The *Function and Aesthetics* of Stepping Stones

Landscape and Greening Course
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1. Introduction

In Japanese tea gardens, stepping stones (Tobi-ishi) function not merely as an aid for walking, but as a dynamic spatial devices that integrate *function* and *aesthetic experience*. Historical assertions such as Sen no Rikyū's principle of *"*60% function, 40% aesthetics*"* and Furuta Oribe's *"*40% function, 60% aesthetics*"* demonstrate the importance of these concepts as design philosophies. However, these ideas are primarily based on aesthetic sensibilities, and their relationship with actual walking experiences and bodily perception has remained unverified. For a deeper understanding of the relationship between theory and practice,this study aims to clarify the influence of the physical dimensions of stepping stones on pedestrian movement and awareness of the surrounding landscape, through empirical measurements and experiential verification.

2.Purpose of the Study

The objectives of this research can be summarized into three main points. First, to objectively measure how the spacing, surface area, and layout of stepping stones affect walking rhythm and visual attention. Second, to examine the extent to which historical design philosophies are realized in actual walking experiences. Third, to describe a concrete balance between "*function*" and "*aesthetics*" that can be applied to contemporary garden design. In particular, this study aims to establish an empirical foundation for steppongstone design by analyzing both bodily movement and landscape awareness.

3.Research Methods

The research was conducted in three stages.
First, on-site research was carried out at 12 domestic gardens, including Tokugawa-en, Katsura Imperial Villa, and Koishikawa Korakuen. The spacing (center-to-center distance) and surface area of individual steppingstones were measured using smartphone distance-measuring applications, from which a database was then compiled.
Second, based on the collected data, scatter plots were created and walking comfort was evaluated based on four levels: red (difficult), yellow (moderate), green (comfortable), and blue (comfortable with both functional and aesthetic awareness). Particular attention was given to analyzing the *"blue points"* to extract the characteristic features of stepping stones

(Figure 1).

Third, steppingstones were installed at Gifu World Rose Garden and an on-campus skills certifications－training yard, and walking tests were conducted with 16 participants including students and faculty members. Walking speed, eye direction, and level of awareness concentration were measured. Shrubs and plastic bottles were intentionally placed along the test paths to reproduce realistic garden environments.

