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The Paradox of Choosing and Buying Prescription Glasses

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Abstract: The fact that the market for dioptric glasses today is increasing has become unquestionable. However, because of the increasing number of luxury glasses manufacturers and the increasing diversification of sunglasses, it is no longer enough to be aware of this fact, but complex strategies for segmentation, targeting and positioning of dioptric lenses on the market are necessary. This paper explores the relationship between consumer behaviour in the choice of dioptric glasses, their motives and factors that influence the choice of glasses and the identification of those factors that lead to the paradox of dioptric spectacle selection. Research on a deliberate sample of 109 respondents will be conducted, using a structured questionnaire. This questionnaire will consist of three units: the motives and factors of consumer behaviour that are crucial to the buying process, evaluating the criteria on the basis of which the consumer selects dioptric eyeglasses and the factors that lead to a paradox of choice, regardless of the motive of the selection.

Keywords: dioptric glasses, consumer behaviour, paradox of choice, evaluating selection criteria

1. Introduction

The human eye enables us to see and understand all that surrounds us and to fully experience life. The eye is one of the most perfect optical devices and together with the brain represents a „window into life" without which we cannot imagine life and all that surrounds us. How would we function if we could not see in what world we live in, how much harder is it live in a world where everything is grey. Optometry is the science of eyesight and vision and optical opacity of eyesight, its examination and correction. It allows the best way to achieve the greatest eyesight of healthy eyes with the use of optical aids. It examines and corrects the optical error of eyesight by prescribing and selling correctional lenses and glasses.

2. Colour and light

In a reality rich with colours there is in fact no colours. The colours we see depend on the light that enters our eyes from the outside world. What we perceive as red or green is actually formed deep in our brains. Theoretical assumptions on the nature of colours date back to the era of Greek philosophers Plato and Aristotle. The first serious research of the light phenomena was conducted in the 17. century by Isaac Newton (1642.-1727.) thus giving birth to optical science or the science of light phenomena. Already in 1704. he pointed out the fact that the „white" sun light is not a homogenous medium, but rather a mixture of different wavelengths and that because of absorption and reflexion on certain wavelengths the viewer will experience certain colours. Sunlight when released through a prism is divided into a spectre of „coloured" beams which comprises of the visible part and 2 invisible parts, the wavelengths above and below the visible part are the ultraviolet and the infrared beams, Fig. 1 [1, 2, 3].

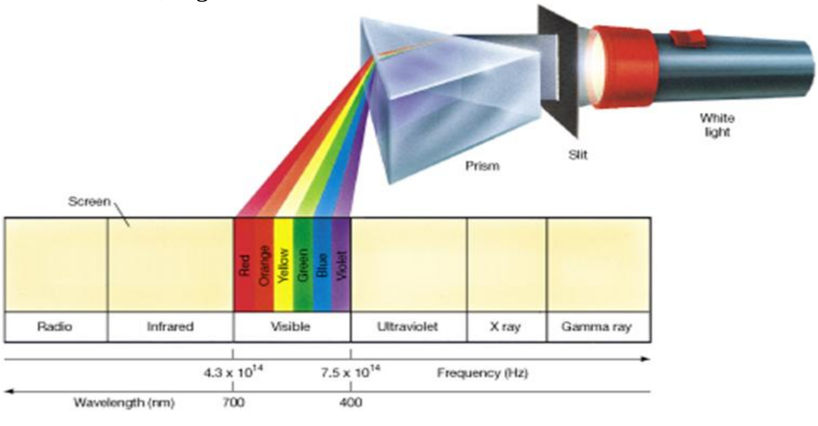

Figure 1. The Electromagnetic Spectrum[4]

Colour is a characteristic of a visible object or a source of light, by which the observer can determine the difference between two fields of free structure, same size and shape that may be caused by the differences in the spectral composition of the light experienced.

