

**dr Wioletta Wereda<sup>1</sup>**

Uniwersytet Przyrodniczo-Humanistyczny w Siedlcach

Wydział Nauk Ekonomicznych i Prawnych

**prof. Florina Pinzaru<sup>2</sup>**

Narodowy Uniwersytet Studiów Politycznych i Administracji Publicznej w Bukareszcie

## **”Eye tracking” the method and psychology of consumer behaviour on the market**

### **Metoda „Eye tracking” a psychologia zachowań konsumenta na rynku**

**Abstract:** *This publication presents the role which the modern method called "Eye tracking" plays in the psychology of consumer behaviour on the market. This method is particularly used in medicine and psychology. In recent years, it has been also widely used in economic sciences, especially in marketing.*

**Keywords:** „Eye tracking” method, marketing, consumer's behaviour

**Streszczenie:** *Niniejsza publikacja przedstawia rolę, jaką odgrywa nowoczesna metoda „Eye tracking” w psychologii zachowań konsumenta na rynku. Metoda ta jest szczególnie wykorzystywana w medycynie i psychologii. W ostatnich latach znalazła ona również szerokie zastosowanie w naukach ekonomicznych, szczególnie w marketingu.*

**Słowa kluczowe:** metoda „Eye tracking”, marketing, zachowanie konsumenta

## **Introduction**

Many factors have influence on the purchasing decisions of consumers. Most often this is the price of the product, the quality, attachment to a favourite brand or utilitarian aspects of the product. However, a common cause to purchase a particular product is the impulse. This impulse can be triggered by various reasons such as one's emotional state at the time of purchase, encouraging advertising of the product or the attractive appearance of the packaging. These aspects can be carried by one of the ways of the consumers survey the so called "eye tracking" method. The concept of eye tracking is still rare in literature, it can be found mainly in worldwide magazines in the field of medicine or psychology. This means that this concept is mostly popular among young consumers, aged 15-35. Currently, the European market is not conducting research on the usefulness of the survey using the eye tracking method among consumers. In other countries, this method is gaining many followers and more and more companies invest money in

---

<sup>1</sup> Adres do korespondencji: Wydział Nauk Ekonomicznych i Prawnych, Uniwersytet Przyrodniczo-Humanistyczny w Siedlcach, weredawioletta@tlen.pl

<sup>2</sup> Adres do korespondencji: Wydział Zarządzania, Narodowy Uniwersytet Studiów Politycznych i Administracji Publicznej w Bukareszcie, florina.pinzaru@facultateademanagement.ro

this type of research. Due to the fact that this is still a fresh concept, not many research companies offer this type of service. The main aim of the article is to present the method from a theoretical and practical background. The research method used in the article is the review of literature and personal experiments.

### The "eye tracking" method – identification

One of the main activities of the marketers is the impact on the senses of consumers and one of the most valuable is the sense of sight. Thanks to the eyes each person expresses emotions such as sadness, joy, anger, and above all recognizes products and advertising. Therefore, the study of the relationship between sight and the brain is an innovative activity in marketing. The area of such research deals with neuromarketing. Neuromarketing is the study of the brain in terms of the preferences of specific goods and brands. It is also referred to as the science of how people use their brains to make decisions; as the science which uses new tools to look at what is happening in the minds of consumers. In other words, neuromarketing is treated as a look at the behaviour of the buyer through the prism of knowledge about the functioning of the brain<sup>3</sup>.

According to M. Wedel, R. Pieters eye tracking is an advanced method to study the perception of people of different objects in front of them (packaging of products and graphical elements displayed on a computer screen)<sup>4</sup>. The method involves tracking eye movement, using a specially designed camera. With this method we can find out where the person looks, which elements are perceived and which are avoided. Thanks to the eye tracking research web designers have the opportunity to see how consumers see and read how they create websites<sup>5</sup>. They can see what route the eyes of potential customers traverses to realize the intended task, which parts of the page retain their gaze longer, how they react to an advertisement (or even look at it) or if the navigation menu for people who are on the side for the first time is transparent, and how users respond to the content of both text and images<sup>6</sup>. Generally speaking, eye tracking methods are usually focused on obtaining the highest spatial precision as possible, locating the centre of the pupil and the point of gaze for a series of frames. However, for the analysis of eye movements, such as saccades or fixations, the temporal precision needs to be optimised as well. The results should not only be precise, but also stable. Eye tracking using low-cost hardware such as webcams brings a new series of challenges that have to be specifically taken into account. Noise, low resolution and low frame rates are some of these challenges, which in the end are the cause of temporal instabilities that negatively affect the results<sup>7</sup>. It is also important that the significant research area nowadays is concentrated on the use of eye tracking tech-

---

<sup>3</sup> H. Mruk, *Neuromarketing jako obszar badań interdyscyplinarnych*, [in:] G. Sobczyk (ed.), *Współczesny marketing. Trendy. Działania*, PWE, Warszawa 2008, p. 97.

