How can food retailing benefit from neuromarketing research: a case of various parameters of store illumination and consumer response

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Abstract

The extension of retail sales cycle and the increasing resistance against traditional sales techniques brings to the fore the issue of product merchandising, which represents a challenge for retailers and marketers to constantly search for new ways and techniques of reaching their customers in a more sophisticated manner. One of the methods to increase the culture of sales environment and the attractiveness of displayed products are smart solutions within store lighting. Customer behavior in sales areas is strongly influenced by the perception of surroundings and feelings of well-being. Light is an important marketing tool due to the fact that it has an impact on consumer emotions and retail atmosphere, it increases retail space and enables easier orientation for customers. It is the only tool that can be precisely controlled and measured by several parameters such as color temperature, light intensity, illumination angle, and color rendering index. By using the dynamic retail solutions of basic, accent, and dramatic lighting it is possible to attract attention, create a unique in-store environment and give customers a reason to stay and come back to the store. Reasons of consumer attention to products seen everywhere are deeply rooted and certainly created by the evolutionary development. Almost a quarter of the human brain is involved in visual processing, much more than in case of any other sense. Approximately 70 % of body sensory receptors are the eyes. The simplest and also the most successful way to reach customer attention in food selection process is through visuals (products) illuminated in an eye-catching way. Visual senses has become top ranked in the sensory hierarchy, therefore visual stimuli have a tendency to overcome all other senses. In case visual and musical stimuli are presented simultaneously, the brain puts more credibility and impact to the visual part. The paper deals with a comprehensive interdisciplinary research of the influence of light and color on the response time and emotional status of consumers (valence) on the food market. It includes the integration of the measurement of light intensity, color temperature or emitted color spectrum in grocery stores, recognition of emotional response and the time of its occurrence among respondents due to different types of light and color in simulated (laboratory) conditions. The research is focused on accent lighting in the segment of fresh unpackaged food. Using a mobile 16-channel electroencephalograph (EEG equipment) from EPOC and a mini camera we observed response time and the emotional status (valence), in order to reveal true consumer preferences in different lighting conditions (color temperature and color rendering index) and non-traditional colors (yellow, purple, red, blue, and green) for the selected food type. The paper suggests possibilities for rational combination of the efficiency, energy intensity and visual impact of accent lighting, by which the retailer can achieve not only an eye-catching and attractive presentation of merchandised products, but also significant savings within operating their stores.

Keywords: Neuromarketing, Emotions, Accent lighting, Consumer behavior, Electroencephalograph

Topics: Consumer behavior: preference analysis, New trends and directions in food consumption

Paper prepared for presentation at the EAAE-AAEA Joint Seminar
‘Consumer Behavior in a Changing World: Food, Culture, Society”

March 25 to 27, 2015
Naples, Italy

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Introduction

Ability to break through the competitive market means to react flexibly to demanding requirements of the market by setting a convenient price, quality and last but not least by creation of favourable environment for cvilised but as well attractive purchase at the place of sale. Retail market is changing at an incredible speed and therefore every retailer is trying to use innovative ideas which can help him to differentiate from his competitors (Hallbauer, 2008). One of the key requirements of operation equipment in modern retail stores is high quality lighting which increases the image of these stores, attracts the potential customers, points their attention to products being offered and finally raises the sales (Nagyová et al. 2014). Characteristics of the used lighting can be designed in grocery stores in different ways. They contribute to creation of an impression of a visual quality of the environment on the location of sales as a whole but they can be used to make the offered products more attractive as well. Despite that is a fact that the culture of exhibition and attractive presentation of fresh unpacked products where the lighting is as the only and most important marketing tool missing in many stores. Nowadays are almost all stores equipped with a basic lighting which is complemented mostly in larger stores with the accent lighting. To provide the right accent lighting in the category of fresh products it is apart from protection filters against light radiation necessary to use a suitable combination of lighting parameters while some types of lighting distort colours what can decrease the visual attraction of the displayed goods. Significant attribute of marketing tools research and visual merchandising in connection with neuroscience is that 50 - 80 % of unplanned purchases are influenced by initial (positive) neural excitations which appear during shopping in store units. Thanks to the innovative interdisciplinary approach with a use of neuromarketing it is possible to create efficient marketing strategies and by the means of that to stimulate human emotions due to which is feasible to manage higher number of closed contracts, multiply incomes and improve an ability to motivate to buy.