There are numerous definitions of colour, of which the most accepted one is the following: Colour is a psychophysical experience caused by electromagnetic radiation with a wavelength of between 380 and 750 nm (the psychical experience was caused by the physical stimulation by electromagnetic wave) [2, 3]. That it really is a psychical experience is proven by the fact that the same physical stimulants of colours (of the same wavelength) cause a different response (experience) in different people. This definition encompasses three conditions that enable us to see a certain colour, which will be described in more detail:

- the source of light (the visible part of the electromagnetic radiation spectre) that is necessary to awaken the eyesight
- eyesight of the observer (human) and his system of vision and
- the observed object and its properties that model light (absorption, reflexion and light transmission) [5]

3. Colour visualisation

Man perceives the world around him with the aid of different senses, one of which is eyesight. Receptor cells in the human brain can awaken in variations of up to 1 000 000 different intensities. However, the human brain is incapable of such experience differentiation. Thus the number of successive tones from white to black, that the average observer can experience, is about 200. The reason is that the human brain doesn't process such a range of intensity that the senses can perceive; instead it processes information in such a way that it maps a greater number of input information into a smaller number of experiences.

It is proven that colours have an important influence in the physiological processes in the organism, that colours symbolise life, as well as having an intense effect on living beings. As the physiological processes are closely linked with psychological processes it is important to observe the effect of colours on the human organism in the psychological sense. We associate colours with emotions and various experiences and in that way we occasionally get a new perception of colour [1].

3.1. Trichromatic theory of vision

The mechanism of vision for the human being is comprised of (for each eye) a lens that focuses on entering beams of light in an image, a varying-sized opening of the iris that controls the intensity of the absorbed light, millions of light-sensitive elements on the internal surface of the retina and the nervous system that relays the impulses of those receptors to the brain. Using those signals the brain creates a visual image that contains a perception of light and darkness, colours, shapes, motions, depths, surfaces etc [6]

Due to its structure (Fig. 2) the human eye enables the perception of vision and colours. According to the accepted theory of visualisation that is to say the interpretation of the way the human eye perceives colour, there are in the eye (retina) 2 types of photosensitive elements, cones and rods; that transfer light energy (electrical and chemical signals) into nerve impulses and register the tone of the colour for the observer.

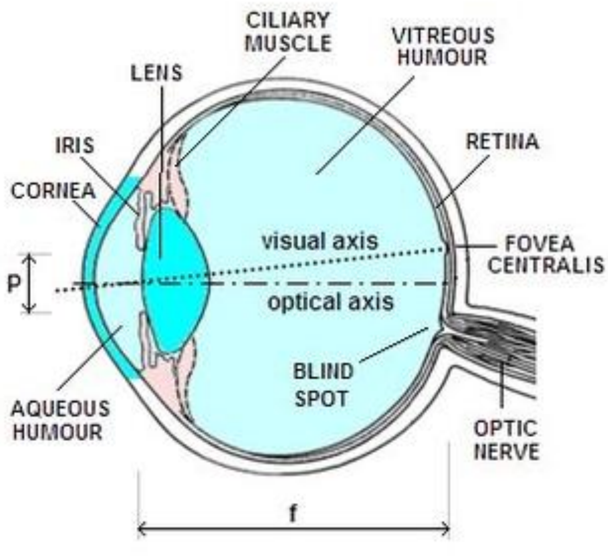

Figure 2. A cross-section of the human eye[7]

Colour vision is based on the fact "that the human eye functions similar to a camera. The retina and the lens work together as a camera lens when it focuses the picture of the visual world of the retina that is located at the back part of the eye, and acts as the film or another picture sensor of the camera. This and other structures have an important influence on our colour perception" as described by Fairchild [8].

The rods are located in the eye at the outer rim of the retina and mediate at lower light levels and are responsible for the experience of brightness of a particular colour, while the cones are responsible for the experience of the tone of colour and mediate at higher levels of light. The cones are located on small area at the centre of the eye retina, the "yellow spot" (Fovea centralis) and are capable of colour differentiation [5].

The cones and the rods are retinal photoreceptors. Viewing with the aid of the cones is clearer and sharper than viewing with rods, but only works at relatively high brightness levels. At low and very low levels we see almost a monochromatic image of low resolution [8].

There are 3 types of cones and each one varies in sensitivity to different spans of the visible spectre and serves for colour vision. According to Fairchild the appropriate names of the cones are L (Long), M (Medium) and S (Short). These terms refer to the long wavelength, medium and short sensitivity of the cons. Spectral sensitivity of S cones is highest at approximately 440 nm, M cones at 545 nm, and L cones at 565 nm, after correcting for light loss in front of the retina [1, 9, 10, 11].