<sup>4</sup> M. Wedel, R. Pieters, *Eye Tracking for Visual Marketing*, „Foundations and Trends in Marketing”, vol. 1, no 4/2006, pp. 231–320.

<sup>5</sup> J. Nielsen, K. Pernice, *Eye tracking Web Usability*, New Riders Press 2010.

<sup>6</sup> B. Wąsikowska, *Eye tracking w badaniach marketingowych*, Zeszyty Naukowe Uniwersytetu Szczecińskiego, no 863/2015, pp. 177-178.

<sup>7</sup> J. Gómez-Poveda, E. Gaudioso, *Evaluation of temporal stability of eye tracking algorithms using webcams*, *Expert Systems with Applications*, Volume 64/ 2016, pp. 69-70.

nologies to collect and analyse information about the users when they interact with a computer. Thus, eye tracking technologies are used for understanding the user's distribution of attention. For instance, gaze tracking systems are created with the purpose of finding out where the user is looking, called the point of gaze and even more, the duration of fixations the patterns of gaze scans and gaze heat maps (which will be shown in figures later on), the diameter of the pupil and also the frequency of blinks<sup>8</sup>.

By analysing measures such as: time to first fixation, fixations before, fixation duration, and fixation count, the gazing behaviour of consumers and influencing factors can be described and then relationships to other important behavioural aspects such as choice behaviour can be determined. Therefore, the eye-tracking technique has great potential for objective observational studies in sensory and consumer science<sup>9</sup>.

There are two types of eye trackers available on the market: one stationary and one mobile. Stationary eye trackers often do not differ in appearance from the computer monitor, while the mobile eye trackers usually are directed at the head of the person. In both cases the process of measuring the movement of the pupils takes place "in the background" and in no way limits the natural behaviour of the respondent during his work with any application programme, especially with a web browser and web applications. The measurement provides accurate information, for instance at what point of the screen does the person who is being investigated look. The mobile eye tracker additionally allows the researcher to collect data in a natural environment of the investigator. The researcher can gather information about what attracted the attention of the respondent in the store or if he noticed specially exposed elements of the interior<sup>10</sup>.

Most eye tracking data are analysed in the context of performing specific tasks (reading, searching for information). The interpretation is made on the basis of registered:

- the fixation - time to focus your eyes on the element of the item;
- saccades - the transfer of sight from one focal point to another;
- residence time in a given region of interest, calculated from taking the decision to move to this area;
- average and total time spent viewing the individual parts of the object;
- the amount of return visits - return to a particular element (logo, slogan, product tested);

---

<sup>8</sup> J. Zhu, X. Han, R. Ma, X. Li, T. Cao, Sun, B. S. & Hu, *Exploring user mobile shopping activities based on characteristic of eye-tracking*, [in] Q. Zu, & B. Hu (eds.), *Human centered computing: Second international conference, HCC 2016*, Colombo, Sri Lanka, January 7–9, 2016, Revised Selected Papers, pp. 556–566; Springer International Publishing; R. Jafari, D. Ziou, *Eye-gaze estimation under various head positions and iris states*, *Expert Systems with Applications*, 42 (1)/2015, pp.510–518; Bentivoglio, A., Bressman, S. B., Cassetta, E., Carretta, D., Tonali, P., & Al-banese A., *Analysis of blink rate patterns in normal subjects: movement disorders*, *Official Journal of the Movement Disorder Society*, 12 (6)/2016, pp. 1028–1034.

<sup>9</sup> T.M. Hang Vu, V. Phu Tu, K. Duerschmid, *Design factors influence consumers' gazing behaviour and decision time in an eye-tracking test: A study on food images*, *Food Quality and Preference* 47/ 2016, pp.130–131.

