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RESEARCH ARTICLE

Deciphering overtourism impacts through eye-tracking analysis

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Abstract – The use of eye-tracking in the field of tourism is not very widespread, most of the existing studies use this qualitative tool to investigate the viewing of tourism websites or advertising. In contrast, this paper focuses on the identification and examination of the negative effects associated with the phenomenon of overtourism through photographs. The primary research involved 14 participants, and the results were presented using heat-map plots.
Participants devoted considerable time to viewing the signs of the negative impacts of tourism in the photos, but based on the responses to the questionnaire completed after the remote eye device survey, it was found that their willingness to travel was not affected to a considerable extent in a negative direction by the undesirable elements in the photos. Broken down by gender, women spent less time exploring natural beauty and built heritage, while men spent more time viewing these areas.

1. INTRODUCTION

Eye-tracking as a neuromarketing method is basically a modern tool of marketing research and its use is increasing, although it is not yet widespread (Lázár, 2020). In tourism, it is mostly used when participants view tourism websites or advertisements (Scott et al., 2015) or when the reactions triggered by tourist experiences are observed (Zátori, 2018).

This paper focuses on some of the visible effects of overtourism. The phenomenon of overtourism received considerable attention in the years preceding the COVID-19 epidemic, as globalization made travel increasingly accessible to large numbers of people, which contributed to the overcrowding of the most popular destinations (Rátz – Michalkó – Keszeg, 2020; Hojcska - Szabó, 2021). During the pandemic restrictions, the volume of tourism declined, but after the restrictions, the problems of overtourism were again evident. The affected areas have experienced a decline in the quality of life of the local population due to increased pollution (e.g. noise, light, air, water, soil), overuse of infrastructure (e.g. parking difficulties, congestion, deterioration of road quality due to increased congestion) and rising costs of living (e.g. (Goodwin, 2017; Gössling, 2020; Dodds - Butler, 2019; Walas – Nemethy, 2017). On the other hand, the tourists' experience is also limited, as they cannot

completely enjoy local attractions, experience cultural values to their fullest extent, and must deal with higher prices and overbooking due to crowding, congestion, long queues, and waiting times (Wall, 2020; Anuar et al, 2020). On the economic side, there are also dangers of overtourism, such as overdependence on tourism, instability caused by seasonality, the dominance of large international companies over smaller local businesses, and the increase in maintenance costs for overburdened infrastructure (Shoory, 2020; Milano, 2019; Ruggieri – Calo, 2018).

This study aimed to investigate some of the negative impacts of tourism with an eye-tracking device. Of the two types of eye-tracking studies - mobile eye-tracking devices and remote eye-tracking devices - this primary research seeks to exploit the potential of the latter.

2. MATERIALS AND METHODS

The primary research involved 14 participants voluntarily. The qualitative study consisted of tracking viewers' visual attention using a remote Tobii eye-tracking device. During the experiment, which lasted a few minutes, the eye movements of the participants were monitored by an eye-tracking system and the observed data were recorded. The eye-tracking device was attached to the screen of a laptop,

and travel-related images (stitched together in a video) were displayed on the screen in front of the viewer. The device on the laptop screen followed the viewer's gaze movement and speed as the video was played, and recorded the points at which the participant's gaze was caught.

In most cases, the researchers are interested in what the participant looks at first in the picture, the path of the gaze, or which part of the picture the viewer looks at for a longer period. The order in which the participant looks at the different parts of the image is called a gaze plot, while the degree of visual attention can be analyzed using heat maps (Herendy, 2018; Lázár - Szűcs, 2020). Due to the nature of the images used in this research, heat maps were used to provide an overview of the intensity of interest and observation, which can be represented using special analysis software. Heat mapping is a two-dimensional data representation method whereby a predefined color scale is used to represent the activity of the viewer, with the colors of the scale indicating the length and intensity of the activity – in this case gaze (Langmár, 2019).

Following the eye-tracker recording of the tourism-themed images, a short questionnaire was filled in by the participants to provide more information about their travel habits and demographic background. In addition to exploring unconscious reactions to the eye-trackers, professionals usually use questionnaires or in-depth interviews to assess participants' conscious opinions, experiences, and situations (Lázár, 2020). Although a quantitative research method of questionnaire survey was also used, its data were not used specifically for quantitative purposes. As the amount of data did not reach a sufficient number of elements, we were not able to perform a deeper statistical analysis. Regarding this issue, the authors' decision was based on the reason that the questionnaire complemented and supported the qualitative eye-tracking study, which has been similarly applied to eye-tracking research by other authors (Szilágyi – Fehér – Berencsi, 2022).