Unlike the cones there is only one type of rod that is capable of colour vision. The visible spectrum is from 380 to 780 nm. It is sometimes labelled as RGB (Red, Green, and Blue) cones which is incorrectly based on the colours in the spectrum, Fig. 3.

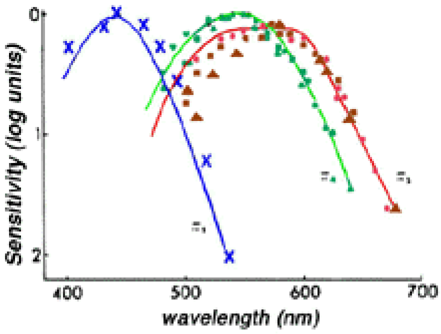

Figure 3. Spectrum of sensitivity of S, M and L cones [12]

The explanation of sense of vision that is to say the experience of colour is given by the "zone theory of colour vision" which unites the theory of opposite processes and the trichromatic theory.

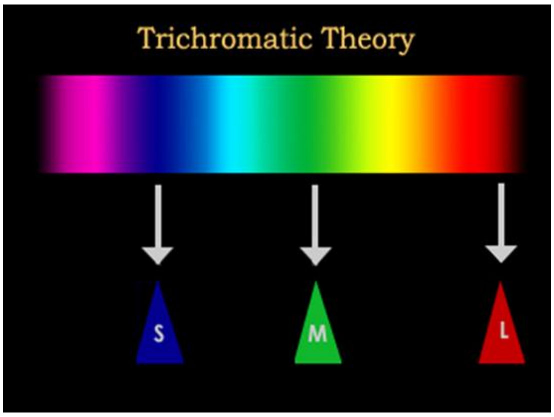

Figure 4. Trichromic Theory [13]

The trichromatic theory is based on scientific papers (of Maxwell, Yung and Helmholtz) which considered that the basis of all consideration of colour vision experience is the fact that the human eye possesses 3 types of independent "sensors" for colours that are close to the red, green and the violet-blue part of the spectrum. Every colour that we wish to reproduce can be made by mixing these three types of pigment [5, 8].

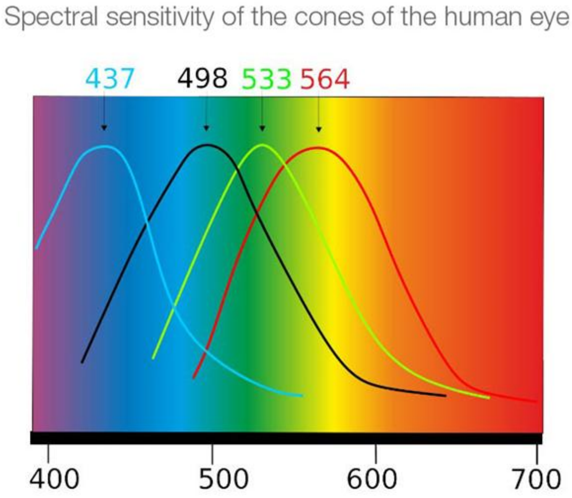

Figure 5. Eye sensitivity to colours [14]

3.2. Hering's theory of opposite colours

Modern day psychologists can confirm that there are 3 types of molecules and that each one is particularly sensitive to short, medium and long waves. Even though this consideration can help to explain why several wavelength areas are impossible to separate from others and why many mixtures result in the same colours, it still does not explain the tones of the colours that we see.

