Optical Illusions and Effects on Clothing Design[1]

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Abstract

"Visual perception" is in the first ranking between the types of perception. Gestalt Theory of the major psychological theories are used in how visual perception realizes and making sense of what is effective in this process.

In perception stage brain takes into account not only stimulus from eyes but also expectations arising from previous experience and interpreted the stimulus which are not exist in the real world as if they were there. Misperception interpretations that brain revealed are called as "Perception Illusion" or "Optical Illusion" in psychology.

Optical illusion formats come into existence due to factors such as brightness, contrast, motion, geometry and perspective, interpretation of three-dimensional images, cognitive status and color. Optical illusions have impacts of different disciplines within the study area on people. Among the most important types of known optical illusion are Oppel-Kundt, Curvature-Hering, Helzholtz Sqaure, Hermann Grid, Muller-Lyler, Ebbinghaus and Ponzo illusion etc. In fact, all the optical illusions are known to be used in numerous area with various techniques and different product groups like architecture, fine arts, textiles and fashion design from of old. In recent years, optical illusion types are frequently used especially within the field of fashion design in the clothing model, in style, silhouette and fabrics.

The aim of this study is to examine the clothing design applications where optical illusion is used and works done in this subject. Some research of the design with the changing fashion of clothes of different types of optical illusions is discussed with examples of their effects on visual perception. In the study, optical illusory clothing models are scanned by visual analysis from documents like film, video, picture, web pages. The findings were analyzed in terms of the surface and design and effects of the optical illusion on clothing design has tried to put forward.

Keywords: Optical illusion, optical illusion and clothing design, optical illusion and textile surfaces

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Optik Yanılsama ve Giysi Tasarımına Etkileri

Özet

Algı çeşitleri arasında ilk sırada "görsel algılama" yer almaktadır. Görsel algının nasıl gerçekleştiği, bu süreçte nelerin etkili olduğunu anlamlandırmada en önemli psikoloji kuramlarından Gestalt Algı Kuramı kullanılmaktadır.

Algı aşamasında beyin salt gözden gelen uyarımları değil, önceki deneyimlerden doğan beklentileri de hesaba katarak fiziki dünyada var olmayan uyaranları sanki oradalarmış gibi yorumlayabilir. Beynin ortaya çıkardığı yanlış algılama yorumlarına psikolojide "Algı Yanılması" veya " Optik Yanılsama" denilmektedir.

Optik yanılsama biçimlerinin parlaklık, kontrast, hareket, geometri ve bakış açısı, üç boyutlu görüntüleri yorumlama, bilişsel durumlar ve renk gibi kimi etkenlere bağlı olarak var olduğu söylenebilir. Optik yanılsamalar insanlar üzerinde farklı disiplinlerin çalışma alanına giren etkilere sahiptir. Bilinen en önemli optik yanılsama türleri arasında Oppel – Kundt, Zöllner, Bükülme - Hering, Helmoltz Kare, Hermann Grid, Muller-Lyler, Ebbinghaus ve Ponzo yanılsaması vb. sıralanabilir. Aslında tüm optik yanılsamalar eskiden beri mimarlık, plastik sanatlar, tekstil ve moda tasarımı gibi pek çok alanda çeşitli teknikleri ve farklı ürün grupları ile kullanıldığı bilinmektedir. Son yıllarda özellikle moda tasarım alanı içinde yer alan giysi modellerinde, stil, siluet ve kumaşlarda optik yanılsama türlerinin sıklıkla kullanıldığı görülmektedir.

Bu çalışmanın amacı, optik yanılsamanın kullanıldığı giysi tasarım uygulamalarını ve bu konuda yapılan çalışmaları irdelemektir. Yapılan bazı araştırmaların değişen moda anlayışları ile farklı optik yanılsama türlerinin giysi tasarımlarına görsel algılamadaki etkileri örnekleri ile sunularak değerlendirilmiştir. Araştırmada optik yanılsamalı giysi modelleri film, video, fotoğraf, web sayfaları gibi dokümanlardan görsel analiz yöntemi ile taranmıştır. Elde edilen bulgular yüzey ve tasarım açılarından analiz edilmiş ve optik yanılsamanın giysi tasarımındaki etkileri ortaya konmaya çalışılmıştır.

Anahtar Kelimeler: Optik yanılsama, Optik yanılsama ve giysi tasarımı, Optik yanılsama ve tekstil yüzeyleri

Introduction

An individual realizes the information about life going on around him or her through sensation and perception. Sensation is considered as the first stage of perception; however, perception is considered as a complex process occurring through receiving, interpreting, choosing and regulating the sensory information. Perception is a concept that is the subject of fields such as psychology, physiology, and art.