<sup>10</sup> B. Wąsikowska, *Eye tracking w badaniach...*, op. cit., pp. 179.

- individual picture elements depending on the kind of the tested material<sup>11</sup>.



Fig. 1. Stationary eye tracker - Tobii TX300 (on the left) and Tobii Glasses (on the right)

Source: *Eyetracking. Solutions and Research*, company's data Eyetracking Sp. z o.o., [in:] B. Wąsikowska, *Eye tracking w badaniach...*, op. cit., pp.179.

### Solutions and presentation of results in eye tracking research

The use of this method in contemporary times is very broad. Generally speaking eye trackers are increasingly being used in many areas of life, from navigating the real store and viewing store shelves, the perception of urban space, to watching television and outdoor advertising, driving a car or even playing sports games<sup>12</sup>.

Thanks to the eye tracking method web designers have the opportunity to see how consumers see and read websites created by them. They can see what route the eyes of potential customers traverse to realize the intended task, on which parts of the website they retain their gaze longer, how they react to an advertisement (or even look at it) or if the navigation menu for people who are on the website for the first time is transparent and how users respond to the content of both texts and images.

According to T.M. Hang Vu, V. Phu Tu and K. Duerschmid in the food sector eye-tracking technique has mainly been applied to packaging research. By recording the dwell times and the areas that consumers pay attention to, an eye-tracker can determine how packaging attracts consumer attention. Some studies conducted a free-viewing task but varied stimulus-driven attention to study how packaging attributes (layout, nutrition label, etc.) affect consumer gazing behaviour and then suggest how to develop an appropriate packaging design. Others researchers conducted a specific task, such as evaluating the healthiness of a prod-

<sup>11</sup> Ibidem.

<sup>12</sup> A. Duchowski, *Eye Tracking Methodology. Theory and Practice*, Wydawnictwo Springer 2007.

uct and the willingness to purchase or to try the product, to study the goal-oriented attention.

The eye-tracking technique is also applied to access visual stimuli of food products in order to evaluate consumer perception of sensory properties such as colour, expected tastiness intensities or consumer perception of quality factors such as healthiness. Moreover, eye-tracking strongly contributed to the study of factors which might influence choice and consumer behaviour such as eating motivation (examples: negative mood, attentional avoidance), decision goal and thinking style. What is more, several studies used eye-tracking to understand how psychological illnesses and food-related health status, such as anorexia nervosa, eating disorder or BMI status, influence consumers' choice and food habits. Thus, eye tracking is proving to be a useful tool for studying consumer perception and behaviour psychology by gaining information in an objective way<sup>13</sup>.

Other studies made in retail stores by T. Otterbring, E. Wästlund and A. Gustafsson show that a retail store is a multi-sensory environment filled with messages to tempt customers in to making unplanned purchases. The purpose of their field study was to examine the interplay between three factors claimed to precede and influence unplanned purchases: store familiarity, visual attention and navigational fluency (the subjective ease of navigating). Eye-tracking recordings and post-study questionnaires showed that store familiarity was positively associated with navigational fluency. However, customers' levels of dynamic gaze behaviour (a frequent, widely distributed viewing pattern) moderated this effect. Dynamic gaze behaviour significantly predicted navigational fluency among customers with low and moderate store familiarity, but not among customers familiar with the store. These findings challenge the formerly held assumption that store familiarity automatically implies navigational ease and store unfamiliarity implies navigational difficulty<sup>14</sup>.

Generally the most common use of eye tracking, or in other words, areas of research in contemporary organizations are:

- the use of eye tracking to study the utility - this area has the key importance in the study of web sites and applications;
- the use of eye tracking to study ergonomics - it is crucial to choose the product from the point of view of the customer;
- the use of eye tracking in psychology - the study of eye tracking increasingly provides new opportunities in many fields of psychology;
- the use of eye tracking in advertising – this advertising creation study aims to check what the customer sees and which he/she completely disregards;
- the use of eye tracking to study the store shelves is used in contemporary trade where existing methods are not satisfactory;
- eye-tracking research is aimed at checking public information systems<sup>15</sup>.

---

<sup>13</sup> T.M. Hang Vu, V. Phu Tu, K. Duerrschmid, *Design factors influence consumers' gazing behaviour...*, op. cit., pp.130–131.