Although he spent considerable time researching the vision perception of the 3-D space, his paper on the subject of colours refers to the problem of, for instance, the yellow colour in the three-colour system. According to Helmholtz yellow must be a product of mixing red and green, but as Hering notices that is not right in human experience. The sensation of the yellow colour is basic and is not the result of mixtures. Furthermore, Hering claims that the mixtures of red and green do not appear but that they actually nullify one another. Hering concluded that there are 4 and not 3 basic sensations of colours or a psychological pyramid which codes our perception with so called “opposite processes”. In the year 1878. Hering wrote that yellow can contain a red or green tint but not blue. Blue can contain only a red or only a green tint, and red only a yellow or only a blue tint. Four colours can be described as basic, as Leonardo da Vinci said. Language also has simple terms for them, not terms borrowed from coloured natural objects. In the case of the opposite colours that explain all the tones of visible spectrum colour, Hering also speaks of antagonistic light variants that make up white. For him white was a sense of its own nature just by itself, like black, red, green, yellow or blue. In addition to that Hering also claims a black-white opposite process in order to explain light. Thus we have **6 basic colour tones**. Hering distances his theory from the world of physicists. According to Hering the claim that red and green or blue and yellow together give white would only make sense if red and green were seen as ether oscillations and not as red and green sense. The four expressions (red, green, yellow and blue) where available to the pioneers in this field and they were able to describe every colour using a combination of these terms.

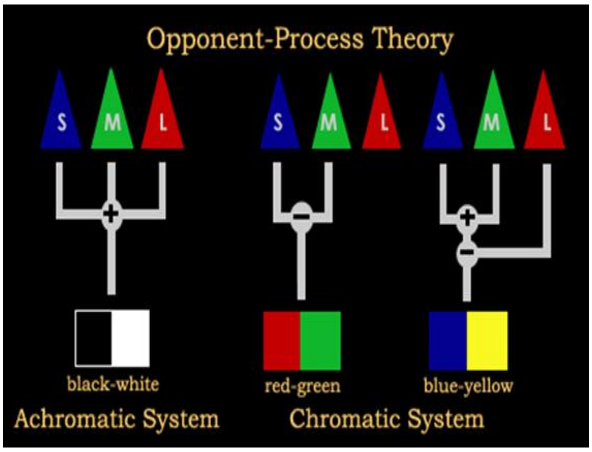

Figure 6. Opponent-Process Theory [14]

In Hering's time knowledge today considered normal was yet to be accepted and proven. Our perception of colour isn't clearer but that should not spoil our enjoyment of them. [1, 2] Hering's theory or the theory of opposite processes assumes that the cones located in the human eye retina are not sensitive to the 3 chromatic areas (red, green and violet-blue) but produce a signal based on the principle of opposite colour pairs. Opposite colour pairs are violet-yellow, red-green and white-black. The reasoning behind this theory depends on the fact that certain defects which involve blindness for certain colours cause blindness to opposite colour pairs. Thus a man who does not perceive or over time loses the sense of red colour at the same time loses the perception for its opposite, green. The same applies to the colour blue, when the perception of yellow is lost. The *Zone Theory of Colour Vision* connects the trichromatic theory with the theory of opposite colours according to which in the retina of the human eye, behind a layer of cone cells of different chromatic sensitivity is another layer (zone) of receptors. It is thought that there are 3 types of bipolar sensory receptors. Each receptor in the second zone is connected to three neighbouring cones of different chromatic sensitivity. Those receptors can receive opposite information from each cone (for instance + and -) and act as opposite cells, that is to say relay opposite information. It is assumed that the information of opposite sensations is generated when from the cones of different colours (violet-blue and yellow or red and green) identical signals arrive (+ and +); while in the case of opposite signals (+ and – or – and +) only the positive signal is relayed to the brain. This way opposite information can be relayed by using the same nerve [1, 5, 8].

3.3. Edward Land's Retinal Theory

In 1959. Edward Lang published a paper that caused a "riot" among the scientists that study colour. Out of desire to explain his observations **Land** proposed a so called **retina theory** in which he points out that for our perception of colour in the real world three separate and independent channels for comparing "light" are important. He showed how important the contrast between a relatively reflexed wavelength and the feature of light cleanness of neighbouring objects in a complex visual scene for maintaining the phenomenon of colour contrast that enriches our understanding of the visual colours [5, 8].

Three main theories that attracted the attention of colour scientists are the Young-Helmholtz trichromatic theory, Hering's opposite colour theory and Land's retina theory. Trichromatic theory is the basic theory of colours of light and it is based on the standard values of colours X, Y, Z (R, G, B) on whose distances the colour we experience will vary. In general this includes long, medium and short wavelengths under the names of colours red, green and blue [1, 5, 8].