Size of the steppingstones and walking comfort

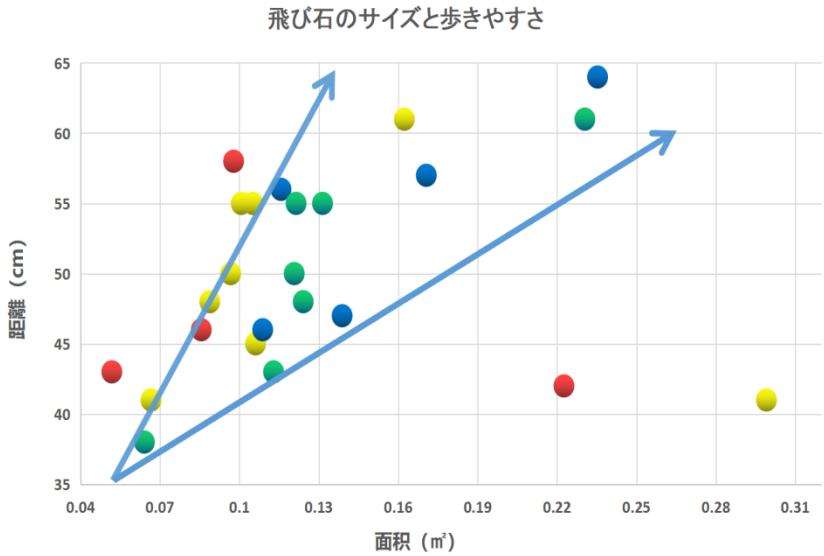

Figure 1. Scatter Plot of Walking Comfort

Distance

Surface area

4.Results and Observations

The optimal Size of steppingstones obtained as a result of this research is as follows. When the spacing between stones ranged from 40 to 50 cm, pedestrians were able to walk with a natural rhythm and stable walking speed. In contrast, when the spacing exceeded 60 cm, walking speed tended to increase unconsciously, resulting in a disrupted walking rhythm. Regarding surface area, stepping stones of approximately 0.12 m^2 enhanced foot stability but reduced attention to the surrounding landscape, whereas stones of approximately 0.08 m^2 slightly reduced walking comfort but encouraged greater visual focus on the scenery. Furthermore, in sections designed with aesthetic intent—combining curved layouts, narrow spacing, and stones with large surface areas—walking speed decreased and attention to the surrounding landscape was promoted. However, when environmental interference factors such as shrubs and plastic bottles were placed, attention to the landscape declined

significantly, limiting the effectiveness of visual guidance. In actual walking tests, many participants failed to notice plastic bottles placed in the back within aesthetically intended sections, showing a reduction in landscape awareness.

These results indicate that establishing the aesthetic function of steppingstones is not only affected by their layout, but by the maintenance of the surrounding environment. The realization of *"aesthetics"* depends not simply on stone shape or angle, but on satisfying two conditions: a natural decrease in walking speed and the effective guidance of pedestrian's visual direction and attention (Figures 2 and 3).

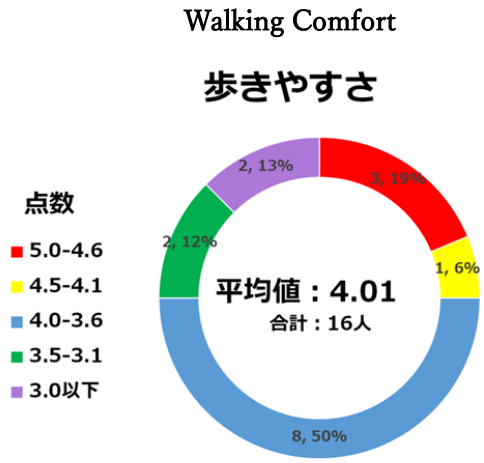

Figure 2. Pie Chart of Walking Comfort

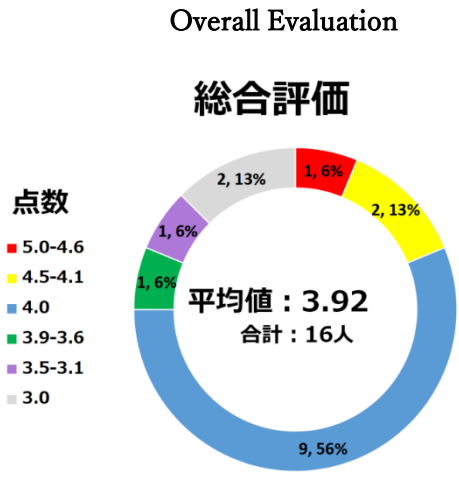

Figure 3. Pie Chart of the Overall Evaluation of Steppingstones

Point

Average Point:

Total:

In other words, steppingstones are redefined not only as a function that enables walking, but also as a device that mediates landscape experience through bodily movement and visual perception. Specifically, by setting stone spacing at 40–50 cm and surface area at 0.08–0.12 m^2, and by clearly organizing the surrounding landscape, a balance between "function" and "aesthetics" can be achieved.

From this perspective, stepping stones function not only as an element that "makes people walk," but also as a device "that helps people see," facilitating the integration of bodily sensation and landscape experience. This study concretely demonstrated the functional and aesthetic roles of stepping stones through empirical data and provided an experience-oriented perspective into garden design.

In conclusion, the true value of stepping stones lie in the integration of *"walking"* and

"seeing." When conditions such as 40–50 cm spacing, 0.08–0.12 m^2 surface area, and appropriate landscape settings are met, stepping stones simultaneously allow for rhythmic walking and enjoyment of the scenery. This approach transcends the conventional one-sided understanding of stepping stones as a mere landscape element, redefining them as a device for dialogue between the body and space. I believe the results of this research will serve as fundamental material for future garden design and construction, particularly in considering spatial composition while emphasizing the walking experience.