

# Analysis of Garden Plant Morphology on Human's Physiology and Psychology

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**Key words:** Garden plant morphology; Physiology; Psychology; Influence

**Abstract:** To visual stimulation, form is a very important visual characteristic. Multiple and abundant garden plant morphology would bring different unique visual senses to people, which would further cause different physiologies on the above basis and corresponding relative psychological reaction in the meantime. The main purpose of this research is to study the influence from garden plant morphology on humans' physiology and psychology. This experiment chooses college students as research objects, and the investigation methods are physiological measurement back-to-back method and psychological questionnaire method. It analyzes different forms of single plant and groups of plants on college students' physiological and psychological influences. On this basis, it promotes garden plant morphology application to provide a series of scientific and effective theoretical basis for demands of actual work.

## Introduction

An important subject element in garden design is garden plants, and an important subject element of the core elements in natural environment is also garden plants, so the functions it exerts are incomparable. In actual work, the types of landscape are abundant, and the existence of plant elements in space would influence people's perception of garden landscape space directly. In garden landscape, plants of different form families would constitute the expression of artistic spatial language directly. Therefore, forms of plants can be expressed with appearance representation, and it also involves with the expression, artistic conception, and emotions and so on of plants. Therefore, good forms of plants can promote people to sense certain artistic conception; meanwhile, people can feel the cultural intention involved in it<sup>[1]</sup>. Therefore, when people are implementing evaluation process in garden landscape, the representation forms of plants are very important basis. During the appreciation process, students are promoted to generate relative physiology on the basis of vision, and they would also produce some psychological changes. After appreciation, people would experience the comfort and beauty brought by the entire garden landscape space. Therefore, in actual work, the priority of garden landscape designers is to grasp the plant form elements of garden landscape; they should be based on the optimal suitability and comfort of human. On the basis of established starting point, they can finish scientific and rational allocation of different forms of plants and build a healthy and ecological human environment in the end.

## **Analysis of research methods and selection of objects**

During the process of studying Human-Environment Relationship, most scholars would choose college students as common examinee groups<sup>[2]</sup>. After analysis of relative literatures, it is found out that during the process of visual stimulation, if college student groups are chosen as examinees, remarkable research results will be obtained; meanwhile, it also promotes the scientificity and representativeness of the results. Since college students are about the same age, they have similar cultural standard and their educational degrees agree with each other, so they are research objects with effective homogeneity. On the basis of determining the theme of this research, 104 college students in a certain university were chosen as research objects, who are students from non-horticulture major and students from horticulture major. In the examinees of this test, there are 70 men and 34 women. The youngest is 19 years old and the oldest is 25 years old; the average age is  $22.32 \pm 2.11$ .

Plants landscape sample plot is chosen in this experiment as research area, and two types are analyzed: natural morphotype and geometric morphotype. Geometric plant unit is usually set at the entrance of gardens, and they are mainly trimmed as geometric shrub hedge and sequence plant tree landscape. Natural plant landscape unit is usually set inside the garden, and over 30 types of plants are involved. In the experiment area, there are 8 types of plants. Generally speaking, natural distribution is adopted for the plants, and there are abundant and integrate community structures, i.e., the tree form is very complete in the growing process without trimming traces, and this is the typical natural form landscape<sup>[3]</sup>.

Activity of SNS (sympathetic nervous system) and PNS (parasympathetic nervous system) are observed, and detailed indexes are systolic pressure and diastolic pressure. Heart rate is usually chosen as indexes for human's tension degree and physiological activation degree, which is also one of the important indexes of human's mental health status. Three indexes, which are average systolic pressure, average diastolic pressure and average pulse, can be used to check human's physiological changes before and after the experiment, and real situations of the above indexes can show circumstances of experimenter's actual health after landscape appreciation activity<sup>[4]</sup>.

Psychological experiment method in this research is emotion scaling method, which is often applied in actual work. It can show experimenter's positive and negative changes well, i.e., it can transform human's subjective consciousness so that it can realize the representation of quantitative indexes. In spatial environment researches, it is often used to complete measurement of psychological feelings.

Formulation of individual emotional scale means finishing evaluation according to differentiated process of context. It is mainly formulated into 5 degrees of assessment scales, and the scores are 5~1 point. The assessment scales are 6 pairs of emotional psychological adjectives, which are: joyful-angry, simple-complicated, harmonious and inharmonious, relaxed-intense, calm-agitated, energetic -bored.

104 college students were chosen in this research and every one of them has good physical conditions. Individual emotion scale questionnaire needs to be filled out by every participant before appreciation. The purpose is to evaluate the 6 emotional conditions of the students: joyful, complicated, harmonious, intense, agitated and energetic. After filling out the questionnaire, relative physiological measurement is conducted to experimenters. After the measurement, they went to the experiment area and the appreciation lasted for about 10 minutes. Major physiological measurement indexes are the following aspects: heart rate, systolic pressure and diastolic pressure. 10 minutes after the experimenting appreciation, every participant is needed for another blood pressure measurement; meanwhile, they need to finish individual emotional condition scale questionnaire.