Theoretical background

Light and lighting represents a fundamental reason of human existence. It dictates our everyday activity, influences our mood and way we perceive all kinds of things around us (Brooker, 2003). Because of that the lighting in a store can be considered an important determination factor of store atmosphere (Borusiak, 2009). The notion "atmosphere" reflects the influence of sensory stimuli of the environment like sight, hearing, smell and touch on the target consumer behaviour (Kotler, 1973 - 1974). Even though the lighting is only part of the overall atmosphere it can effectively affect the consumer behaviour. Formation of subliminal message is a crucial part of every store design. There are many factors which overlay in overall atmosphere creation, which influences the subconscious via senses, as well as formation of a certain customer´s state of mind (Varley, 2014). The moment when the customers make their decisions is affected to a considerable level by what they see, hear, smell and what they touch in their surrounding because these are immediate signals for creation of emotions (Kang et al. 2011). Emotions and feelings are primary medium for consumer decision-making system (Pham, 2004). The central brain part processing emotions is called amygdala (Rillling & Sanfey, 2011). The role of emotions in consumer´s decision-making process was explained on the principle of neurological and cognitive frames, for instance the theory of somatic markers (Reimann & Bechara 2010). The mentioned theory deals with so called attention to negative impacts in decision-making. There are special types of feelings which come from secondary emotions. Connected with learning are these emotions shifted to an image of future consequences and certain situations (Plessis, 2011). Due to that is the first impression of the customer important when entering the store and which is influenced to a significant level by the lighting used in the store (Ebster & Garaus, 2011). Basic and accent lighting affects as well how are the goods and used colours displayed in the store (colour rendering index). Various types of light sources can cause that the same object appears in a different colour. That reflects the fact that light sources have a different spectral structure, even though they can have the same chromaticity temperature (He, 2010). The fact is that right colour display (colour rendering index) can influence customers´ emotions more directly (Bitner, 1992). Proofs indicate that some colours (mainly red) create a feeling of excitement and encouragement to eat and others (for example blue) make relaxed environment (Lowrey, 2012). Lighting of the store can be the most effective factor to increase general feelings of satisfaction, because it supports comfort, convenience and favourable emotional reactions (Summers & Hebert, 2001).

Lighting in stores does not influence only consumer behaviour on the place of sales but it is a stimulus at specific products (meat, bakery products, fruit and vegetables). While discount stores are more brightly lit aimed to make the shopping more effective, on the other hand store departments with lower level of lighting try to strike feelings of relaxation. Higher intensity of basic lighting, but which does not blind the customers is common for larger shop formats and ranges from 600 to 800 lux (Bean, 2014). In most cases are brightly lit stores more successful than the dark ones, because the lighting rings drama to the store and can represent a real communication tool (Floor, 2006). The study (Areni & Kim, 1994) found out that brighter indoor lighting of the store makes a more positive impression on consumer perception reflected in time spent looking at the goods. Total preferences of lighting and colour temperature (chromaticity temperature) which is produced can be changed depending on weather and moods of customers (Georges et al. 2014). Many consider attraction of human eye to be the most important role of lighting in the store (Karlen & Benya, 2011) because up to one quarter of human brain is involved in visual processing what is much more than any other sense. Eyes represent approximately 70 % of body sensory receptors and gather light and make a focus better. The brain itself matches colours, shapes, facial expressions, and countries with meanings in the way they are seen (Pradeep, 2010). All primates including people have developed a sight sense in two eyes - binocular vision. Visual signals are transmitted from each eye through millions of eye nerve fibres to so called chiasm where the nerve fibres are on the other side what means that the brain receives signals from both eyes but the stimuli from the right side are processed by the left hemisphere and the stimuli from the left side are processed by the right hemisphere.

Consumer psychology and neuroscience offers more detailed research of consumer behaviour and decision-making process on the location of sales. Modern neuroscience tools which help to see into human brains and so that open a way to psychological decision making process - black box of the brain as says (Dooley 2012). The concept of neuroscience methods application into research of consumer emotions and cognitive reactions caused massive interest recently. Usage of psychophysiological techniques in consumer research is not new really because observation of pupils dilatation and electrodermal activity were observed in 1960 and followed later by eye tracking and measurement of heart activity (Wang & Minor, 2008). The notion "neuromarketing" itself was said for the first time in 2002 by a professor Ale Smidt and it is more connected with practical usage of neuroscience knowledge for managerial purposes (Hubert & Kenning, 2008), while the identical term "consumer neuroscience" is considered to be more appropriate in the academic area (Hubert, 2010; Ramsøy, 2014). The neuromarketing represents a relatively new field of marketing which tries to research the influence of neuromarketing stimuli on customers´ reaction as well as consumers at the same time. The stimuli are cognitive, affective, and sensomotoric. It is a tool which we use to identify real and true preferencies of customers, i.e. to find so called buy button. From this point of view is the influence on customer subliminal (Zurawicky, 2010). Mainly, it is a connection of medical knowledge, technologies and marketing which due to brain scans can help us understand the stimuli in the brain and how they are processed as well (Lindstrom, 2009).

The question of effective presentation of goods in the retail stores is related to the problem of efficiency and energy demand (Finne & Sivonen, 2008). Using primarily an important marketing tool like the lighting, it is necessary to take into consideration the energy consumption because the lighting is one of the biggest items on the costs list in a retail store. Retailer should not focus only on effective presentation of the goods on display but it is needed to look for compromise between energy consumption of the lighting equipment and their influence on consumer perception of the food market. Besides other the energy consumption can be in the individual stores significantly different regarding the format and segment. Unequivocally is the highest energy consumption in the food retail store because of constant keeping of food in cold and presentation of goods in the field of fresh products (Horská & Berčík, 2014).