3.4. The causes of defective vision and colour experience

Besides psychological reasons, there are psychical and psychological reasons for defective colour vision. That what is considered the sources of psychological reason for incorrect colour vision is as follows: the influence of colours in the environment, simultaneous and successive contrast and in certain cases metamerism (when caused by the observer) [5].

4. The paradox of choice

4.1. Dioptric glasses or a fashion choice and all that influences on that

When it comes to glasses or different frames, constant changes which have no purpose are happening; to put it simply the society demands new creations, as well as the consumer that chooses them. There is no realistic reason why large frames are worn one season, and minimalistic ones are worn the next season because glasses as a fashion choice are a complex choice, thoroughly chaotic and burdened with the appearance of "personal me" [16, 17, 18].

There is a countless number of components, tastes and influences that affect the choosing of glasses, regardless of them being sunglasses or dioptric glasses; while the different types of choosing frames for glasses, that is to say glasses, is something all generations must face with without regard for specific needs. There is no question that the choice of dioptric glasses will improve the quality of life and allow the consumer to control his fate, to see better. However, the choice of glasses is a question of life style. [19, 20] As consumers choose, they have a lot of decisions they have to accept (eye condition, dioptre, age, way of life, a frame that matches the dioptre and their face physiognomy) and as the number of frames increases so does the effort the consumer inputs when deciding which glasses, which frame to choose. Eventually the abundance of choice of dioptric glasses leads to paradox of choice regarding what is price wise acceptable, what is best for the eyesight and what is a fashion choice [19, 21].

5. Methodology and research findings

The research on consumers of optical products is focused on understanding and explaining the motivational frames, factors that influence the decision about purchasing optical products, as well as the need of the consumer that affects the choice and purchase of a certain optical product. [22] The better the understanding of the process of perception as well as the process of making a decision when buying the optical product the greater the certainty of recognising the factors that influence the decision of purchase. The dynamics of demand depend on the perception on the optical products market. Also, this research will acquire information about market segmentation structure and their demographic characteristics, life style, habits, expectations, preferences, attitudes etc. that influence the making of a decision regarding the purchase of an optical product. When the consumer purchases an optical product, he buys the whole personality of a luxury product that contains the elements of a product, but also the luxury and the perception he has of the product. That feature of an optical product consists of an image the consumer creates about the real and often the imagined advantages of a certain optical product, about people that use it, about a profile that a person, if he uses it, will present to the society. An optical product is not bought out of only necessity but is bought with emotion. The goal of the research is to perceive and understand the behaviour of optical products consumers from 3 perspectives: the first one examines the consumer through socio-economical features, the second takes into account the amount of information and knowledge consumers have about have about the products and the third perspective includes values, life styles, personality and attitudes.

5.1. Auxiliary research goals

Auxiliary research goals were

- ✓ Determining the motives of choosing an optical product
- ✓ Determining what behavioural factors of consumer behaviour are key in the process of purchasing optical products
- ✓ Determining what criteria is key in the process of purchasing optical products
- ✓ Determining the importance of achieving customer satisfaction as a condition of loyalty or reselecting the product

5.2. Research hypothesis

Following defined research objectives, two basic research hypotheses have emerged:

- **H1) By purchasing an optical product their consumers send signals about their personality and economic status**
- **H2) For consumers for which the aesthetic impression and personal style are important, the price is of negligible importance**

5.3. Research methodology

In order to explain the motives and attitudes of optical products consumers and other factors that determine their behaviour a poll method was used. As an instrument of research a structured poll questionnaire was used. Based on the study of relevant literature a questionnaire was created. In creating the questionnaire closed questions with offered answers were used as well as open questions and closed questions with offered modalities measured by a five positions Liker scale. Calculating the reliability of the measuring instrument, the Crombach Alpha coefficient shows the following:

Table 1. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,846	**,843**	33

A reliability of 0.9 can be considered excellent, when the value is about 0.8 the reliability can be considered very good, and when the value is 0.7 the reliability is acceptable. The sample was made by consumers chosen by a suitable pattern, the consumers of optical products. This sample is suitable for acquiring indicative results and making general conclusions about the influencing factors on the behaviour of optical products consumers and in the future can serve as a basis for further research about consumers, their motives, attitudes and preferences when choosing concrete optical products. The sample consisted of 109 people over the age of 18. Data analysis was done by the method of descriptive statistics [21,22,23].