According to the main characteristics of perception suggested by Aydınlı (1992): a) ''perception varies from person to person''; b) ''in perception, movement is essential''; and c) ''in perception, people collect information from their environments in accordance with their aims and requirements'' (Çağlayan, Korkmaz, and Öktem, 2014).

The sense of sight, which forms a person's impressions about the external environment in which he or she lives, is an important dimension for a person to perceive and make sense of the environment, and therefore to establish a relationship with the environment (İnceoğlu, 2010). Light is the main source of vision. The process of vision occurs as a result of some physiological events that occur regarding us simultaneously with the light source. The human eye has the capability to see under the conditions with strong or weak light sources, and to adapt itself to the situation (Bayav, 2008). The process of visual perception begins as the individual starts to implement the process of vision through choosing the images of a wide range of colors, shapes, and objects around his or her environment (İnceoğlu, 2010).

Even though there are differences perceived depending on the distance from objects, illumination, perspective, and so on, the color, shape, and brightness or darkness levels often appear not to differ. The final decision about the color of fabric is never made under artificial light; it is checked from a distant point whether the picture was hung on the wall properly (Gombrich, 1992: 65).

In order to examine the visual perception, support is provided by Psychology. In this regard, the Gestalt Theory, which focuses on how the visual perception occurs, what factors are effective in this process, and how those factors affect the process internally and externally, should be tackled (Ağaç and Sakarya, 2015). According to the Gestalt Theory, the complementary principles in organizing the perception are as follows: Figure & Ground Relation, Proximity Principle, Similarity Principle, Closure Principle, Continuation Principle, Simplicity Principle, and Pragnanz.

Although each new approach in the field of design is addressed as a new trend or style, the principles that they make use of are basically the same. At this point, the results obtained by the Gestalt theorists are the main factors that determine the design principles. The results that the Gestalt theorists, who had investigated how a person sees and transforms the visual information into a meaningful whole, obtained in this field are one of the basic factors that determine the design principles (Çağlayan, et al., 2014).

As the eye, brain, object, and environment are considered as a whole when the visual perception is discussed, perceptual illusion is another important subject that is to be addressed herein. The term 'illusion' is referred to as the phenomenon where a fact is interpreted differently, as the disruption or deviation of perception (Avcı Tuğal, 2012: 27).

Many people think that the objects they perceive visually are the same things they see with their eyes. Comparing with a horizontal line with the same length, a vertical line, actually,

leaves an impression as if it was longer than the horizontal line (Gombrich, 1992: 298). However, the brain does not merely account for the stimulations coming from the eye, but also can interpret the stimuli that actually do not exist in the world physically as if they did, by accounting for the expectations resulting from earlier experiences (Sarnıç, 2011).

Occasionally, the blind spot in human eye may cause the brain to gather the signals coming from the optic nerves in a wrong way. Therefore, while the eye and the brain are trying to see the reality, they may also cause illusions. This causes the object being seen to be interpreted inaccurately. The inaccurate perceptual interpretations are so abundant that these are called in psychology as ''the Perceptual Illusion'' or ''the Optical Illusion.''

Perceptual illusions suggest that the order of perception tends to make mistakes, and the outcome of perception is not perfect. Actually, perceptual illusion is one of the situations in which the interactions between the physical reality and the psychological experience are optimally identified (Eryayar, 2011).

Although the facts known regarding the optical illusion have not been completely clarified scientifically, there has been an agreement that both physiological and psychological processes are effective in these illusions (Buğdaycı, 2008).

The physical factors affecting the illusion are the relationships between the size and weight of the object. Our experiences showed that these two characteristics coexist (Özer, 2011).

Optical illusions have effects on people that are the study field of different disciplines. These effects have been used as an artistic value since the first stages of the visual arts.

Because there are not many theoretical explanations regarding the subject, it is not easy to classify the illusion types. However, it could be suggested that there are some types of optical illusions such as brightness and contrast, motion, geometry and perspective, interpretation of 3D images, cognitive conditions, and color (Buğdaycı, 2008).   This study was based on the sequence provided by Bach and Poloschek in 2006 concerning the optical illusion types. These types include Geometry or Perspective (Angle), Brightness and Contrast, Cognitive/Gestalt Effects, Color, Motion, and the Optical Illusions based on the Interpretation of 3D Images.

