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The influence of trees on the perception of urban squares

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ABSTRACT

The balanced relationship between nature and urbanity in cities concerning ecology, sustainability, climate, and well-being, is an omnipresent aspect of modern urban planning. Accordingly, the perceived value of trees in urban squares is a crucial, albeit hard to quantify, determinant of successful plaza design. Against this background, we investigate the extent to which the sheer existence of trees affects the perception and assessment of public urban squares. In order to measure the subconscious effects of trees on place perception, a two-group online survey was carried out that simulated different greening scenarios. The empirical results indicated positive effects of trees on the perceived esthetics and characteristics of urban squares, such as city image, worth to stay there, cleanness, and shopping atmosphere. We show that the assumed price level in adjacent restaurants as well as the willingness to visit, in terms of the willingness to stay in an urban square (i.e., the desired duration of visit) and the willingness to revisit it (i.e., the desired frequency of visit), are positively influenced by the presence of trees. Our results provide direct implications for urban planners and city managers.

Introduction

Motivation of the research focus

The systematic greening of cities is an important topic in urban planning and has gained increased attention in various scientific disciplines. Comprehensive research has been devoted to the evaluation of urban vegetation, especially in the context of sustainability, the acceleration of urban densification, and the quality of urban life. The multiple functions of trees in cities, the value as well as the benefits and costs of urban forests, and the diverse influence of greenness in urban areas have been widely discussed (e.g., Getz et al., 1982; Dwyer et al., 1992; Orland et al., 1992; McPherson & Simpson, 2002; Wolf, 2003, 2009; Gorman, 2004; Tyrväinen et al., 2005; Donovan and Butry, 2010).

Despite the increasing urbanization of many countries and the predominance of built infrastructure in cities reinforcing the need for research in urban greening, there is still no full awareness of the benefits trees can contribute, even though a high level of research activities on this matter can be observed in the last two decades (Draper and Richards, 2009). Corresponding explorations often focus on trees, or green in general, planted along streets, in parks or gardens, or next to or in buildings. In contrast to other public places, urban squares are rarely investigated—especially with respect to their greening. Information about the appreciation of vegetation in urban squares can be assumed to support the user-friendly planning and designing of urban squares or the creation of greening strategies to improve their public perception. Abdulkarim and Nasar (2014) emphasized the need for and importance of experiments analyzing cause and effect. It seems questionable whether the results of previous research concerning the benefits and positive influences of urban vegetation can simply be transferred from other kinds of public places to urban squares without explicit verification—in particular if they stem from studies that did not focus on the relationship between cause and effect.

Moreover, due to the Internet and other mass media, the worldwide consequences of rapid urbanization have received a high level of public awareness. Today's widely accepted demand for a balanced relationship between nature and urbanity inevitably induces a social desirability for trees in urban environments, e.g., as a countermeasure to global warming. Directly asking people to express their opinions regarding the benefits of trees or forests may lead to biased responses in terms of socially desired answers.

On squares, trees are often planted to give shade, to reduce noise, or just to embellish the site. As so-called "amenity trees", they provide recreational, environmental, ecological, social, health, and esthetic values, rather than productive benefits (Draper and Richards, 2009). However, it is still not clear what subconscious

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impact trees growing on urban squares may have. In contrast to the use of trees for practical purposes, the esthetic benefits (Tyrväinen et al., 2005) and positive or negative effects regarding the perception of the place as a whole or its features and functions are not apparent. Therefore, a widely unbiased elicitation of opinions regarding the effects of amenity trees is needed.

The present study focuses on an empirical investigation of the subconscious impact trees may have on people's perception and evaluation of urban squares and their immediate surroundings via the following overall research question:

> Do trees influence the perception of urban squares and, if so, what effects do they have?

In order to answer this question, a detailed study of the role of urban trees is required with respect to the perception of the following tangible and intangible aspects of urban squares:

- esthetics
- attributes, i.e., common characteristics and/or functions (city image, attraction for tourists, worth to stay there, seating possibilities, cleanness, and shopping atmosphere)
- price levels (assumed price level in adjacent shops and restaurants)
- willingness to visit, which is operationalized via the willingness to stay (desired duration of visit), the willingness to travel (accepted travel time), and the willingness to revisit (desired frequency of visit)

In particular, we aim to clarify the influence of trees on the perception of urban squares by the nonprofessional public, i.e., people without special expertise in urban design.