Methodology

The object of research is the accent lighting and non-standard types of colours in sections with fresh food (fruit and vegetables) with a service. On the basis of light tests in simulated laboratory conditions of retail store and with usage of EEG device we tried to reveal hidden consumer preferencies (valence) under different lighting conditions (type of light source, intensity, chromaticity temperature and colour rendering index) (Table 1), as well as non-standard colours (yellow, red, purple and green) with selected types of food (Table 2).

Station	Light Source	Power	Luminous	Colour temperature	Colour rendering index
1	Halogen lamp	160W	650 lux	2700 K	70 CRI
2	Metal-halide lamp	70 W	580 lux	5000 K	60 CRI
2	Metal-halide lamp	150W	850 lux	3000 K	85 CRI
4	LED lamp	60 W	620 lux	5600 K	75 CRI
5	Fluorescent lamp (tube)	72 W	540 lux	4100 K	64 CRI

Table 1. Used lamps during the testing

Colour	Light Source	Power	Luminous	Colour temperature
Yellow	LED lamp	30 W	374 lux	2780 K
Red	LED lamp	30 W	154 lux	1890 K
Purple	LED lamp	30 W	430 lux	4000 K
Green	LED lamp	30 W	306 lux	3100 K

Table 2. Used colours during the testing

The primary research consisted of consumer neurotests during active regime of all types of lighting and subsequent progressive presentation of non-standard colours of lighting in simulated conditions. 67 respondents in the age from 20 to 62 took part in the test, see Table 3.

Gender	male	female	total
Number	25	42	67
Proportion	37 %	63 %	100 %

Table 3. Respondents during testing

To collect the data we used Emotive EPOC headset which includes 14 data collection electrodes and 2 reference electrodes placed and marked in compliance with the international 10 - 20 system of electrode placement. In addition to the international norms in relevant places are: AF3, F7, F3, FC5, T7, P7, O1, O2, P8, T8, FC6, F4, F8 a AF4. Figure 1 depicts 14 positions of electrodes of Emotive EPOC headset. EEG signals in the alpha (7 – 13 Hz) and beta zone (13 – 30 Hz) are in the centre of interest while researching the emotional valence and excitement. Presence of EOG factors (eye movements / blinking) is dominant mostly with 14 Hz, EKG (heart) artefacts around 1.2 Hz and EMG (muscle) artefacts over 30 Hz. Non-physiological artefacts caused by electrical lines are normally present over 50 Hz

(Ramirez & Vamvakousis, 2012). The advantage is that at extra alpha and beta frequency is significantly reduced a content of side interfering elements (noises) in the EEG signals. That is a reason why it was necessary to apply a filtration inevitable for extraction of alpha and beta frequency zones. By using fast Fourier Frequency Transformation (FFT) is the original signal divided in time to frequencies to remove specific (unnecessary) frequencies before regressive transformation to signal with the frequency of interest (Lin et al. 2008).

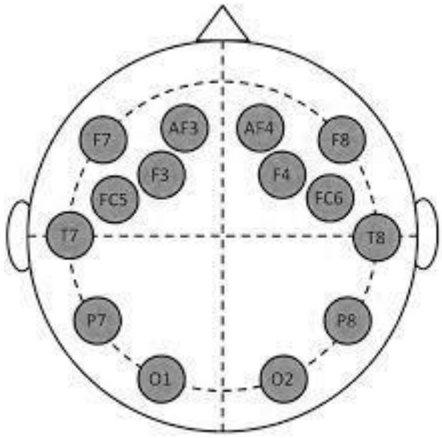

Fig. 1. 10-20 system Emotiv EPOC

To be able to determine the valence (emotional) level of negative or positive states of mind we compared levels of activation of two cerebral cortex hemispheres. F3 and F4 electrodes are the most used positions when looking at the alpha activity because it is typical for prefrontal lobe which plays a key part in regulation of the emotions and conscious experience. Revealing the valence value will be conducted by the means of calculation and comparison of alpha and beta value in F3 and F4 canals (Petrantonakis, 2011). Calculation of valence (emotions) value is set:

$$V = \frac{aF4}{bF4} - \frac{aF3}{bF3}$$

When: aF4 = alpha activity in right prefrontal electrode F4

bF4 = beta activity in right prefrontal electrode F4

aF3 = alpha activity in left prefrontal electrode F3

bF3 = beta activity in left prefrontal electrode F3

Primary data from the electrodes in the right F4 and left F3 hemisphere were gained via TestBench software by the EPOC company. We measured emotions in three two-second-long intervals. On the basis of measured values of alpha and beta activity in the mentioned electrodes we used a valence formula to classify emotions to positive, negative and neutral detected at five different positions. From the valence data we calculated the average and standard deviation in the software for data analysis - Rapidmeter 5. After stating the average emotions in the individual intervals we gained three values which we added up by the means of which we formed our own metrics. In this way we detected the value of overall emotions with different types of the lighting. To compare the valence of two positions we used non-parametric Wilcoxon signed rank test. Using the Singrank function in the programming environment Matlab R2010b we compared the individual values and light sources (positions) among each other to find out what and if there are any differences from the valence point of view (positive, negative and neutral feelings). For the individual emotions we formulated Wilcoxon signed rank test and visualised its course for the individual positions. On the pre-set selected level of importance α we are testing the zero hypothesis H_0:F=G against the alternative hypothesis H_1:F$\neq$ G.