3. RESULTS

3.1. Characterization of the sample
Half of the survey participants were female and half male; 50% live in a county seat and 42.9% in a town. In terms of the educational background of the participants, 50% were current undergraduate students (BSc, BA) with a high school diploma; 21.4% had a Master's degree (MSc, MA). The participants were young people aged between 20 and 38 years.

Considering that the subject of the study is tourism, the questionnaire included basic questions about the participants' travel habits, but these were not surveyed in more detail.
The European regions visited by the participants were defined according to the StAGN (2014) position paper (Figure 1).

Most of the respondents to the primary survey (10 people) had visited Central European countries (Poland, Czech Republic, Slovakia, Germany, Romania, Switzerland,

Liechtenstein, Austria, and Slovenia) several times. All participants have visited at least one Central European country (other than their country of origin, Hungary).
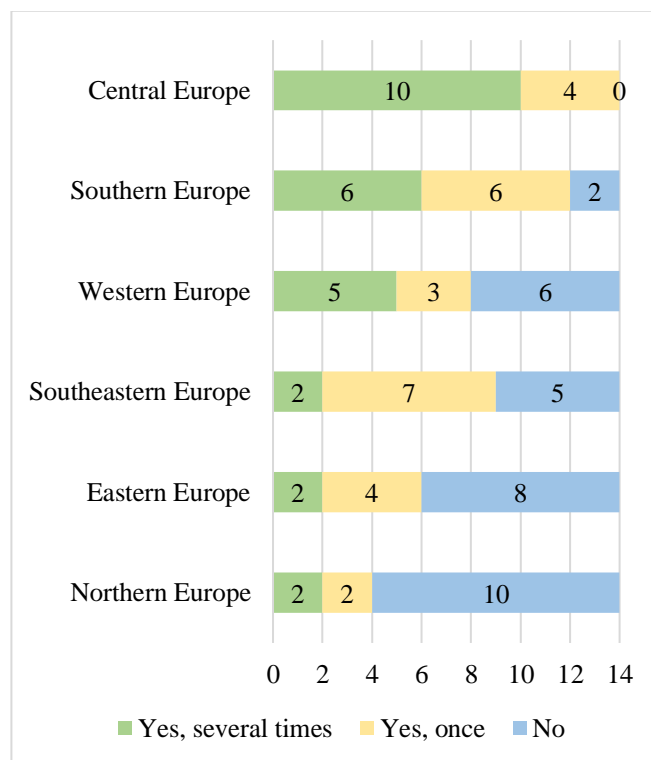

Figure 1: European regions visited by participants (number of participants)
Source: edited by the authors (2023)

This was followed by the Southern European region (Malta, Italy, Spain, Portugal, San Marino, Vatican City, Andorra), where 6 participants have visited several times and 6 participants have visited once. Western Europe (Belgium, the Netherlands, Luxembourg, United Kingdom, Ireland, France, Monaco) has been visited several times by 5 and once by 3 people from the group. South-Eastern Europe (Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Kosovo, Albania, Northern Macedonia, Greece, Bulgaria, and Turkey) has been visited several times by 2 people and once by 7 people from the survey. In Eastern Europe (Belarus, Ukraine, Moldova, Georgia, Russia, Estonia, Latvia, Lithuania) 2 people have traveled several times, and 4 have traveled once. Northern European countries (Iceland, Finland, Norway, Sweden, Denmark) were the least preferred destinations by the participants, with 10 people who had never visited a Northern European country.

The purpose of leisure travel of the survey respondents is illustrated in Figure 2.

3.2. Results of the eye-tracking study
In the eye-tracking study, the viewer saw three sequential sets of four images. In each of the three sessions, three pictures showed a tourist destination with signs of overtourism, and one picture showed a scene with normal or low levels of tourism, with a pleasant level of tourist activity. The photos

were classified into three groups: built heritage, coastal tourism, and event and festival tourism.