<sup>14</sup> T. Otterbring, E. Wästlund, A. Gustafsson, *Eye-tracking customers' visual attention in the wild: Dynamic gaze behaviour moderates the effect of store familiarity on navigational fluency*, *Journal of Retailing and Consumer Services* 28/2016, p.165.

<sup>15</sup> B. Wąsikowska, *Eye tracking w badaniach...*, op. cit., pp. 183-185.

Whereas data obtained during the eye-tracking research are shown mainly in the form of:

- scan paths (indicate the order of the perception of the individual areas; in addition the scan paths allow to identify the elements that can distract from the main content of the message - figure 2);



Fig. 2. Scan paths

Source: B. Wąsikowska, *Eye tracking w badaniach...*, op. cit., p.181.

- heat maps (provide a summary of the results of keeping focus for the group of respondents; can determine which elements of the watched picture attracted attention to the greatest extent and those that were bypassed by the respondents - figure 3);

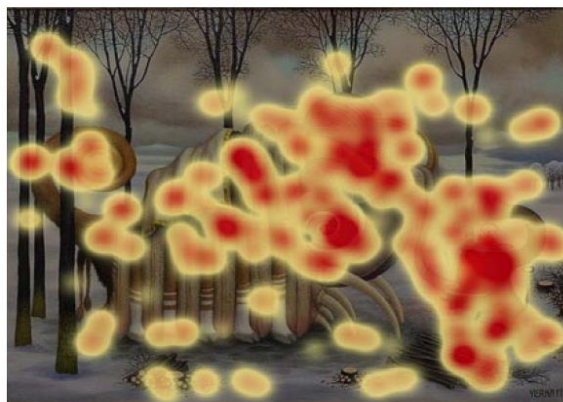


Fig. 3. Heat map

Source: B. Wąsikowska, *Eye tracking w badaniach...*, op. cit., p.181.

- reversed heat maps (demonstrate what elements of the watching image were noticed by the tested person- figure 4);



Fig. 4. Reversed heat maps

Source: B. Wąsikowska, *Eye tracking w badaniach...*, op. cit., p. 182.

- areas of interest (separated areas with a percentage distribution record of the observations presented, for example in the form imposed on the viewed image translucent layers containing a percentage description of the extent to which level individual elements attracted the attention; for such areas various statistics can be generated - figure 5).



Fig. 5. Areas of interest

Source: B. Wąsikowska, *Eye tracking w badaniach...*, op. cit., p.182.

## The psychology of consumer behaviour on the market – general overview

The most important element in the whole purchase process is a consumer demanding goods to meet his needs. The consumer operates within a particular organizational unit, which is the household, and there shall be made a variety of business processes<sup>16</sup>. The main activity of the consumer on the market is to meet his/her needs in the most optimal and satisfactory way. The science that deals with this issue is research on consumer behaviour. Consumer behaviour is defined as a set of activities and methods of operation which have to lead to meet certain needs. These include not only physical actions but also all the operations taking place in the psyche of the consumer at the time of purchase<sup>17</sup>. The science which is interested in the behaviour of consumers on the market is extensive and constantly expanding. It deals with collecting information on all elements of the process which is to make a purchase and analyze it. The behaviour of all consumers, regardless of age, gender, preferences and circumstances are analyzed. Likewise, there is a large discrepancy among the products, as many goods can be consumed which allows to achieve the satisfaction and fulfillment of desires. Types of consumer behaviour can be divided into:

- voluntary – it means those activities that arise from an inner desire to have goods and are not limited by anything;
- coerced – it means, arising out of a compulsion which is for instance, the restriction resulting from the difficult situation of random individuals; such an action is also the result of the influence of other people to the consumer's activity.

Consumer behaviour during purchasing activity is determined by five groups of factors. There are the following factors determining consumer behaviour at the place of sale<sup>18</sup>:

1. Physical environment (including the geographic location of the store, its inner design, lighting, markings, exposure, etc.);
2. Social environment (to the environment are included other consumers being in the retail outlet, its characteristics, roles and interactions between them as well as the congestion of the store. Congestion affects the time that customers spend on purchases, on their moods or discourages purchases);
3. Timing (determines the time of shopping, time constraints and the time elapsed and expected; depending on what period of time customers make purchases e.g. consumers around holiday seasons often make purchases influenced by impulse);
4. Task orientation (includes the intention, the purchasing role and the attitude of the consumer; the circumstances connected with making purchasing decisions determines the size of purchases and the amount of money intended for it);
5. State of feelings preceding the visit to the store (the main determinants are temporary moods and conditions i.e. feelings of fatigue, hunger, anxiety or additional privileges such as coupons or discount cards that affect the perception, assessments made and the acceptance of the environment in which the consumer is located). The way in which consumers make purchasing decisions is inherent with the issue of consumer behaviour.