H_0: individual types of lighting influence equally the valence of customers

H_1: individual types of lighting do not influence equally the valence of customers

Level of importance: $\alpha = 0.10$ (10 % error risk)

We used the same procedure in the case of valence comparison with non-standard forms of lighting (yellow, red, purple and green). The methodology of research and evaluation of influence of the accent lighting but as well the non-standard types of lighting on customers´ emotions were conducted in the presence of erudite neurologist with EEG certificate.

Result and analysis

We conducted a test of the accent lighting given the fact that the store lighting represents a significant part of the shopping environment and with some types of fresh non-packed goods is the only and crucial marketing tool. To demonstrate the influence of lighting on consumers´ emotions we simulated the environment of fresh food department (fruit and vegetables). As shows Fig. 2 the brain reactions of the chosen respondent are diverse with the individual types of lighting with a different chromaticity temperature and intensity.

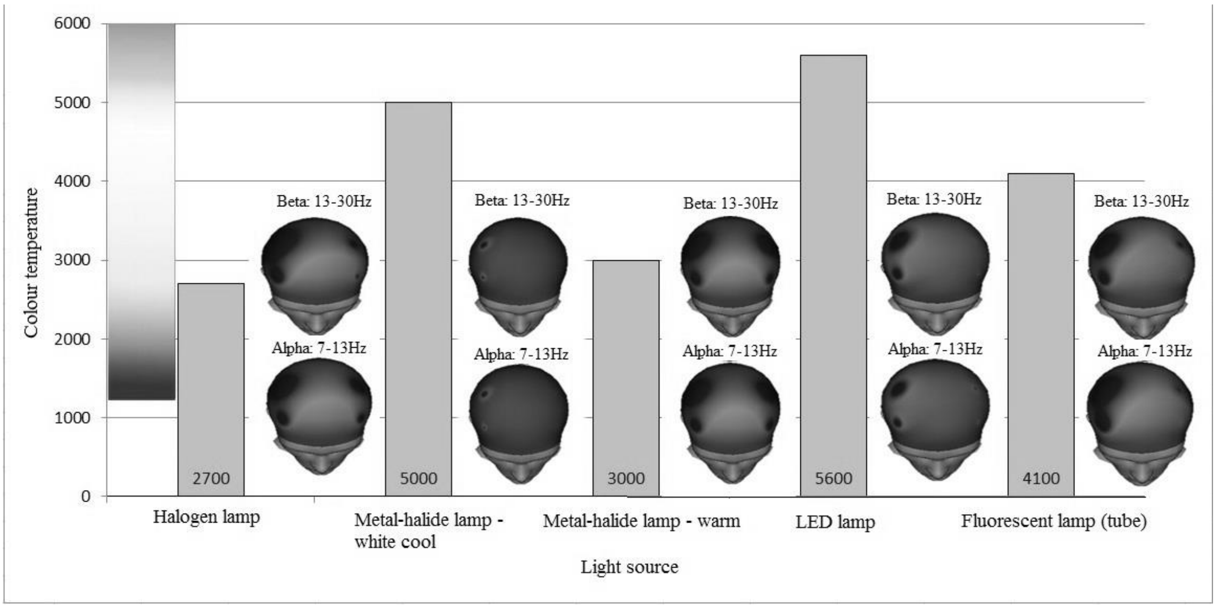

Fig. 2. Comparison of respondent's emotional involvement within each type of accent lighting in simulated conditions

The most significant response was in this case detected with halogen and metalhalogenid light source producing chromaticity temperature of 2700 - 3000 K. On the contrary, the smallest influence on respondent´s emotions were detected with light sources emitting cool light: LED a metalhalogenid - white cool.

We conducted their comparison using a statistics test on the basis of the average valence values with the individual types of accent lighting. The dissimilarity of valence (feelings) was confirmed at tested subjects between halogen and LED spotlights (Table 4). This difference results mainly from not the same chromaticity temperature. While the halogen spotlight has warm yellow colours and chromaticity temperature up to 3000 K, LED spotlight is close to 6000 K what can be characterised as cool white colour.