1. Geometry and Angle Illusions

Oppel-Kundt Illusions

The Oppel-Kundt Illusion is one of the earliest visual illusions known. In this illusion, the segment B was found by dividing two vertical lines called 'A' and 'C' into two equal spaces. Then, the space between the lines A and B was subdivided into vertical lines with equal intervals between; the space between the lines B and C with equal length was left empty. Herein, the interval between A and B is perceived as wider than the interval between B and C (Fig. 1.a) (Mikellidou & Thompson, 2014: 1).

Direction Illusion (Zöllner Illusion)

This illusion was discovered by the German astrophysicist Johann Karl Friedrich Zöllner in 1860. The long lines shown in Figure 1.b are perceived as if they were going to intersect each other, suggesting that this is a perceptual illusion related to the angles of the lines intercepting the parallel lines (Sarnıç, 2011). This illusion is mostly caused by both the angle of short lines intersecting each other, and the color of figure and ground.

Helmholtz Square Illusion

In 1867, the German psychologist and physicist Hermann von Helmholtz discovered that the square consisting of horizontal lines was perceived as longer than the square consisting of vertical lines (Fig. 1.c) (Swami, 2012).

Bending / Hering Illusion

This illusion, discovered by the German physiologist Ewald Hering in 1861, includes vertical red lines constituting two parallel line segments (Fig. 1.d). However, these lines look bent outwards due to the inaccurate depth perception and perspective caused by the lines with angles on the background. Therefore, the illusion is also called as ''the Bending Illusion.'' (Sarnıç, 2011).

Müller-Lyer Illusion

The Müller-Lyer Illusion is one of the most well-known illusions. The illusion was discovered by the German psychologist Franz Carl Müller-Lyer in 1889. Two lines of the same length are perceived to be of different lengths due to the linear patterns with the fins of arrow at the beginning and end of the lines (Fig. 1.e) (Avcı Tuğal, 2012: 121).

Ponzo Illusion

In 1913, the psychologist Mario Ponzo suggested that the human brain interprets the magnitude of objects according to the background. In Ponzo illusion, the depth cues such as lines, perspective, etc. cause the perception to develop in this way (www.biltek.tubitak.gov.tr/gelisim/ psikoloji/algilab.htm). The objects shown in Fig. 1.f are actually of the same length, but the perspective provided on the background causes our brains to perceive them differently.

Café Wall Illusion

In this illusion, discovered by Dr. Richard Gregory in 1979, the horizontal black and white parallel straight dividing lines (bricks) appear to be sloped (Fig. 1.h) (http://twistedsifter.com/2014/09/the-cafe-wall-illusion/).

Ebbinghaus Illusion (also known as 'the Titchener Circles')

This illusion was discovered by the German psychologist Hermann Ebbinghaus in 1890. In this illusion, related to the proportional perception, of two circles of identical size, the orange circle on the right appears bigger than the other one. This is caused by the proportion of the size of the outer circles to the central circle (Fig.1.i) (http://www.optical-illusion-pictures.com/famous.html)

2. Brightness & Contrast Illusion

Hermann Grid Illusion

This illusion was accidentally discovered by Ludimar Hermann in 1870. The grey ghost marks appearing on the intersection point of the segments drawn on a white grid located on a black background disappear when one looks at the direct intersection point of them (Avcı Tuğal, 2012:124).

Simultaneous Contrast Color Illusion

This illusion, also known as *the Gelb Illusion*, is the main source of the perceptual constancy illusion. Color and brightness constancy is responsible for the fact that a familiar object will appear the same color regardless of the amount of light or the color of light reflecting from it. In Fig. 1.j, there is a color transition from dark grey to light grey on the background. Even though the central horizontal line appears to show a color transition from light grey to dark grey, it has actually one color.

The Checker-Shadow Illusion, shown in Figure 1.k, was discovered by Edward H. Adelson. In this illusion, squares A and B are actually the same color; as the cylindrical object casts a shadow upon the surface, when the squares A and B are located between two vertical lines with same color, it is understood that these two squares are actually the same color (http://www.biltek.tubitak.gov.tr/gelisim/psikoloji/algilab.htm#ucboyutlualgi).

3. Cognitive Gestalt Illusion

Kanizsa Triangle

This illusion was discovered by the Italian psychologist Gaetano Kanizsa in 1955. In Fig. 1.1, although it appears like there is a white equilateral triangle, there is actually no triangle drawn in that image.