Background and research hypotheses

The term "urban tree" covers all trees that typically grow in urban squares without discrimination according to age, shape, or species. An "urban square" is defined as an open public space in a city that supports social interaction by serving as a meeting place and which is used by the citizens for activities like strolling, sitting, and communicating, often in connection with a variety of consumption offerings (Richter, 1981; Marcus et al., 1998). Open access and accessibility by public transportation are typical attributes of urban squares. Besides their function regarding social and health (e.g., well-being or recovery) aspects, urban squares have an esthetic function as part of the structural design of a city (Richter, 1981). Squares are synonymously called either "piazzas" due to their Italian origin or "plazas" due to their Spanish origin. Initially, this architectural form was left unplanted, but this has changed in the course of time so that nowadays squares often have trees (Forrest and Konijnendijk, 2005). Nevertheless, in comparison to other urban areas, e.g., public gardens or parks, the vegetation in squares is rather sparse. As squares are usually paved and surrounded by streets and buildings (Marcus et al., 1998), they often represent "gray" rather than "green" spaces.

In the relevant literature, esthetic perception plays an important role in the overall evaluation of urban vegetation. One of the main functions and intangible benefits of urban trees is directly connected to esthetics (McPherson and Simpson, 2002; Tyrväinen et al., 2005). Vegetation often serves as a method of beautification and as a visual attribute (Smardon, 1988; Ignatieva et al., 2011). Therefore, trees and other greening are often used by urban planners as ornamental items or decorative elements to improve overall esthetics when designing squares. But do they really fulfill this purpose and are they really able to influence the esthetic evaluation of the places in which they grow? Research in landscape perception has revealed consistent patterns in preferences for nature and natural elements; natural landscapes are preferred in contrast to other, especially urban, scenarios (Kaplan et al., 1972; Lange et al., 2008). According to Dwyer et al. (1992), the presence of an urban forest can turn an urban environment into a more pleasant and desirable place. However, Hofmann et al. (2012) showed that the perception of parks (regarding their beauty and the preference for trees) may differ between planners and citizens. Ferdous (2013) investigated the relationship between key visual characteristics of urban plazas and their esthetic response, discovering that plazas with a partially open low-height surrounding enclosure, a moderate quantity of water features, a moderate to large quantity of monuments and sculptures, and plentiful vegetation, are strongly associated with a positive esthetic response. In contrast to Ferdous (2013), we extend current research on the esthetic influence resulting from the existence or nonexistence of vegetation. We hypothesize that the esthetic evaluation of an urban square significantly differs depending on the availability of trees.

Urban greening can but need not necessarily have an effect on the perception of the tangible and intangible characteristics of a square. As centers of urban life, urban squares often represent the city as a whole (Sukopp and Wittig, 1998) and contribute to the image of a city. A positive city image, in turn, is important for people's decisions on where to move to or to remain and where to spend leisure time or holidays. Trees are often planted in cities to improve their image (Konijnendijk, 2010) and to contribute to their overall competitiveness (Arvanitidis et al., 2009). Therefore, it seems likely that the intangible benefit of trees regarding image improvement is also associated with urban squares. As trees provide esthetic enjoyment for both residents and visitors of a city (Givoni, 1991), they could also enhance the attraction for tourists visiting squares. As trees can even influence people's choice of residence (Getz et al., 1982), it seems reasonable that they also might have a positive influence on the perceived worth to stay in a square.

Trees in combination with facilities for sitting and resting are recommended by Whyte (1980) for well-designed spaces because of not only their esthetic function but also their ability to give shelter from sun or wind. By using eye-tracking methods, Nordh et al. (2010) substantiated the importance of benches for parks in terms of restoration. In a similar context, Nordh et al. (2009, 2011) found that people have a preference for trees, bushes, grass, and flowers when deciding where to sit. Abdulkarim and Nasar (2014) showed that seats, food vendors, and sculptures improve plaza visitability significantly, with seats being the most important aspect and having a positive interaction effect in combination with sculptures. However, it is not yet clear whether the perception concerning the comfort of seating possibilities changes due to the existence of trees.

Furthermore, the cleanness of a square may be important for a pleasant and comfortable stay. Some of the more disadvantageous aspects of trees relate to their leaves as well as to their blossoms, fruits, and seeds falling on streets and pavements (Gorman, 2004; Lorenzo et al., 2000). Even though Lorenzo et al. (2000) showed that the perceived disadvantages of trees are reflected in a reduction of the amount people are willing to pay for the protection and preservation of trees, most of these results indicate that they have a low or insignificant importance. Although trees can litter their surrounding area with foliage so that a place without trees might look neat and tidy and hence be perceived as well kept, the opposite seems to be true. Wolf (2003) identified significant differences in the evaluation of the maintenance and upkeep of inner-city business districts. Scenes with no trees are rated lower than those with traditional trees or mixed vegetation. Therefore, it can be assumed that trees have a positive effect on the perceived cleanness of a square.

It is typical for squares to also offer consumption possibilities (Marcus et al., 1998), including small shops or farmers' markets.