	Fluorescent lamp (tube)	LED lamp	Metal-halide lamp	Metal-halide lamp 70W	Halogen lamp
Halogen lamp	H0	H1	H0	H0	X
Metal-halide lamp 70W	H0	H0	H0	X	
Metal-halide lamp	H0	H0	X		
LED lamp	H1	X			
Fluorescent lamp (tube)	X				

H0 – same = no difference

H1 – different = difference

Test at α=0,1

Table 4. Wilcoxon signed rank test – comparison of individual types of lighting

	Halogen lamp	Metal-halide lamp	Metal-halide lamp	LED lamp	Fluorescent lamp (tube)
-3	24	17	18	13	25
-2	8	9	8	8	3
-1	16	20	24	19	20
0	5	7	5	11	5
1	12	8	7	14	9
2	0	1	1	2	2
3	2	5	4	0	3
	67	67	67	67	67

Table 5. Comparison of average emotions with individual types of lighting

As results from the graph no. 3 the most significant changes in emotions of respondents happened in the case of LED spotlight. It is a modern type of light source with low energy and operation demand. More relevant changes in the average emotions with this type of the accent lighting could have been caused by sunny spring weather. In case of bright warm day the consumers tend to prefer cooler colours what is unequivocal with this spotlight. Position 1 with halogen spotlight and position with fluorescent lamp can be classified with respect to course of valence progress as the most negative. Usage of halogen light source in store units is considerably limited by the amount of the energy consumption. On the other hand the fluorescent lamp light sources often substitute the accent lighting mostly in stores of smaller format.

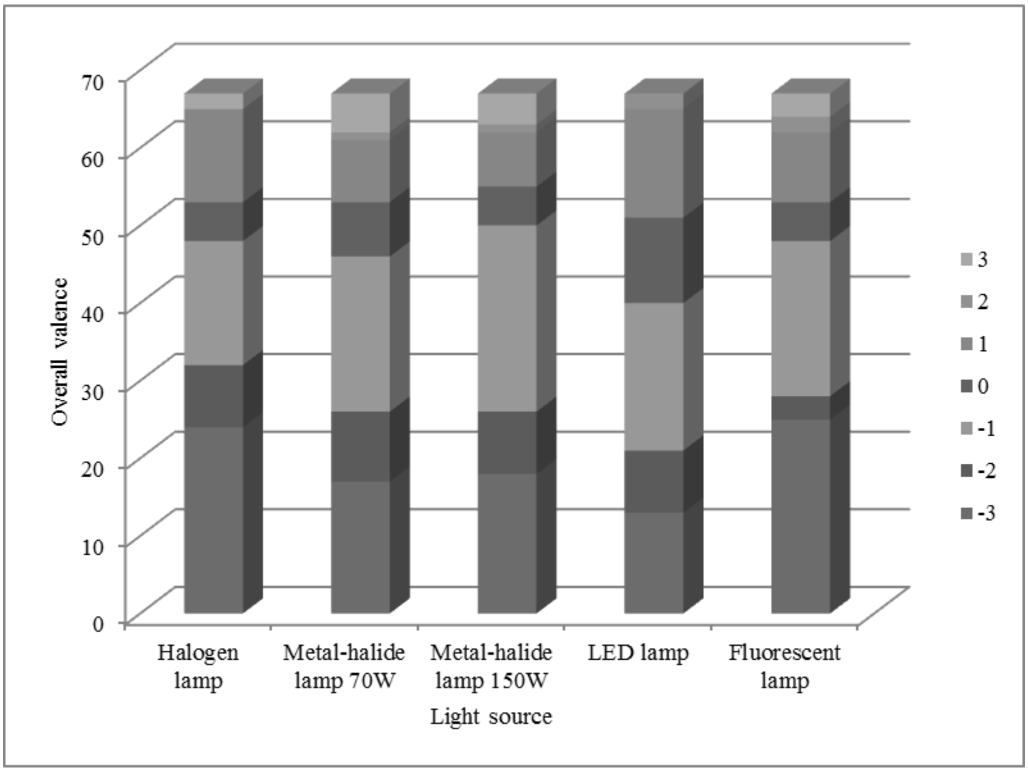

Fig. 3. Graph of average emotions comparison with individual types of lighting range from -3 to 3

	Halogen lamp	Metal-halide lamp	Metal-halide lamp	LED lamp	Fluorescent lamp (tube)
NEG	48	46	50	40	48
NEU	5	7	5	11	5
POS	14	14	12	16	14
	67	67	67	67	67

Table 6. Comparison of primary emotions at individual types of lighting

Also the valence detected only in one time interval (not average) reflects the negative emotions with the individual types of used light sources. Partial exception is as well in this case the LED light source (Fig 4). Relatively small differences in feelings of participants can be caused by the brain ability to adapt to the conditions given. In addition the colour rendering index of all used light sources oscillates from 64 to 85 Ra (CRI). It means that the displayed colours of the exhibited products under the individual types of lighting vary too. Despite that this fact did not generate more significant changes in consumer valence. What is interesting is that concluding from the survey research, which was part of the accent light research, as the most positive position assessed by the consumers was the metalhalogenid spotlight 150 W.