5.4. Research results

It can be observed the behaviour of consumers of luxury cosmetic products is influenced by the quality of the optical product. On the basis of the research we grouped the consumers according to their interest for an optical product and expectations from the same and according to the social motives that were aimed at other people (the need for company and affiliation) and motives that were aimed at themselves as a person (self-validation motive, self-accomplishment, motives for acquiring):

- A- Quality: functional superiority and great performance
- B- Hedonism: emotions and affective state- true pleasure
- C- Social moment: social value for self and the group
- D- Uniqueness: exclusivity
- E- Status: appearance of wealth and status

Also the questionnaire was created in a way to take into account the rational motives, motivation by usefulness; as well as emotional motives, motivation by psychological and hedonistic objectives such as reputation, pride and satisfaction. The consumer who makes the decision to purchase an optical product on the basis of quality perceives the optical product as a utility and chooses those products that bring him the greatest usefulness for the money invested and enter a group of quality supporters. More and more modern day consumers live on the basis of hedonism and guide their behaviour towards satisfaction. Those consumers purchase a product that gives them a sensation of pleasure, comfort and happiness.

When buying the product consumers attempt to identify with a certain reference group. One of the options when the consumers feel "unique" is through their attitudes, experiences but also through the products they own. In the eye of the consumer the product that will make the consumer even more desired by the other consumers is of greater importance. Optical product has the same effect as any other luxury product such as expensive leather shoes, a unique handbag; and the same products can improve or worsen appearance. With the purpose of either proving or disproving the first research hypothesis (**H1)** we give an overview of the **crosstabulary analysis** between the following research claims:

"It is important they suit my face and personal style" (28)
And
"I avoid wearing glasses as they don't suit every make up and prefer to wear lenses" (18)
"I choose glasses according to the shape of my face" (17)
"People that wear glasses appear older and more serious" (16)
"People that wear glasses appear more professional and intelligent" (15)
"I choose those dioptric glasses that are unique and will make my appearance special" (14)
"I choose frame brands that enjoy a cult status in the world of fashion" (13)
"Glasses are the first thing people notice when approaching me and the choice of frame is of upmost importance" (12)
"For me (personally), choosing dioptric glasses is a fashion statement" (11)

The apparent convergence of the result towards the pole of acceptance points to an absolute correlation of the chosen answers and confirms the conclusions.

This proves hypothesis H1.

Table 2. VAR00028 * VAR00011 Crosstabulation

Count

		VAR00011					
		,0000	1,0000	2,0000	3,0000	4,0000	Total
VAR00028	,0000	6	0	0	0	0	6
	1,0000	1	0	0	1	2	4
	2,0000	2	1	4	2	1	10
	3,0000	2	6	7	3	3	21
	4,0000	13	6	22	12	15	68
Total		24	13	33	18	21	109

Table 3. VAR00028 * VAR00012 Crosstabulation

Count

		VAR00012					
		,0000	1,0000	2,0000	3,0000	4,0000	Total
VAR00028	,0000	6	0	0	0	0	6
	1,0000	0	2	1	1	0	4
	2,0000	2	2	3	3	0	10
	3,0000	0	3	7	6	5	21
	4,0000	3	5	10	13	37	68
Total		11	12	21	23	42	109

Table 4. VAR00028 * VAR00013 Crosstabulation

Count

		VAR00013					
		,0000	1,0000	2,0000	3,0000	4,0000	Total
VAR00028	,0000	5	0	0	0	1	6
	1,0000	1	2	1	0	0	4
	2,0000	1	1	2	5	1	10
	3,0000	1	1	8	7	4	21
	4,0000	4	2	13	19	30	68
Total		12	6	24	31	36	109

