A Study on Comfort Evaluation using Brain Waves and Questionnaire Survey in Green Spaces CG

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Introduction

Modern society can be stressful, and there is growing interest in the creation of comfortable living space. Many studies of urban space have focused on ways of creating relaxing space and comforting environments. For example, green space at highway rest facilities has been found to ease driver stress (Iwasaki et al., 2007). In recent years, devices for measuring biological information that were originally used in the field of medicine have become generally available and are being used in a variety of research fields. Research into the evaluation of urban space is no exception, and many researchers are now using biological information to quantify the effects of spatial recognition on the human body. Examples are the measurement of salivary amylase levels (Nakagawa et al., 2014) and brain waves in moving subjects (Miura et al., 2005).

Here we quantified the difference between the healing effect and the stress reduction effect due to the difference in green amount in the CG space using an inexpensive electroencephalogram (electroencephalogram or electroencephalogram) device. Our aim was to quantitatively verify the healing and stress-reduction effects of these spaces by using EEG measurement and a psychological analysis performed with a questionnaire survey.

Study Methods

In this research, we create images of green spaces and create CG images of 8 patterns with different green amount and width of the park. The characteristics of the eight patterns are shown in Table 1. In addition, Fig. 1 shows CG images of eight patterns.

For our measurements we used a relatively inexpensive and portable simple EEG machine. We used the following method to measure brain waves. Subjects donned the EEG machine, which then recorded their brain waves while they performed mental arithmetic (30 s) → landscape appreciation (60 s) → video viewing (30 s). After we had observed the subjects' brain waves, we performed a questionnaire survey at the same time as the subjects appreciated the landscape at each site. The survey items in the questionnaire covered each subject's living environment, the degree of stress in the environment in which they had grown up (5-stage evaluation), and the subjects at each observation point. There were 30 subjects, all of whom were students aged from 16 to 22 years.

Table.1 The characteristics of CG images

Sample image number	Width of the park	Tree height	Distance of trees
1	2m	low tree (1m)	None
2	2m	Medium tree (2.5m)	1.5m
3	2m	Medium tree (2.5m)	3m
4	2m	High tree (4.5m)	1.5m
5	2m	High tree (4.5m)	3m
6	2m	High tree (4.5m)	6m
7	1m	High tree (4.5m)	1.5m
8	1m	Medium tree (2.5m)	1.5m

image number 1	image number 2	image number 3	image number 4
			
image number 5	image number 6	image number 7	image number 8
			

Figure.1 The characteristics of CG images

Results

The conclusion in this study is as follows.

1) From the comparison of brain waves and questionnaire results using CG images, behavior of brain waves and relaxation degrees of questionnaire results due to changes in street width

are consistent. And It was confirmed that the narrower the garden road width, the lower the relaxation degree with the rest index. However, the influence on the degree of relaxation due to the change in the planting interval was not confirmed from the brain waves and questionnaire results.
2) Subjects who showed inconsistency in the degree of relaxation due to electroencephalograms and questionnaire results in the change in planting interval tended to relax in a closed green space. This result is different from existing research.

References

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