Most of the buying decisions of consumers are dictated by the continuous process of learning. The result of learning is a habit. It arises as a result of multiple

<sup>16</sup> J. Bekasik, *Ekonomia*, Wyd. PWN, Warszawa 2001, p.44.

<sup>17</sup> L. Witek, *Merchandising w małych i średnich przedsiębiorstwach*, Wyd. C.H.Beck, Warszawa 2007, p. 16.

<sup>18</sup> *Ibidem*, pp. 19-20.



repetitions of the same activities. The habit is not the action itself but the acquired aptitude to a specific behaviour. Besides habitual activities (automatic), constantly repeated can be distinguished those in which there is a willingness to take a specific type of activity with the ability to adapt to changing conditions and situations in which they are to be made. The second type of the action is called a skill. The skill is a disposition more complex than a habit because it is not automatic. According to a scientific approach consumer behaviour is a trite action as if it were automatic, without reflecting, attention, or thinking. Habits lead to the formation of customs which are generally practiced in the community as patterns of behaviour in a given situation. In human behaviour habits are very common. They also determine, to a large extent, consumer behaviours on the market. It manifests itself primarily in the purchasing habits of the same products, especially frequently purchased by consumers. The individual custom can be drinking coffee at a specific time of day. In contrast, in a social group the custom can be doing shopping once a week, for example on Saturdays. Moreover, customs must be approved socially whereas habits do not have to be approved and may even be unacceptable by society. Habits are characterized by relative durability. They usually survive a long time thanks to the transfer from generation to generation. Deciding to buy is a risky activity especially in the case of purchasing products for the first time. Such a purchase is usually accompanied by the risk of making an incorrect decision, that is the probability of various types of losses that may arise as a result of the purchase. Risk as we know is a kind of uncertainty that consumers have when they cannot predict many important consequences of the purchase decision. The risk of buying occurs when consumers perceive the danger of taking an incorrect decision and fear that the consequences of such a decision may be important for them, for instance a waste of money, the prestige, the time and the ridicule.

Perceived by consumers, the risk of purchasing is subjective in nature and is closely linked with the psyche. Therefore, it is classified as the internal determinant of consumer behaviour. The size of the risk of purchasing varies and depends on many factors. It is generally believed that the extent of the risk is strictly associated with the type of the purchased product. Much greater risk is associated with the purchase of technically complex products such as personal computers, automobiles, dishwashers as well as medicines than everyday products. The size of the risk has a significant impact on the knowledge of the product by the consumer. Much bigger risk is taken on buying a product with which the consumer had no experience in the past or he had a negative experience with, than the product that is well-known and proven in use. It is widely believed that the size of the risk taken by the consumer depends on the relative financial value of the purchase, it means the relation of the price to the financial resources of the consumer.

A larger financial commitment (the higher price) is the risk of incurring major losses as a result of a wrong decision. Perceived risk is significantly increased if the financial resources are limited. Purchase at the request, with the possibility of the return of goods or renting instead of purchasing, can be a way to reduce the perceived risk of purchase and it is a very good way to reduce the functional risk so the risk of buying a product that does not meet the expectations of reliability, durability, performance, etc. The factors influencing consumer behaviour also include lifestyle. In literature there are many attempts to define this term. Often, the term

generally means the individual patterns of activities, interests and beliefs with which consumers differ from each other. It should be noted that the term lifestyle is not accurate and cannot be arbitrarily anticipated that which fields of behaviour are within the scope of lifestyle and which types or forms of behaviour constitute lifestyle. It is believed that the distinctiveness of individual lifestyles manifest themselves most often in the following areas:

- the time budget, i.e. the amount and structure of the time available;
- the nature of the work and its role in a lifetime;
- the manner of dressing and furnishing the house;
- the behaviour related to hygiene and health;
- the participation in culture;
- the socio-political activity;
- the social contacts, informal ties.