Table 5. VAR00028 * VAR00014 Crosstabulation

Count

		VAR00014					
		,0000	1,0000	2,0000	3,0000	4,0000	Total
VAR00028	,0000	6	0	0	0	0	6
	1,0000	2	1	0	1	0	4
	2,0000	4	2	3	1	0	10
	3,0000	4	6	7	3	1	21
	4,0000	21	12	17	8	10	68
Total		37	21	27	13	11	109

Table 6. VAR00028 * VAR00015 Crosstabulation

Count

		VAR00015					
		,0000	1,0000	2,0000	3,0000	4,0000	Total
VAR00028	,0000	6	0	0	0	0	6
	1,0000	1	1	0	1	1	4
	2,0000	5	2	1	1	1	10
	3,0000	4	2	8	4	3	21
	4,0000	24	8	17	5	14	68
Total		40	13	26	11	19	109

Table 7. VAR00028 * VAR00016 Crosstabulation

Count

		VAR00016					
		,0000	1,0000	2,0000	3,0000	4,0000	Total
VAR00028	,0000	6	0	0	0	0	6
	1,0000	0	0	3	1	0	4
	2,0000	3	1	4	1	1	10
	3,0000	3	2	9	5	2	21
	4,0000	13	8	12	16	19	68
Total		25	11	28	23	22	109

Table 8. VAR00028 * VAR00017 Crosstabulation

Count

		VAR00017					
		,0000	1,0000	2,0000	3,0000	4,0000	Total
VAR00028	,0000	4	0	1	0	1	6
	1,0000	1	0	0	2	1	4
	2,0000	2	2	1	1	4	10
	3,0000	3	3	8	6	1	21
	4,0000	18	10	18	11	11	68
Total		28	15	28	20	18	109

Table 9. VAR00028 * VAR00018 Crosstabulation

Count

		VAR00018					
		,0000	1,0000	2,0000	3,0000	4,0000	Total
VAR00028	,0000	5	0	1	0	0	6
	1,0000	0	0	0	3	1	4
	2,0000	5	2	1	0	2	10
	3,0000	3	2	9	5	2	21
	4,0000	21	12	19	10	6	68
Total		34	16	30	18	11	109

Table 10. VAR00028 * VAR00019 Crosstabulation

Count

		VAR00019					
		,0000	1,0000	2,0000	3,0000	4,0000	Total
VAR00028	,0000	5	0	0	0	1	6
	1,0000	3	0	0	1	0	4
	2,0000	4	3	0	0	3	10
	3,0000	9	3	4	3	2	21
	4,0000	38	7	9	6	8	68
Total		59	13	13	10	14	109

For the purpose of proving or rejecting the second research hypothesis we give an overview of the crosstabulary analysis between the following research claims:
“It is important that they suit my face and personal style” (28)
And

"Think about and name out what makes your dioptric glasses unique for you" (34)

Table 11. VAR00028 * VAR00034 Crosstabulation

Count

		VAR00034				
		,0000	1,0000	2,0000	3,0000	Total
VAR00028	,0000	3	0	1	2	6
	1,0000	**2**	**0**	**1**	**1**	**4**
	2,0000	4	3	1	2	10
	3,0000	6	1	4	10	21
	4,0000	9	6	16	37	68
Total		24	10	23	52	109

← price

Price, as a factor in choosing is in the second row of the table. It was marked by only 4 questioned out of a 109. In relative numbers this is only **3.7%** of the questioned.

This proves the second research hypothesis (H2).

6. Conclusion

The selection of dioptric glasses is getting bigger and bigger, and whilst certain consumers choose to look at the selection as a question of choice, it is precisely the large selection of dioptric glasses that leads to the paradox of what to choose, which leads to bad decision thereby leading to overall discontent. The bigger the selection, the greater the chance is the consumer's choice will be less than perfect, less functional, and less intended for medical purposes and it will focus too much on the choice of fashion. The theory of choice paradox represents the way in which the consumer makes his or hers decisions based solely on the brand of dioptric glasses or the frame brand, and the make and model of the aforementioned and or by what they represent by wearing those glasses. It is precisely when making a decision about the choice of dioptric glasses and fitting frames, that are a question of fashion selection as well, that modern consumers are faced with far too big a choice, they are more inclined to face a stump and prioritize fashion instead of health.

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