

Multisensory Urban Design: Healing Effects of Visual, Auditory, and Olfactory Enhancements in Street Landscapes

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Abstract : Objective: This study aims to investigate the therapeutic benefits of comprehensive street renovations and their individual components from a multisensory perspective, identifying key factors that enhance the multisensory experience in urban public spaces. Method: The study employed a combination of physiological measurements and subjective ratings to investigate the healing effects of street renovations from three sensory perspectives: visual, auditory (single soundscape vs. mixed soundscape), and olfactory (single scent vs. mixed scents). Forty university students (balanced gender) were recruited and randomly assigned to three independent groups to experience different stimuli: (1) Visual only group (N=14); (2) Visual and auditory group (N=13); (3) Visual, auditory, and olfactory group (N=13). Each group experienced three VR scenarios in sequence: Visual - current scenario; Auditory - single bird song (sparrow); Olfactory - single scent (bush). Visual - pavement and seating renovation scenario (adding bike lanes, shallow grass ditches, seats, changing ground pavement); Auditory - two bird songs (sparrow, blackbird); Olfactory - two scents (bush, grass). Visual - increased plant configuration scenario (peach tree, rose); Auditory - three bird songs (sparrow, blackbird, and blue-throated); Olfactory - three scents (bush, grass, rose, and peach tree). Participants wore devices to monitor physiological data (EEG, GSR, and HRV), used the Perceived Restorativeness Scale (PRS) to assess recovery effects, and a self-made sensory evaluation scale to evaluate indicators such as sensory pleasure and richness. Results: Physiological measurements indicated that renovated scenarios (pavement and seating renovation and increased plant configuration) had better relaxation effects. In the visual-only group, emotional healing increased with renovations, but this trend weakened when auditory elements were added, especially in the visual, auditory, and olfactory groups. Subjective evaluations of all sensory combinations showed a significant increase with renovation improvements. The sensory evaluation scale revealed that positive olfactory evaluations enhanced visual and auditory sensory ratings, and floral scents effectively countered the negative impacts of adverse auditory factors. Conclusion: Overall, renovated streets demonstrated greater restorative potential than before the renovation. The multisensory combination after renovation (visual, auditory, and olfactory) showed the highest recovery scores. Participants preferred visually biodiverse environments, which induced pleasure and a sense of safety. However, overly diverse auditory and olfactory stimuli could lead to sensory overload and discomfort. This study demonstrates that the healing effects of multisensory combinations are closely related to sensory pleasure, sensory coordination, and sensory overload, providing valuable insights for future street renovation designs and multisensory urban design strategies.

Keywords : multisensory integration, street renovation, urban landscape, sensory healing, visual enhancement

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