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Research Paper

Does landscape related expertise influence the visual perception of landscape photographs? Implications for participatory landscape planning and management

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HIGHLIGHTS

- Landscape related expertise seems to influence how landscape photographs are viewed.
- Expertise enhances and speeds up efficient information extraction and processing.
- Experts explore the images to a larger extent with short focuses on many objects.
- Laymen focus on a limited number of landscape features, restricting the exploration.
- A literally different view on landscapes can explain diverging landscape assessments.

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ABSTRACT

Does expertise in landscape related issues influence the way landscapes are observed? In an eye tracking experiment 21 landscape experts and 21 laymen were asked to observe 74 landscape photographs, each for 10 s. Experts seemed to make significantly more fixations and saccades, had a longer scan path and a larger visual span than the laymen. As a consequence, in the same amount of time, experts visually explored the landscape photographs to a wider extent and in a more global and holistic fashion. This is probably due to the presence of expertise, which seemed to enhance efficient information extraction, enabling experts to interpret and understand the landscapes more easily. In contrast, the laymen's visual exploration of the landscapes was considerably more restricted as they spent significantly more time and attention to singular objects, in particular to buildings. This behaviour may be a result of the lack of expertise, which makes longer fixation times necessary to understand the meaning of the composing landscape elements. A slower information processing leaves less time to visually explore the landscape photograph and hampers laymen to observe the landscape as a whole. Consequently, experts and laymen may not perceive the same features in a landscape and might not even see the same landscape. This conclusion is important for participatory landscape management in which experts and laymen are asked to visually assess landscapes. The often diverging assessments of both groups could partially be explained by their literally different view on landscapes, on which their judgement is based.

1. Introduction

Landscapes are important in our every-day activities and their condition affects our quality of life. Consequently, people are concerned when these landscapes are subject to change (Scott & Moore-Colyer, 2005). However, landscape management and development policies are often very top-down driven. Strategies are formulated by experts while the opinion of the public is insufficiently considered (Harrison & Burgess, 2000; Luz, 2000; Pinto-Correia, Gustavsson, & Pirnat, 2006). As a reaction, an increasing number of researchers express the need to incorporate public perception approaches in landscape management processes, as it is the public who eventually will experience the new developments (De Groot, 2006; Nassauer, 1997; Seddon, 1986; Vouligny, Domon, & Ruiz, 2009). This participatory methodology is also strongly promoted by the European Landscape Convention (Council of Europe, 2000) and the Aarhus Convention (UNECE, 1998).

Landscape change essentially affects the visual aspect of the landscape and policy makers usually seek to limit this impact

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(Dakin, 2003; Gobster, Nassauer, Daniel, & Fry, 2007). A widely used method to evaluate landscape management and development consists of using landscape photographs and simulations. This technique also seems particularly effective in informing a lay public about landscape changes (Bishop & Rohrmann, 2003; Ryan, 2006; Tress & Tress, 2002) and is therefore increasingly gaining importance in landscape management and design (Al-Kodmany, 1999; Lange, 2005). Landscape visualizations have, for example, been used for assessing environmental management planning (e.g. Sheppard & Meitner, 2005), for evaluating the visual impact of wind turbines (e.g. del Carmen Torres Sibille, Cloquell-Ballester, Cloquell-Ballester, & Darton, 2009; de Vries, de Groot, & Boers, 2012; Lothian, 2008; Thayer & Freeman, 1987; Tsousos, Tsouchlaraki, Tsiropoulos, & Serpetsidakis, 2009) and for assessing landscape management in general (e.g. Dandy & Van Der Wal, 2011). However, although visualizations could facilitate the dialogue between policymakers, planners and designers (experts) and the general public (non-experts) (Lange, 2005), often both groups seem to have opposed views when it comes to evaluating landscape changes visually (Bell, 2001; Godschalk & Paterson, 1999). These differences may be related to the way people literally perceive their environment. Research has demonstrated that the same landscape may indeed elicit different perceptions by different people (Brabyn, 1996; Conrad, Christie, & Fazey, 2009). This could be a result of the fact that not everyone observes a landscape in the same way and thus that different persons do not necessarily see the same landscape. As a result, different groups of observers may also perceive different features as being the key aspect of a specific landscape. In particular, this could be an issue in visual landscape assessment studies based on landscape photographs in which different groups of observers are consulted. If those groups indeed observe landscapes differently, the probability of having diverging opinions increases as different people might literally not see the same landscape. However, research on how landscape visualizations are perceived is still underexplored (Lange, 2005), while this could perhaps explain the discord between landscape experts and lay people when it comes to visual landscape assessments. In this context, Sevenant (2010) reports that perception is selective and intelligent, which is illustrated by the statement 'you see what you know or recognize'. Differences in people's intellectual and/or social background, related to acquired knowledge, experience, culture, ethnicity et cetera, will influence what is known, what will be recognized and thus what will be seen. In-depth analysis of how persons with different backgrounds observe landscape(s) (photographs) could be very useful in better understanding how disagreements between landscape experts and lay people concerning visual landscape aspects arise. This information could also help to more easily resolve such issues.

