

Title	中国における都市公園景観の視覚品質の研究:知覚、感情、ストレス回復の多次元評価
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Citation	
Issue Date	2025-06
Type	Thesis or Dissertation
Text version	ETD
URL	<a href="http://hdl.handle.net/10119/19970">http://hdl.handle.net/10119/19970</a>
Rights	
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## **Abstract**

Urban parks play a vital role in enhancing the quality of life, particularly in rapidly urbanizing countries like China, where the rapid expansion in the quantity of urban parks has not always been accompanied by a corresponding improvement in their quality. Poorly designed parks not only fail to fulfill their intended purposes but can also result in resource wastage and dissatisfaction among users. This dissertation addresses these challenges by focusing on the Landscape Visual Quality (LVQ) of urban parks in China, providing an evidence-based framework for improving both the aesthetic and functional aspects of park design while catering to the unique needs and preferences of Chinese users.

The research is structured into three interrelated studies, each contributing to a comprehensive understanding of how LVQ impacts human perception, visual behavior, emotions, and stress recovery:

Study 1 develops a comprehensive evaluation system for assessing urban park LVQ using multidimensional visual indicators, including eye-tracking data, image segmentation, and spatial feature indicators. Through GEE logistic regression models, the study identifies key positive and negative factors influencing seven perceptual dimensions, including beauty, comfort, color, complexity, liveliness, greenness, and safety. Integrating these multidimensional visual indicators, a generalized estimating equations (GEE) logistic regression model demonstrated superior performance over existing traditional models focusing only on spatial features, facilitating more accurate evaluations of LVQ perception. Moreover, herb plants (eye-tracking indicator), water ratio (image segmentation indicator), and number of materials (spatial feature indicator) were the most positive factors affecting human perception. Isolated planting style positively impacted the perception of greenness, and sky ratio negatively correlated with beauty perception. Additionally, openness levels of 20–80% enhanced beauty perception, while openness above 80% decreased liveliness but improved safety perceptions. Shrub species diversity positively correlated with perceptions of greenness and complexity, whereas single and dense shrub arrangements diminish perceptions of

greenness and liveliness. Overall, this study provides valuable insights for urban planning at the design stage to enhance decision-making and visual quality of urban parks, thereby contributing to the establishment of more sustainable urban development strategies.

Study 2 focused on the emotional dimension of LVQ. This study quantifies how seven landscape elements influence emotional responses and visual behavior. Herb plants most effectively promote both psychological and physiological emotional responses, making them the most emotionally beneficial natural element. Shrubs and artificial objects are associated with negative emotional responses, requiring careful proportion and spatial arrangement. Flowering trees simultaneously decrease pulse rate and increase skin conductance, indicating a compound emotional state of calmness and alertness. To support emotional restoration, designated restorative zones should minimize artificial elements and incorporate water features and herb plants. By bridging perception and emotion, this study provides practical recommendations for urban park design to foster positive emotional experiences.

Study 3 examines the potential effects of urban park landscapes on children's emotional and stress recovery, contributing child-focused perspectives to the LVQ framework. The findings suggest that LVQ may be associated with landscape element proportions and spatial openness. For children, while greenery remains important, spatial openness seems to play a more prominent role in shaping children's emotional responses. Landscape features may impact children's emotions, particularly calmness, happiness, and disgust, suggesting that thoughtful spatial arrangements and visual balance could contribute to child-friendly landscape design.

This research synthesizes findings from the perceptual, emotional, and stress recovery dimensions of LVQ to develop a comprehensive set of optimization guidelines for urban park design. These guidelines integrate evidence-based recommendations across multiple dimensions, offering a practical framework for balancing aesthetic, emotional, and functional objectives in park planning. By aligning user-centered insights with multidimensional evaluation methods, this dissertation provides urban planners and

landscape designers with actionable tools to create inclusive, visually engaging, and emotionally supportive urban parks. This contribution not only advances the understanding of LVQ but also supports the broader goal of sustainable urban development, addressing the well-being priorities of diverse user groups, including children, in rapidly urbanizing regions like China.

**Keywords:** Urban park, Virtual reality, Eye-tracking, Human perception, Emotion responses, Physiological signal.