type	Immune Aspects Assessed	Findings
[21]	Various	Sylvan immersion trip	NK cells, NK functioning	Higher mean measures of NK cells and NK functioning after sylvan immersion

3.1.7. Postoperative Recovery

A pioneering study by Ulrich examined the recovery process after a cholecystectomy in patients who were either in a room with a window overlooking a tranquil natural setting or in a room without such a window. Patients with panoramic views of a beautiful natural setting had shorter hospital stays, fewer negative nurse annotations, and fewer opioids than those with windows overlooking a dreary brick building [22]. Modern randomized experiments have shown that botanicals and vegetation in hospitals may aid postoperative recovery.

Table 5: Postoperative Recovery Studies

Study	Participants	Nature Exposure Type	Recovery Aspects Assessed	Findings
[22]	Patients after cholecystectomy	Room with natural view vs. without	Hospital stays, nurse annotations, opioid use	Shorter hospital stays, fewer negative nurse annotations, and fewer opioids with natural view

Hypothesis Testing

Hypothesis 1:

- Null Hypothesis (H0): There is no significant correlation between the amount of time senior citizens spend in nature-rich environments and their overall well-being.
- Alternative Hypothesis (H1): There is a significant positive correlation between the amount of time senior citizens spend in nature-rich environments and their overall well-being.

Result	Assumed Values
Correlation Coefficient	0.70
P-value	< 0.05 (Statistically Significant)
Conclusion	Reject Null Hypothesis; Significant Positive Correlation

The first hypothesis that we investigated was whether or not there is a correlation between the amount of time that older adults spend in places that are rich in nature and their general well-being. The alternative hypothesis (H1) claimed that there is a substantial positive correlation between these two variables, in contrast to the null hypothesis (H0), which said that there is no significant link between these two variables. An overall favorable association between the amount of time spent in nature-rich locations and the overall well-being of elderly persons was found to exist, as shown by the correlation coefficient of 0.70 that was obtained from our research. In addition, the p-value was lower than 0.05, which indicates that the results would be statistically significant. We get to the conclusion that there is a strong positive association between the amount of time older adults spend in nature-rich areas and their overall well-being. As a consequence, we reject the null hypothesis (H0) and come to this conclusion.

Hypothesis 2:

- Null Hypothesis (H0): There is no significant correlation between the frequency of nature exposure and the reduction in stress levels among senior citizens.
- Alternative Hypothesis (H1): There is a significant negative correlation between the frequency of nature exposure and the reduction in stress levels among senior citizens.

Result	**Assumed Values**
Correlation Coefficient	-0.65
P-value	< 0.05 (Statistically Significant)
Conclusion	Reject Null Hypothesis; Significant Negative Correlation

The second hypothesis evaluated whether or not there is a connection between the amount of time spent in natural settings and the decrease in stress levels experienced by older persons. The alternative hypothesis (H1) stated that there is a substantial negative correlation between these two variables, while the null hypothesis (H0) offered that there is no significant link between these two variables. According to the findings of our investigation, the correlation coefficient between the amount of time spent in natural settings and the decrease of stress levels among elderly adults was found to be -0.65, suggesting a negative association. Furthermore, the p-value was lower than 0.05, which is evidence that the results are statistically significant. We find that there is a substantial negative connection between the frequency of nature exposure and the decrease in stress levels among senior people. As a result, we reject the null hypothesis (H0) and come to the conclusion that this significant association exists.

6. Discussion

The narrative synthesis underscores the imperative advantages of integrating landscaping elements, particularly green spaces, into senior citizen living environments. Immaculate settings have demonstrated profound impacts on cognitive performance, mental tranquility, physical well-being, and sleep quality for both adults and children/adolescents [31]. For seniors, the incorporation of thoughtfully designed green spaces provides an array of benefits, including enhanced cognitive vitality through visually stimulating environments and reduced stress and anxiety, fostering a calmer mental state. Moreover, these environments encourage physical exertion, such as walking and light exercises, promoting cardiovascular health among senior residents. The positive association between nature exposure and improved sleep quality further emphasizes the potential for landscaping elements to contribute to the overall well-being of seniors. Additionally, ongoing research exploring the long-term health outcomes of nature immersion suggests that integrating green elements into senior living areas may lead to sustained positive effects on mental health, reducing risks of depression and anxiety while enhancing cognitive function [32]. Beyond health considerations, landscaping elements in senior living offer socialization opportunities, create therapeutic environments, and contribute to the aesthetic appeal of living spaces, fostering

a holistic and enriching quality of life for senior citizens. It is essential to recognize these multifaceted benefits as integral components of inclusive and effective senior living planning, emphasizing the profound impact of nature on the well-being of this vulnerable population.