Lifestyle is in many cases the main motivator of purchases and a source of various forms of consumer activity in the market. It is therefore of particular interest to marketers and the current method of eye tracking is clarifying certain habitual behaviour. Lifestyle is often used as a criterion for market segmentation, more effective than demographic, economic and social variables. Knowledge of consumer lifestyles that make up certain habits, customs allow to customize product offerings to customers' requirements. It also lets marketers specify the target image and elements of visual interest in the designing and introduction of new products thanks to the method of eye tracking.

## Conclusions

Summing up the topic it should be pointed out that the eye-tracking method has been increasingly used for studying consumer behaviour over the last few years. Understanding factors influencing consumers' gazing behaviour in an eye-tracking test will contribute to a better organisation and a more valid application of the method.

According to B. Wąsikowska eye tracking studies help formulate a number of significant conclusions regarding the products tested. Thanks to the use of the eye tracking method it is possible, for example to propose several projects of the tested website or applications and checking in which case the tested respondents react in the best way and which proposal gain their acceptance. It can also be seen how consumer opinions of products are changed into their actual purchases. The eyesight is the most complex organ receiving stimuli and the most important way of perceiving the world by man, the use of devices for eye tracking allows to gather information which is difficult to obtain in other studies. Empirical studies have shown that human eyes follow one's attention, and what is more, this relationship does not work in reverse – the attention of the tested person does not follow his/her gaze. In practice, it means that during the observation the respondents notice some elements of what is recorded by the eye-tracking device but when they are asked directly about the item they do not confirm that they had seen it. This fact, hindering the interpretation of the results of research conducted by the traditional methods, is one of the proofs that eye tracking research can be successfully used in marketing practice and scientific studies (e.g. estimating the importance of the

usage of logos and websites as well Social Media in gaining feedback from respondents etc.)<sup>19</sup>.

## Bibliography

- Bekasik J., *Ekonomia*, Wyd. PWN, Warszawa 2001.
- Bentivoglio, A., Bressman, S.B., Cassetta, E., Carretta, D., Tonali, P., Albanese A., *Analysis of blink rate patterns in normal subjects: movement disorders*, Official Journal of the Movement Disorder Society, 12 (6)/2016.
- Duchowski A., *Eye Tracking Methodology. Theory and Practice*, Wydawnictwo Springer 2007.
- Gómez-Poveda J., Gaudioso E., *Evaluation of temporal stability of eye tracking algorithms using webcams*, Expert Systems with Applications, Volume 64/ 2016.
- Hang Vu T.M., Phu Tu V., Duerschmid K., *Design factors influence consumers' gazing behaviour and decision time in an eye-tracking test: A study on food images*, Food Quality and Preference 47/ 2016.
- Jafari R., Ziou D., *Eye-gaze estimation under various head positions and iris states*, Expert Systems with Applications, 42 (1)/2015.
- Mruk H., Neuromarketing jako obszar badań interdyscyplinarnych, [w:] G. Sobczyk (ed.), *Współczesny marketing. Trendy. Działania*, PWE, Warszawa 2008.
- Nielsen J., Pernice K., *Eye tracking Web Usability*, New Riders Press 2010.
- Otterbring T., Wästlund E., Gustafsson A., *Eye-tracking customers' visual attention in the wild: Dynamic gaze behavior moderates the effect of store familiarity on navigational fluency*, Journal of Retailing and Consumer Services 28/2016.
- Wąsikowska B., *Eye tracking w badaniach marketingowych*, Zeszyty Naukowe Uniwersytetu Szczecińskiego, nr 863/2015.
- Wedel M., Pieters R., *Eye Tracking for Visual Marketing*, „Foundations and Trends in Marketing”, vol. 1, no. 4/2006.
- Witek L., *Merchandising w małych i średnich przedsiębiorstwach*, Wyd. C.H. Beck, Warszawa 2007.
- Zhu J., Han X., Ma R., Li X., Cao T., Sun B.S. & Hu, *Exploring user mobile shopping activities based on characteristic of eye-tracking*, [in] Q. Zu, & B. Hu (eds.), *Human centered computing: Second international conference*, HCC 2016, Colombo, Sri Lanka, January 7–9, 2016.

---

<sup>19</sup> B. Wąsikowska, *Eye tracking w badaniach...*, op. cit., pp. 190-191.