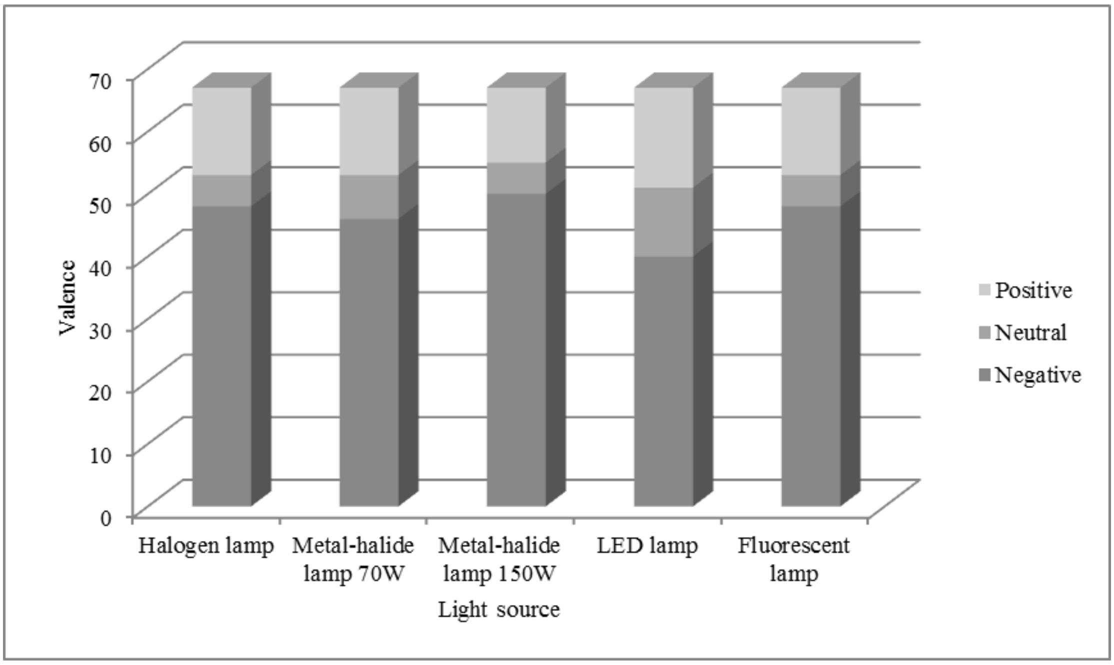

Fig. 4. Graph of immediate emotions comparison with individual types of lighting range from -1 to 1

We created two pictures of the brain activity of one man and two women with halogen lighting with power of 160 W to compare. In the Fig. 5 you can observe differences in electrical brain activity in the individual hemispheres, as well as in rhythms (frequency band) of the electrical brain activity. Alpha band (7 - 13 Hz) is typical for relaxed state of mind. Beta band (13 - 30 Hz) is typical for rational thinking and knowing solution of the situation. If the alpha activity prevails, we can in humans presume the positive feelings to sensory stimuli. It is important to identify which band dominates in a man because both bands are always present in the man, however, in different (even though only minimum) range.

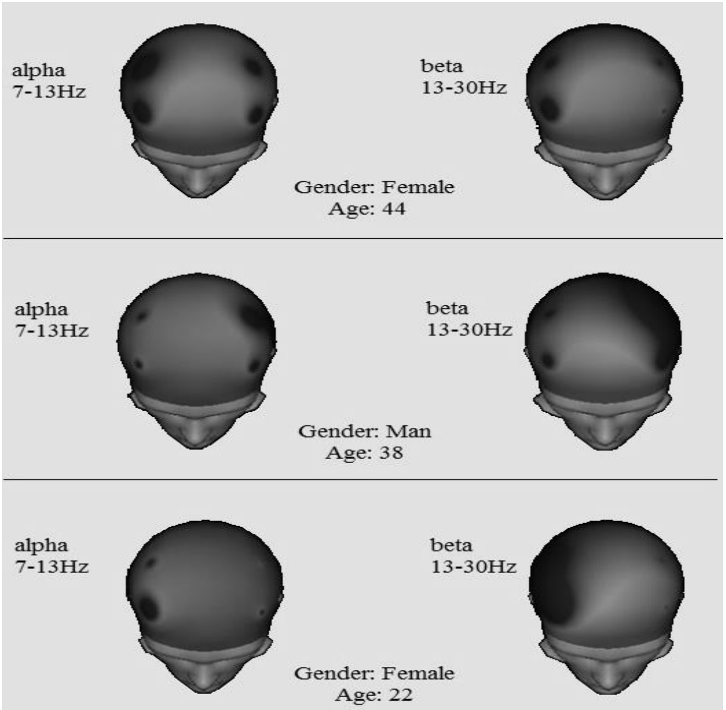

Fig. 5. Comparison of accent lighting perception by the individual respondents with halogen spotlight position.

From the picture can be seen that the comparison of light stimuli perception of common respondents (up and down) versus professional sensory analysis (middle) activity in the left hemisphere prevails in a professional what means that he is rationally justifying the situations, while emotional reactions in the right hemisphere dominate in laymen. The light stimuli affect in a various ways genders and age groups. The two upper pictures depict a reaction of an older woman, the central ones the alpha and beta brain activity of a man and the bottom part the brain activity of a younger woman. The picture apparently shows that women in general react more emotionally than men, they are more empathic and perceptive. As you can see there is a difference between the perception of younger and older women. The younger women react in a more emotional way than the ones born earlier.

We found out by testing the non-standard forms of the accent lighting (colours) on the basis of their mutual comparison via non-parametric test that the significant differences in the emotions of tested participants exist between yellow and purple, and purple and green colour. On the contrary minimal variations in emotions were measured between green and red, as well as green and yellow.

	Green	Purple	Yellow	Red
Red	H0	H1 (even at 0.05)	H1	X
Yellow	H0	H1 (also at 0.05)	X	
Purple	H1	X		
Green	X			

H0 – same = no difference
H1 – different = difference
Test at α=0,1

Table 7. Wilcoxon signed rank test – comparison of individual colours

	Yellow	Red	Purple	Green
-1	39	39	31	34
0	9	8	5	9
1	19	20	31	24
	67	67	67	67

Table 8. Comparison of primary emotions with individual colours

This crucial finding is related to the fact that in the case of purple colour used to illuminate the fruit were detected the most positive emotions, see Fig. 6. Relatively more positive emotions appeared in the case of green colour, where is roughly the same amount of the negative emotions than with purple colour. More significant changes of valence with purple colour compared to other ones can be caused by the fact that it is the least natural colour for the lighting in this case of apples and oranges, therefore it aroused a certain level of attention in the respondents. Almost identical valence with yellow and red colour was most probably caused by the technology of colour mixing in the used RGB spotlights.

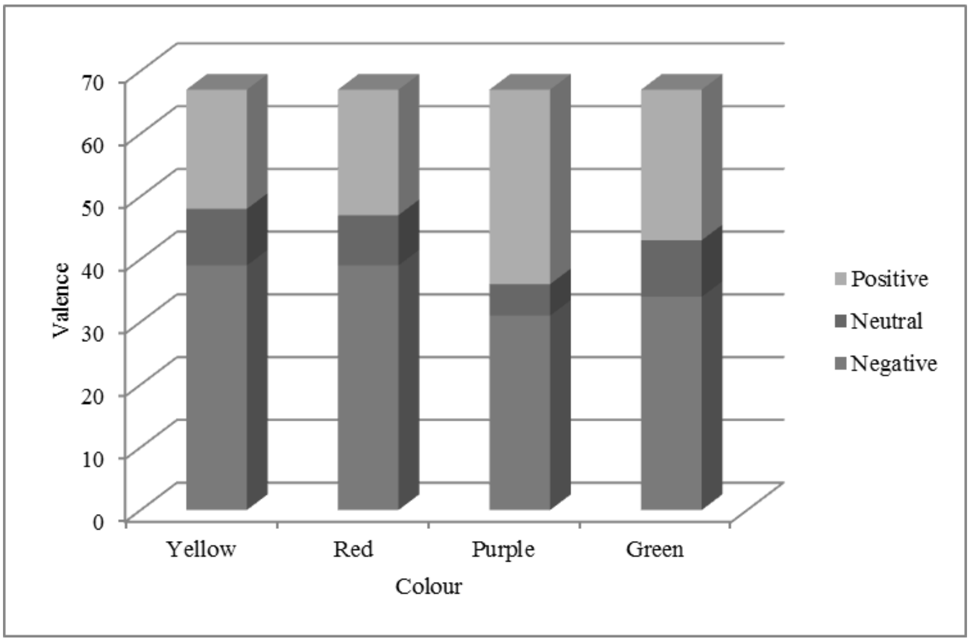

Fig.6. Graph of primary emotions comparison with individual colours - range from -1 to 1

Fig. 7 was created for better illustration of comparison of two chosen respondents (man and woman) with non-standard purple lighting regarding that the most positive emotions were detected with this type of lighting. The x-axis in the graphs represents the time sequence and when we interpret it we focus on the last interval (25 - 30) only, whereas the chosen respondents were looking at the purple colour in this stage and so we observe the relevant emotions detected with the colour. On the y-axis we watch the emotional state of the researched subject (excitement, engagement, meditation, frustration).

From the picture is obvious that the lighting did not cause a change of state of mind indicator, like the excitement because the level of the red line is close to zero value. In addition the value of emotional engagement was decreasing at that time. Similarly this type of lighting did not cause any crucial changes of woman perception. Levels of all emotions including the state of mind indicator stayed the same. With respect to higher levels of the excitement in this case is possible to presume higher sensitivity of sensory organs to the shown stimuli.