After the above measurement, relative data is obtained, which will be used for statistical analysis of the participants' standard of comfort, physiological changes before and after the experiment and scores of positive and negative emotional scales <sup>[5]</sup>.

## Results

Physiological data of human is scored by average  $\pm$  standard deviation, and the detailed indexes are average diastolic pressure, average systolic pressure and average pulse. Physiological changes before and after plant landscape appreciation after analysis is shown as Table 1. Note: Average diastolic pressure decreases distinctly after appreciating natural plant unit, and the difference is distinct with statistical significance. Systolic pressure decreases insignificantly without statistical significance. After appreciating geometric plant unit, both average diastolic pressure and average systolic pressure decrease, while pulses increased.

Table 1 Results of average diastolic pressure, average systolic pressure and average pulse

Index		Before appreciation	After appreciation
Natural plant unit	Average diastolic pressure (mmHg)	113.22 $\pm$ 8.12	107.11 $\pm$ 11.33
	Average systolic pressure (mmHg)	68.22 $\pm$ 9.41	68.11 $\pm$ 6.12
	Average pulse(beat.min <sup>-1</sup> )	78.64 $\pm$ 11.99	78.12 $\pm$ 8.55
Geometric plant unit	Average diastolic pressure(mmHg)	113.91 $\pm$ 8.03	107.55 $\pm$ 7.18
	Average systolic pressure (mmHg)	66.91 $\pm$ 8.06	64.33 $\pm$ 6.28
	Average pulse(beat.min <sup>-1</sup> )	76.22 $\pm$ 9.05	77.28 $\pm$ 7.14

Analysis of change trend of the average values of positive and negative emotion before and after appreciation of morphotype plant landscape is shown as Graph 1-6. Therefore, compared with geometric plant landscape, positive emotions of natural plant landscape has more obvious improvement, as is shown in Graph 1, Graph 3 and Graph 6. At the same time, compared with geometric plant landscape, negative emotions of natural plant landscape are lower, as is shown in Graph 2, Graph 4 and Graph 5. There is more comfort in the subjective evaluations of natural plant landscape, while joyful emotions of natural plant landscape are more promoting, and geometric type is easier to induce the harmonious emotions of audiences.

## Discussion

To garden landscape architecture, the spatial setting of plant landscape is a very direct spatial experience; meanwhile, it is a very abundant spatial experience. In plant landscape space, people can get in touch with natural environment more intimately, acquire natural, comfortable and healthy ecological aesthetics accurately and arouse their active psychological elements. In real work, garden plant landscape is a concrete material space; meanwhile, it can be regarded as an emotional psychological space. In this space, people can get psychological satisfaction and even generate emotional resonance during appreciation. Landscape space constituted by garden plant is a multi-dimensional space, including time and emotional character. Generally speaking, plants would present aspect changes with the evolution of time and changes of seasons; meanwhile, they can also

present unique life characteristics, construct special emotional space so that appreciators can feel the scale, characteristics, emotions and rhymes of plant space, thereby influencing people's psychological and physiological feelings and creating different basic influences. Therefore, in the constructing process of plant landscape, plant designers need to analyze various characteristics of plants fundamentally and grasp plant space as well as constructing plant space from an integral perspective so as to process the organization and relationship of plant landscape space reasonably and effectively; meanwhile, they should consider comprehensively and analyze different spatial types' influences on people's physiology and psychology. On the above basis, they can create harmonious, ecological and healthy plant landscape.

On the basis of investigation on college students, this research studies common plant forms in gardens and conducts direct analysis on plant forms and relationships of landscape spaces of plants; it also analyzes its influence on human's physiology and psychology and actual change trends on the basis of the influences; on the above basis, corresponding application analysis is completed on different types of plant forms strictly in garden landscape. On the basis of analyzing relative literature materials, it analyzes the landscape space types of plant forms, form characters of garden plants as well as the relationships of garden landscape spaces. After the investigation, it is found out that the activity of human's sympathetic nervous system would be influenced distinctly by different types of plant landscapes. During the appreciation of geometric plant landscape, neural activity hyper-function of college students' parasympathetic nerve would be enhanced obviously; meanwhile, their heart rate would be improved directly; changes of natural form plant human heart rate are not distinct, and there are significant changes between the two. In conclusion, to human's physiology, different form types of plant landscape would have different influences, and natural form of plant landscape is more healthy and comfortable compared with geometric plant landscape. At the same time, natural plant landscape can promote the development of positive emotions of humans, while functions of geometric plants are not obvious, and their effects in relieving tense emotions are not good.

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