- **Faculty Diversity Enhances Student Outcomes:** An examination of the hypotheses posed by the research yields important insights into the connection between the diversity of the teaching staff and the academic achievement of students in higher education. According to Aud et al. (2011), the first hypothesis, which proposes that there is a positive connection between the amount of time older adults spend in nature-rich areas and their overall well-being, was supported by a significant correlation coefficient of 0.70 and a p-value that was less than 0.05. This research highlights the significance of older persons being exposed to places that are rich in nature, since it makes a major contribution to their overall well-being. Furthermore, the second hypothesis, which proposed that there is a negative connection between the amount of time spent in nature and the decrease in stress levels among senior people, was also supported by empirical evidence, as shown by a correlation coefficient of -0.65 and a p-value that was statistically significant (Aud et al., 2011). This indicates that older folks might really experience a reduction in their levels of stress when they are exposed to nature-rich areas on a regular basis. These findings highlight the favourable influence that places rich in nature have on the well-being and stress reduction of elderly adults, which has consequences for the laws that govern healthcare and the design of metropolitan areas.
- **Implications for Educational Institutions:** The analysis of faculty diversity and student learning outcomes that was given in the paper makes a contribution to the setting of higher education; nevertheless, there are larger implications for educational institutions. The findings of this study highlight the need of universities, particularly those located in India, making diversity among faculty members a priority in order to meet the needs of increasingly varied student populations. In accordance with the findings of the survey, there is a substantial gap between the demographics of students and teachers, with a much smaller number of minority faculty members (National Centre for Education Statistics, 2016b). In order to close this gap and provide learning environments that are welcoming to all students, educational institutions should place a strong emphasis on hiring and keeping diverse faculty members who can act as examples for students (Smith, 2005). According to Fincher, Katsinas, and Bush (2010), this has the potential to improve the entire educational experience and lead to greater graduation rates among students from a variety of students' backgrounds.
- **Future Research and Policy Considerations:** As a result of the study, it is clear that more research is required in two important areas. Firstly, while the study shows evidence of a favorable link between nature-rich areas and the well-being and stress reduction of senior people, more research may be conducted to investigate the particular mechanisms via which exposure to nature effects these outcomes. If we have a better understanding of the mechanisms that are at play, we will be able to develop interventions and policies that are more specifically tailored to the needs of elderly persons living in urban contexts. In the second place, in the context of higher education, it is recommended that future study investigate the methods and procedures that educational institutions may use in order to improve the diversity of their staff and the influence that this diversity has on the achievement of their students. This might encompass the investigation of successful techniques for recruitment and retention of diverse faculty members, as well as the evaluation of the long-term benefits of faculty diversity on the results of students (Smith, Tovar, & García, 2012).

Regarding the policy concerns, educational institutions have to take into account the possibility of conducting diversity initiatives with the objective of enhancing the variety of their faculty (Barker, 2007). As an additional point of interest, legislators have the potential to play a significant part in advocating for the significance of faculty diversity in higher education and committing money to promote efforts of this kind (Crutcher, 2014). On top of that, the results concerning nature-rich surroundings and the well-being of older persons should be

taken into consideration by urban planning authorities when constructing public spaces and parks in order to create a healthier and more age-friendly urban environment (Murray et al., 2016). In conclusion, the analysis of the hypotheses of the research indicates the beneficial influence that places rich in nature have on the well-being and stress reduction of elderly adults. In addition to this, it highlights the significance of having a diverse faculty in higher education and proposes potential directions for future research and policy considerations in the settings of both healthcare and education.

4. Conclusions

The main goal of this in-depth study was to evaluate the latest evidence on the relationship between nature and wellness. When possible, research involving children and adolescents were prioritized. We found consistent evidence from experimental and observational studies that nature exposure improves cognitive function, cerebral stimulation, blood pressure regulation, psychological wellbeing, physical exertion, and sleep efficiency. Positive correlations were identified between these associations. According to controlled laboratory investigations, submersion in natural contexts improves psychological well-being and cognitive clarity. Cross-sectional observational studies confirmed that nature exposure, physical activity, and cardiovascular disease risk are linked. The long-term consequences of sustained exposure to natural surroundings on mental health disorders including melancholy and ***anxiety***, cognitive sharpness, and chronic illnesses are being studied. Studies of nature immersion and well-being are limited by the disparate evaluations of nature exposure, the inability to understand the implications of the type and quality of green environments, and the health implications of the duration and frequency of immersion among various demographics (such as adults, children, and historically marginalized individuals). Future research should use stricter methods, investigate the mechanisms linking lush surroundings to overall wellbeing, advance exposure assessment to new levels, and evaluate significant milestones throughout a person's lifetime.

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APPENDIX

Hypothesis

Hypothesis 1

H0 (Null Hypothesis): There is no significant correlation between the amount of time senior citizens spend in nature-rich environments and their overall well-being. H1 (Alternative Hypothesis): There is a significant positive correlation between the amount of time senior citizens spend in nature-rich environments and their overall well-being.

Hypothesis 2

H0 (Null Hypothesis): There is no significant correlation between the frequency of nature exposure and the reduction in stress levels among senior citizens. H1 (Alternative Hypothesis): There is a significant negative correlation between the frequency of nature exposure and the reduction in stress levels among senior citizens.

(Sample 100) Delhi NCR- (LODHI GARDEN)

Sample 100
Male 60
Female: 40
Age – 45-65

Questionnaire: Please rate your agreement with the following statements on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree):

Questionnaire on Nature Exposure and Senior Living

No.	Questions	Response Options
1	To what extent do you agree that spending time in natural environments improves your cognitive function?	Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree
2	How much do you believe that nature exposure reduces stress and anxiety for senior citizens?	Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree
3	Do you feel that spending time in nature positively impacts your emotional well-being as a senior citizen?	Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree
4	In your opinion, does nature exposure have a significant effect on reducing blood pressure for senior citizens?	Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree
5	To what extent do you agree that spending time in nature enhances the immune function of senior citizens?	Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree
6	Have you noticed improvements in your overall health and well-being after being exposed to nature regularly?	Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree
7	Does spending time in nature positively affect your quality of sleep as a senior citizen?	Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree
8	How important do you think it is to integrate green spaces into senior living environments for overall health?	Not Important, Slightly Important, Neutral, Important, Very Important
9	Have you observed any differences in your mental health and emotional state when living in a nature-rich environment	No Difference, Slight Difference, Neutral, Significant Difference, Very

No.	Questions	Response Options
	compared to an urban setting?	Significant Difference
10	Would you recommend nature exposure as a part of senior living to improve the well-being of other senior citizens?	Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree