THE ROLE OF PLANTS IN DIFFERENT ASPECTS OF HUMAN LIFE WITH FOCUS ON MENTAL HEALTH*

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Professional paper

Abstract

Urbanization leads to the exploitation and occupation of green areas, contributing to a high degree of their fragmentation. In this way, the habitats of plants and animals are endangered, which has a very negative effect on biodiversity within cities. These consequences of urbanization require innovative concepts of urban design that will increase the quality of life in urban areas.This paper presents ways of introducing plants into cities, and presents their importance in improving the quality of life in urban areas. Given that there is a higher percentage of mental health problems in cities than in rural areas, special emphasis is placed on the role of green areas and plants indoors in improving the mental state of people, and in preserving their mental health. The results of numerous researches that contribute to the understanding of the effect of plants on the quality of life in urban areas are given.

Key words: *urbanization, fragmentation of green areas, quality of life, mental state, mental health*

INTRODUCTION

The majority of residents of urban areas perceive the natural environment more positively than the urban environment and due to this fact, the construction or renovation of existing green areas is an indispensable item when forming plans for the arrangement of urban areas. Predictions of human population growth require a continuous process of urbanization at the global level (Alberti, 2017). Urbanization leads to the exploitation and occupation of green, contributing to a high degree of fragmentation, the loss of green in the areas of development and expansion of cities, the loss of connectivity of plant and animal habitats, and the reduction of biodiversity within cities. The aforementioned consequences of urbanization require innovative concepts of urban design that will increase the quality of life in urban areas, aimed at the development of more sustainable, resilient and healthy cities (Russo and Cirella, 2018). The results of numerous studies contribute to the understanding of the effect of plants on the quality of life in urban areas. Introducing plants through innovative concepts of urban design will increase the quality of life in urban areas. Given that there is a higher percentage of

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mental health problems in cities than in rural areas, special emphasis is placed on the role of green and indoor plants in improving the psychological state of a person, and in preserving his mental health.

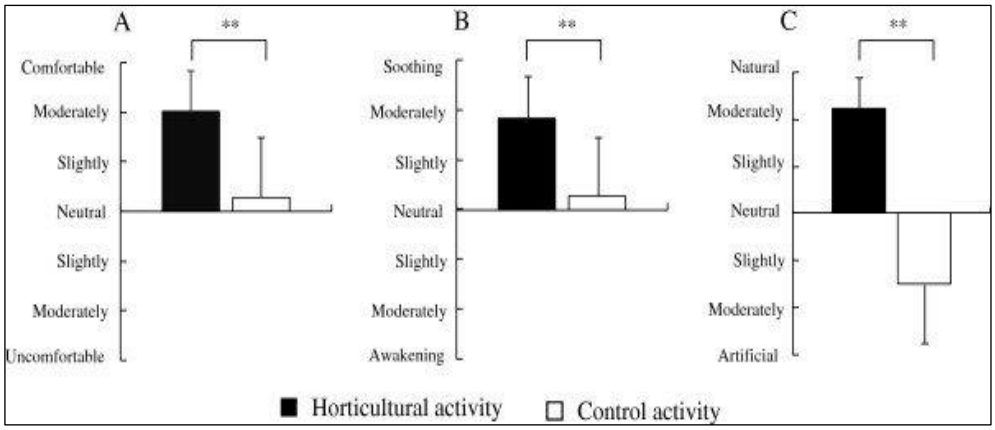
MATERIALS AND METHODS

The preparation of this work was preceded by an exhaustive analysis of collected data on the ways in which green and plants in the exterior and interior affect the lives of residents in an urban environment, and a special emphasis was placed on the psychological state, that is, on the positive effect of plants in preserving the mental health of the city population. The method of work applied in this research was implemented through the following stages: a) collection of information (study of literature), b) analysis of data from scientific and professional literature and c) unification of results.

RESULTS AND DISCUSSION

Ways of using plants for some specific problems, such as polluted air, have been researched in detail. However, the basis of intangible benefits, such as the effect of plants on mood, is still insufficiently researched, which is why there are certain unknowns in this sphere of plant action (Lohr, 2010). Through three main roles (aesthetic-decorative, sanitary-hygienic and cultural-educational), green and indoor plants contribute in many ways to better conditions for human life in the urban environment. The sanitary and hygienic role is also reflected in the fact that during the summer months plants increase the humidity of the air and lower their temperature by 2 to 3°C. When it was determined that plants have a positive effect on the mental health and psychological state of a person, research began to be conducted with the aim of explaining the specific mechanisms and ways of their action. Through research on the benefits of plants, there has been an increase in their use to solve environmental and health problems in preserving and improving the mental health of people in an urban environment.

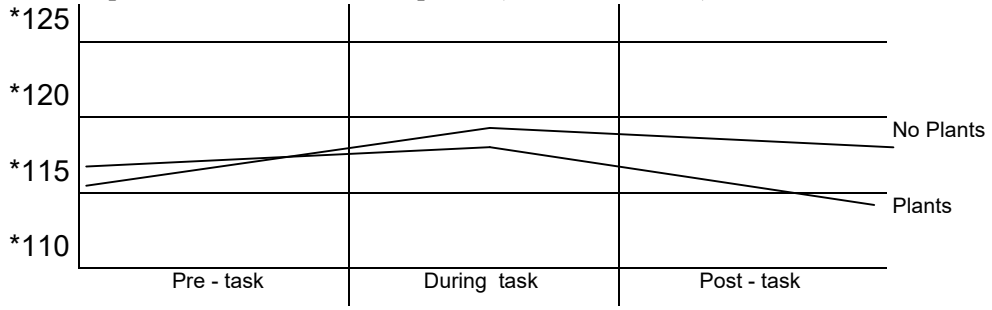
Psychological relaxation (Lee *et al*., 2013) through the horticultural activity of transplanting real and artificial flowers yielded psychological responses measured using a semantic differential rating scale followed by measurements of heart rate and heart rate variability (HRV). The mental states of the participants during each activity were monitored by heart rate measurements and heart rate variability (HRV). Analysis of physiological responses using two-way analyses of variance (ANOVA) revealed that sympathetic nerve activity significantly decreased in the late period (11 to 15 minutes) of horticultural activity only in the group of participants who worked with real plants and not with artificial ones (Lee *et al*., 2013). Horticultural activity promotes pleasant, calm and natural feeling



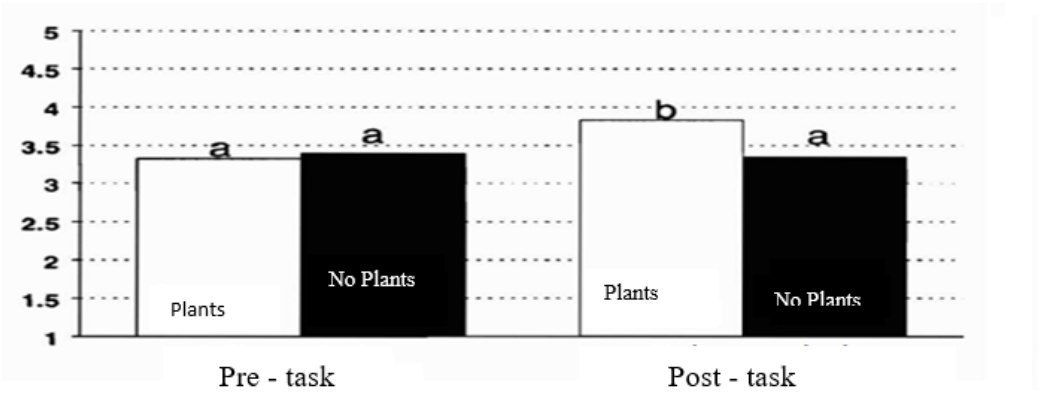
Graph 1. Comparison of changes in mental state after horticultural and control activities

A – Pleasant feeling; B – Feeling of calmness; C – Affection for plants (Lee *et al.,* 2013)

Research related to the role of plants in increasing productivity and reducing stress levels in the workplace shows that workers in work rooms without windows have less job satisfaction and rate the physical conditions of their work as "less pleasant and stimulating". Many people believe that bringing plants indoors improves worker productivity and satisfaction, but there is still relatively little research that specifically examines these impacts. Research conducted in a teaching computer lab (University of Washington) documents the benefits of bringing plants into a windowless workspace. Participants were divided into two groups, one of which performed the task in a room without plants, while the other group performed the task in the presence of plants. The blood pressure and emotions of the participants were monitored while they performed a simple computer task with the presence or absence of plants in the room monitored the speed of task performance, number of errors, and stress level. After the experiment, it was determined that productivity was higher and the stress level was lower when the task was performed in a room with plants (Lohr *et al*., 1962).

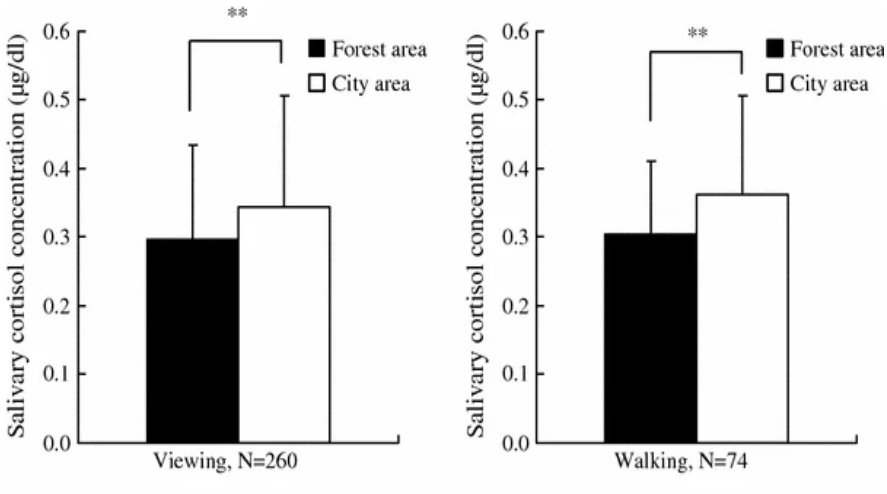


Graph 2. Systolic blood pressure before, during and after performing a computer task (Lohr *et al*., 1962)

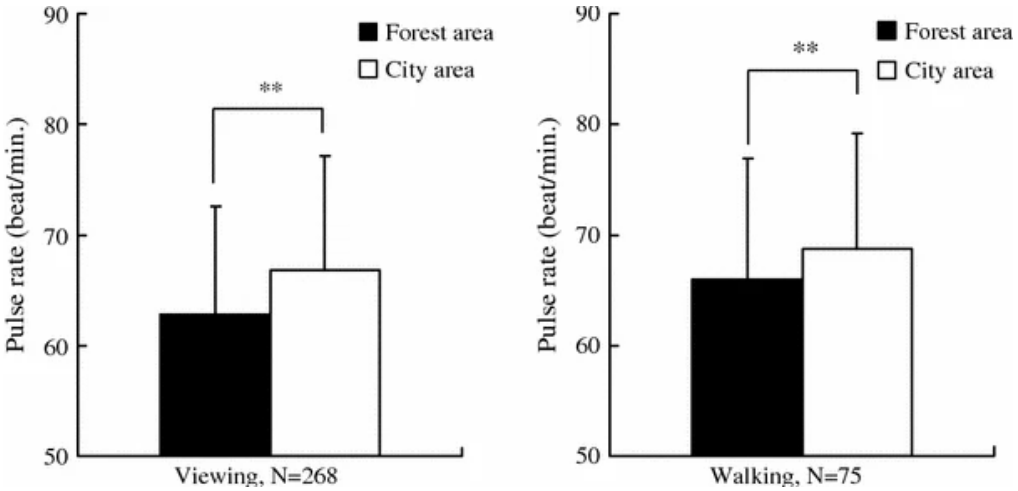


Graph 3. Errors and reaction time while performing a computer task with the presence or absence of plants (Lohr *et al*., 1962)
Graph 4. Respondents' answers to the statement "I feel concentrated" on a scale from 1 to 5, before and after performing the computer task with or without plants (Lohr *et al*., 1962)

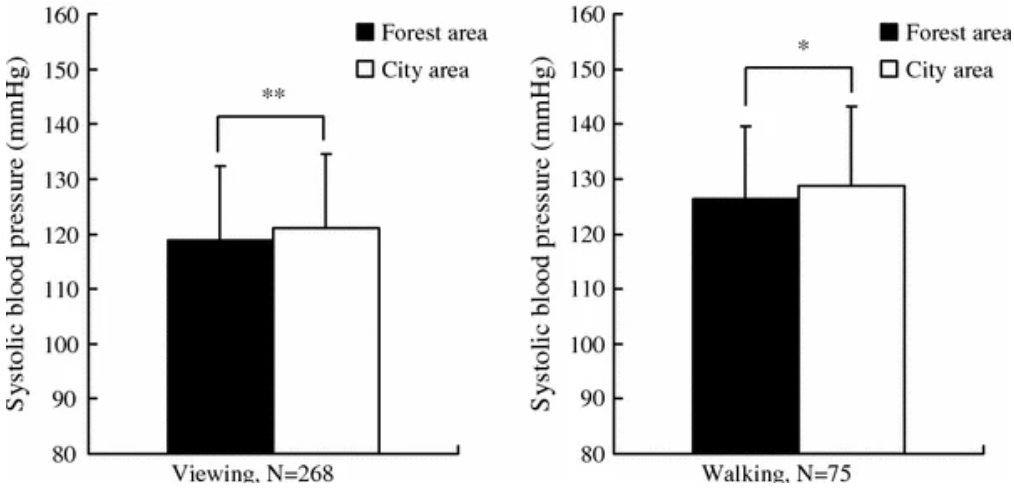
Research related to the physiological effects of Shinrin-yoku ("forest bathing") was carried out through field experiments conducted in 24 forests throughout Japan. During the experiments, the subjects went to the forest or the city, where they stayed for a certain period, stayed in rooms with the same conditions, and received the same meals. Cortisol, blood pressure, pulse and heart rate variability were used as indicators. On the first day, one group of respondents stayed in the forest, and the other respondents stayed in the city. The next day, each group was sent to a different area for cross-checking. The results showed that the forest environment promotes lower cortisol concentration, lower heart rate, lower blood pressure, higher parasympathetic nerve activity and lower sympathetic nerve activity than the urban environment. The relationship between the natural environment and relaxation (eg lowering blood pressure and pulse rate, inhibiting sympathetic nerve activity, increasing parasympathetic nerve activity and lowering cortisol levels). These results will contribute to the development of a research area dedicated to forest medicine, which can be used as a strategy for preventive medicine (Jin *et al*., 2009).