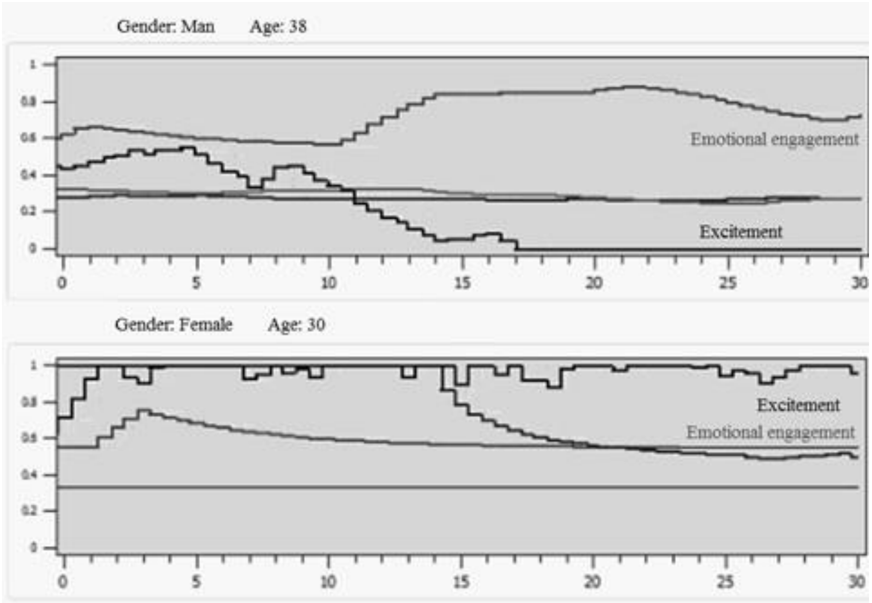

Fig.7. Comparison of emotions of two respondents with non-standard purple lighting

Conclusion

Every businessman who wants to keep the pace with the modern age must promote and sell with the means which the newest technology brings. The individual senses of the customer cannot be separated easily because his perception consists of all senses and brings overall view and evaluation of the shopping place. Customer´s perceptions on the shopping location are very important due to the fact that they influence the shopping behaviour. In the case of fresh non-packed products (fruit and vegetables) is in the foreground the accent lighting which substitutes fully the promotion function of packaging. During looking at the products on the shopping place are in the human brain processes and bonds which the customer does not realize. In the neuro study we used 67 younger and older respondents with the purpose to reveal the affect of the accent lighting as well as non-standard colours on the valence state of the participants (feelings). Via the conducted neuro studies we gained the primary data which were statistically evaluated and proved the influence of the individual types of accent lighting and colours on the customers´ emotions. The Wilcoxon signed rank test clearly proved that the valence of the respondents is different with accent lighting while it was the most dissimilar with the positions with LED light source compared to halogen and fluorescent lamp. At the same time was detected the highest amount of positive emotions with this type of lighting. This LED spotlight has the lowest electricity consumption among all the used types of lighting what means it has a great potential for high quality and energetically not demanding lighting of a retail store. There are more types of the LED light sources offered on the market not only with various power, chromaticity temperature but as well colour rendering index. High quality LED sources should contain LED chips with Ra (CRI) 80 and more, however, generally sold LED light bulbs have Ra (CRI) 70 or even only 62. Commercially produces LED chips with Ra (CRI) have maximum 90 but their usage is very rare because this type of LED chips has much lower light intensity. Besides are nowadays available various systems of intelligent control of the light which enable not only energy saving but setting of the intensity and chromaticity colour too depending on weather, what is a precondition for creation of always the right atmosphere in the store. Rightly designed lighting can contribute not only to a significant energy saving but to increase in sales too. Similarly via the Wilcoxon signed rank test we confirmed the difference in emotions with the individual non-standard colours used to illuminate the category of fresh products. The most positive emotions appeared with purple colour. These non-standard types of lighting were tested to reveal the valence with the individual colours main reason of which is the ability to attract the customer´s attention on the shopping place. The conducted neuromarketing study proved the fact that by the right choice and setting of the accent light (intensity, chromaticity temperature, colour rendering index) is possible to create an attractive presentation which is reflected in every customer´s emotional response. All spontaneous decisions run in our subconscious, the first impression being the decisive element. The human brain tries to classify into categories of positive, negative, friend, enemy, it is attractive yes or no, although all this happens so fast. It means that a man perceives certain stimuli and this their classification is in the background of a certain motivation. Attractively lit fruit, what creates the impression of fresh, juicy products, immediately causes irritation in the brain by creating various illusions. The customer can theoretically implement the rational thinking but every appeal has an emotional ground which is later rationally reasoned. It means that if the customer´s mind has once decided that the product is good, it simply excludes and ignores everything rational what contradicts. The brain is just set like that some things are appropriately adjusted and the customers have only a small chance to resist it.

On the basis of empiric findings we plan to conduct a similar research in the future with a bigger sample of tested respondents, taking into consideration the homeostasis, mental state of respondents´ minds (chemical state of the brain - excitement), seasonal influences (winter, summer) as well as individual tiredness of respondents (beginning and end of the week). Future research will be realised not only during the active regime of all types of the lighting but separately too to eliminate the ability of brain to adapt to sensory conditions of the environment. Besides we will try to take into account the effect of women´s menstrual cycle which significantly influences their brain activity.

Acknowledgement

The paper is part of the research project VEGA 1/0874/14 "The use of neuromarketing in visual food merchandising" conducted at the Department of Marketing at the Slovak University of Agriculture in Nitra.

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