Heat map visualisation
Based on the results of the heat map studies, it can be concluded that in images with a distinct human figure, participants spent more time looking at the human figures than at other elements of the environment. This is in line with the results of other previous studies using gaze tracking (Herendy, 2011; Pernice – Nielsen, 2009).
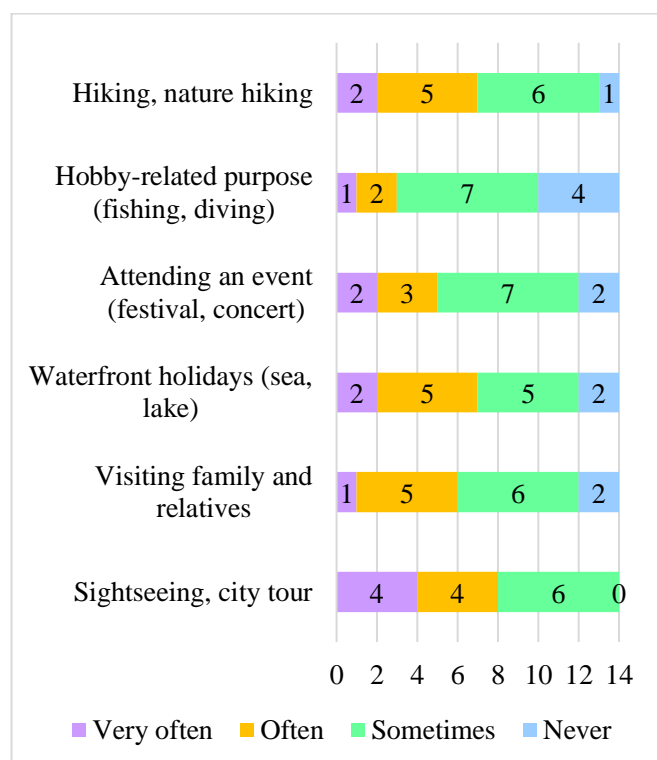

Figure 2: Participants' motivation for traveling (number of participants)
Source: edited by the authors (2023)

As half of the individuals in the survey were female and half male, it was appropriate to conduct a heatmap study of gaze tracking by gender. This is illustrated in Figures 3, 4, and 5.

Observing the colors of the heat map in the images of the built heritage (Figure 3), it can be stated that women focused more on the view of the people, while men paid slightly more attention to the role of the landmark and the environment.

Figure 3: Heat map visualization by gender: built heritage
Source: edited by the authors (2023)

In the section on coastal tourism (Figure 4), the heat map illustrations show that women were less detailed in viewing

the litter left on the beach, again with more attention paid to the people in the pictures.

Figure 4: Heat map visualization by gender: coastal tourism
Source: edited by the authors (2023)

In the case of the photos on event tourism and festival tourism (Figure 5), both men and women focused strongly on the event environment (posters, stage, equipment) and also took a close look at the participants.

Figure 5: Heat map visualization by gender: event and festival tourism
Source: edited by the authors (2023)

Southern European countries involved in 3S tourism (sea, sand, sun) are clearly characterized by seasonal congestion in their coastal areas due to the presence of tourists (Szőllős-Tóth, 2022; Capocchi et al., 2019; Briguglio - Avellino, 2019).

A heat map visualization of the results of the eye-tracking study of coastal images is presented in Figure 6, grouped according to whether the participant has ever visited Southern Europe. Those who had not visited Southern Europe before (top row of Figure 6) typically spent more time observing the landscape, sea, and nature.
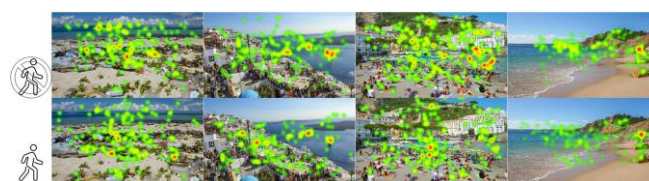

Figure 6: Heat map visualization according to whether the participant has been to Southern Europe: coastal tourism
Source: edited by the authors (2023)

The choice of participants
After a few minutes of eye-tracking, each participant filled in a short questionnaire. The first three questions asked them where they would feel most comfortable in each of the four locations presented in the three sessions. The preliminary hypothesis was that "Respondents would choose, at least 80% of the time, images where no signs of overtourism can be detected". However, this hypothesis had to be rejected, as only 21 (50%) of the 42 choices in total did respondents

choose images where signs of overtourism were not strongly evident.

Of the three sections of photos, the category on events and festivals was the section with the least respondents selecting the photo we marked (where fewer people are included) (28.6%). Previously published studies have shown that even in the case of mass events, such as festivals and other large events, crowds and congestion are disturbing for participants and are usually voiced by visitors (Hinek – Kulcsár, 2019; Formádi et al, 2019; Kiss – Hinek, 2020). However, it is undeniable that visitors attending festivals and larger events are usually aware of the fact that the program of their choice is likely to be crowded, and thus less likely to view this phenomenon as an unexpected problem. This may also partly explain the choice of survey respondents. To explore further reasons, respondents were asked to justify their choice in an open question. Those who chose the less crowded scene said: 'Cultural curiosity can be discovered in the picture, in a positive atmosphere, in a clean environment', 'it looks like a family event', and 'there are not many people and the weather is very nice'. In contrast, those who opted for the music festival or dance carnival highlighted the importance of concerts, musical experience, and a good atmosphere.

Of the pictures showing built heritage, 57.1% of the participants chose the less crowded destination. They all noted in their answers to the open question that the photo shows fewer people, no crowds, and is easier to explore because it is not crowded. All the other respondents chose the second least crowded location, and the reasons given by most of them were the popularity, interest, and uniqueness of the attraction, the greenery, and the beauty of the landscape.