Graph 5. Change in cortisol concentration in saliva after staying in the forest (Jin *et al*., 2009)



Graph 6. Change in heart rate after staying in the forest (Jin *et al*., 2009)



Graph 7. Change in systolic blood pressure after staying in the forest (Jin *et al*., 2009)

Through numerous experimental studies, it has been proven that passive and active experiences of nature have a positive effect on the psychological and physiological well-being of humans and that they contribute to the preservation of mental health. However, any natural environment (a park or a promenade with trees) can contribute to a better mood and have a positive effect on mental health. Watching photos or videos with scenes from nature has a positive effect on the mood, encouraging positive emotions. The presence of plants in closed spaces is also extremely important because they make the space more comfortable and pleasant. It has been proven that people prefer to stay in rooms where there are plants. They purify the air and increase humidity, thus creating healthier conditions for living indoors. Although several experiments have been conducted to understand how plants affect the psychological state and mental health of humans, there is still not enough data to fully understand the mechanism of their action.

CONCLUSIONS

In order to mitigate the negative consequences of urbanization, it is necessary to focus on innovative solutions of urban design that will enable increasing the sustainability of cities and improving the quality of life in them. Until now, many experiments and research have been conducted documenting a wide range of positive effects of plants on humans. Various studies prove that human-plant interactions have a positive effect on human health. Research conducted with different target groups in different countries and in different circumstances (students, workers, patients, teenagers, elderly people) resulted in a positive response to the presence of plants, either in the form of active interaction or passive experience.

However, although a large amount of research has been conducted on the interaction between humans and plants, and on their effect on the mental health and psychological state of humans, there are still many unknowns when it comes to the mechanism of action of plants. The reason for this is the methodological limitations of the research, which make it difficult to investigate and fully clarify the effect of plants on mental health and emotional state in more detail. Although the specific way plants affect mental health and human emotions is still insufficiently researched, it can be concluded that contact with plants represents an intuitive action that has a positive effect on psychological stability by stimulating human senses in different ways.

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ULOGA BILJAKA U RAZLIČITIM ASPEKTIMA LJUDSKOG ŽIVOTA S AKCENTOM NA MENTALNO ZDRAVLJE

Sažetak

Urbanizacija dovodi do iskorištavanja i zauzimanja zelenih površina, doprinoseći visokom stepenu njihove fragmentacije. Na ovaj način dolazi do ugrožavanja staništa biljaka i životinja što izrazito negativno djeluje na biodiverzitet unutar gradova. Navedene posljedice urbanizacije zahtjevaju inovativne koncepte urbanog dizajna koji će povećati kvalitet života u gradskim sredinama.
U radu su navedeni načini unošenja biljaka u gradove, te je predstavljen njihov značaj u poboljšanju kvalitete života u urbanim sredinama. S obzirom da je u gradovima prisutan veći procenat problema mentalnog zdravlja nego u rualnim područjima, poseban akcenat je stavljen na ulogu zelenih površina i biljaka u zatvorenim prostorima u poboljšanju psihičkog stanja čovjeka, te u očuvanju njegovog mentalnog zdravlja. Navedeni su rezultati brojnih istraživanja koja doprinose shvatanju djelovanja biljaka na kvalitet života u gradskim sredinama.

Ključne riječi: *urbanizacija, fragmentacija zelenih površina, kvalitet života, psihičko stanje, mentalno zdravlje*