In this study, we analyze if landscape experts, who acquired knowledge and (professional) expertise in landscape related topics, indeed observe landscapes differently from the general public and how this is reflected. To this end, we conducted an eye tracking experiment, in which landscape experts and laymen were asked to observe a number of landscape photographs. During the experiment, the observer's point of regard, as well as the direction of his/her eye movements (or saccades) were continuously recorded. These data subsequently allow a complete reconstruction and analysis of the gaze pattern made while observing the landscape photographs. The first research objective is related to the hypothesis that the global viewing pattern differs between landscape experts and laymen. It is expected that experts visually explore a landscape differently from lay people because of their expertise in landscape related issues. This is investigated in this paper. The second research objective is to determine on which elements in a landscape experts and lay people fix their attention and if significant differences between both groups exist. To explore this, we perform statistical analyses, as well as a qualitative examination of the eye tracking data. Comparing image perception of experts and novices has been applied in many eye tracking studies in several domains of interest. Examples are given by Landsdale, Underwood, and Davies (2010) (experienced versus untrained users of aerial photographs), Hermans and Laarni (2003) (experienced versus novice map users), Mourant and Rockwell (1972), Underwood (2007) and Konstantopoulos (2009) (advanced versus novice drivers), Krupinski (1996) and Litchfield, Ball, Donovan, Manning, and Crawford (2008) (experienced versus inexperienced radiologists), Mann, Williams, Ward, and Janelle (2007) and Cañal-Bruland, Lotz, Hagemann, Schorer, and Strauss (2011) (professional sportsmen versus novices), Reingold, Charness, Pomplun, and Stampe (2001) (professional chess players versus novices), Nodine, Locher, and Krupinski (1993) and Vogt and Magnussen (2007) (artists versus artistically untrained participants), etc. All of these studies found significant differences between the observation patterns of experts and novices. However, in landscape research, eye tracking is a relatively new technology. Except for the studies of De Lucio, Mohamadian, Ruiz, Banayas, and Bernaldez (1996) (analysis of the exploration strategies of men and women in natural landscapes), Berto, Massaccesi, and Pasini (2008) (analysis of the types of attention when viewing landscape photographs), Tveit, Hagerhall, Nordh, and Ode (2010) (investigation of which aspects of a landscape are important when assessing its stewardship), Nordh, Hagerhall, and Holmqvist (2012) (analysis of eye movement patterns when rating restoration likelihood while viewing landscape photographs) and Dupont, Antrop, and Van Eetvelde (2014) (analysis of how photographs properties and landscape characteristics affect the viewing pattern) this technology has been little used in this field so far.

2. Methods

2.1. Subjects

Two groups of 21 subjects each participated in the eye tracking experiment. The expertise groups were formed based on the educational and/or professional background of the subjects, by analogy with previous studies concerned with expert-novice differences (e.g. Dyer, Found, & Rogers, 2006; Hermans & Laarni, 2003; Konstantopoulos, 2009; North, Williams, Hodges, Ward, & Ericsson, 2009; Vogt & Magnussen, 2007, etc.). Participants who are actively working or studying in landscape related fields were assigned to the 'landscape expert' group. Subjects without such educational or professional background were assigned to the 'laymen'-group. In practice, the expert group consisted of landscape researchers, landscape ecologists, landscape architects and planners and students who were finishing a Master in Geography with a specialization in Landscape Research. For the laymen group subjects who were unfamiliar with landscape related topics were chosen. In total, 42 persons (18 males and 24 females), aged between 22 and 65 and naive with respect to the purpose of the study, voluntary participated in the experiment. All subjects had normal or corrected-to-normal vision.

2.2. Photograph stimuli

In total, 74 colour photographs, representing a variety of rural and more urbanized landscapes in Belgium and northern France were used as stimuli. A range of different most common landscape types was chosen in order to be able to generalize the results of the study (for Belgium and the north of France) as much as possible. Fig. 1 gives an idea of the landscapes included in the study. All photographs were taken with a constant focal length of 50 mm