Of the photos showing the beaches, the landscape least affected by the apparent negative impact of tourism was chosen by 64.3% of respondents. The reasons given by the respondents were 'clean beaches, seawater, no disturbance to the harmony of nature by human activity', 'no pollution, few tourists and clean location', and the tranquillity, untouched nature, and quietness of the location. Among the reasons given by those who did not select the image we marked were the previous pleasant holiday in the destination, the presence of mountains in the photo, in addition to the sea, and the breathtaking views.

4. CONCLUSION AND SUMMARY

Based on data from the years before the COVID-19 epidemic, the world's top ten most popular tourist destinations are the countries that receive 40% of global tourist arrivals (UNWTO, 2021). The problem of congestion due to the number of tourists has become increasingly important over the years. The main reason for traveling is leisure (55%) (UNWTO, 2021), which includes holidays, recreation, and leisure activities, so 3S tourism, city tourism, and festival tourism play a key role.

The primary research aimed to investigate some of the negative impacts of tourism through remote eye-tracking on the issue of overtourism. The qualitative, remote eye-tracking research was completed using 14 participants. Respondents in the survey saw four photos in each of the categories of built heritage, coastal tourism, and event and festival tourism. Of the four images presented, three showed the negative effects of tourism and one showed a normal, pleasant level of tourism with few tourists. In the short questionnaire, participants were also asked to choose which of the four destinations in each section they would feel most comfortable visiting. When preparing the research, the following hypothesis was formulated: "Respondents will at least 80% of the time choose pictures where no signs of overtourism can be detected". Out of a total of 42 choices (14*3), only 21 (50%) of the respondents chose photos showing normal or low levels of tourism, so the hypothesis has to be rejected. Even though the participants' attention was mainly focused on the crowds and other signs of overtourism, they could not distract themselves from the destination's fundamental values, such as parts of the built heritage or natural beauty. In addition, personal impressions, previous pleasant experiences, and memories also influenced the respondents in the sample, who, in many cases, based their choices on these key memories, according to their given answers to the open questions.

The visual representation of the level of attention was achieved using heat maps generated by a special software. In general, the results show that, in the cases where human figures were detectable in the photographs shown, the participants involved in the neuromarketing research spent a relatively large amount of time observing those figures. Thus, in a future eye-tracking study, when the focus is on observing signs of overtourism, it would be appropriate to select one of the sections of photographs that do not show any people at all, but in which other adverse effects of tourism are prominent. It may be advisable to separate the sections of photos according to the negative effects of tourism, and thus to group the photos according to economic, environmental, and social criteria.

In this survey, half of the participants were women and half were men. The gaze-tracking of the photos, grouped by three types of tourist trips, showed that women spent much more time observing people figures. Although men also viewed the people in the pictures, they paid more attention to nature, the sights, and the environmental pressures in the pictures.

An interesting aspect of the research was that participants who had never visited a country in Southern Europe before spent a noticeably greater amount of time looking at the landscape, the sea, and nature.

One of the more significant findings to emerge from this study is that the negative effects of overtourism were visible in the photos, the participants spent a lot of time observing the crowds, and the waste at the imaged destination. Nevertheless, their willingness to make a travel decision would not be significantly influenced by the unpleasant factors they saw. Although the participants seemed to be aware of the signs of overtourism, most of them did not care about them and expressed little concern about them. Given

this, we believe that raising public awareness of the long-term consequences of overtourism is important. The fight against the negative effects of overtourism is not only a task for decision-makers and destination management organizations, but also for travelers who are on the demand side. Education is essential to make tourists more aware and responsible during their travels, with a major role being played by tourism organizations, social media celebrities, influencers, bloggers, and vloggers promoting responsible travel and sustainability. There are many good examples of travel bloggers promoting alternative tourism, which can actively contribute to a more even distribution of tourist flows by introducing less popular destinations to the public (e.g. Travellina, 2023a; 2023b).Taking into account the results of the eye-tracking neuromarketing study, it can be stated that although participants perceived signs of overtourism in the photos presented, their willingness to travel was not negatively influenced by what they saw. Therefore, it seems to be of great importance to draw the attention of tourism participants to the possibilities of reducing the negative effects of tourism.

5. LIMITATIONS OF RESEARCH

Of all the preparations for eye-tracking studies that present images, the selection of the photographs is the most attention-grabbing task. In the course of our research, several photos were selected that met several predefined criteria. However, as new experience was gained in conducting the primary research, more and more new criteria were formulated. We believe that further interesting results could be obtained by examining separately the photos showing the environmental, social, and economic negative effects of tourism, and also by creating a section without any people in the photos.

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