4. Color Illusions (Hue Difference)

Bezold Effect

This effect, named after a German professor of meteorology, Wilhelm von Bezold, is based on the fact that colors appear differently depending on the color of setting (environment). The

red color on a white background appears lighter, and the red color on a black background appears darker. In Fig. 1.m, as the background color and brightness of the artist Henri Matisse's (1869-1954) painting 'Nu Blue II' change, the figure becomes clearer.
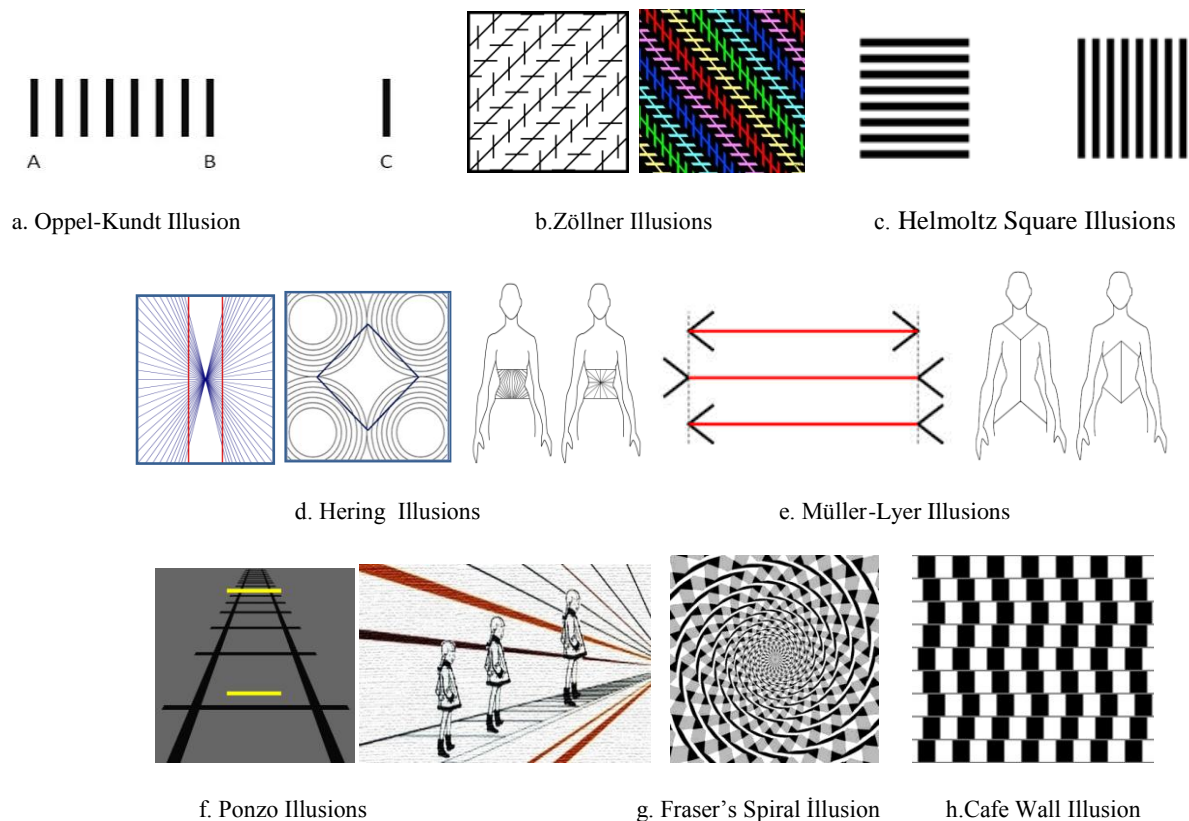
5. Illusions Based on 3D Interpretations

Necker Cube

'The Necker Cube' was first published by Swiss 'Louis Albert Necker' (1832). This illusion is based on the illusion that the human eye may sometimes see the 2D drawings as 3D objects. By adding a third dimension to each edges of the figure of a two-dimensional cube drawn with an isometric perspective, and by drawing them through giving them strength and thickness, this impossible cube is produced (Fig. 1.n).

6. Motion & Time Illusions

Motion Illusion

Motion illusions, one of the most entertaining optical illusions, are based on the illusion that the static images appear to be in motion, based on the use of color contrasts interacting with each other, and the use of figures (Fig. 1.o).
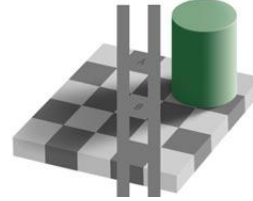
a. Oppel-Kundt Illusion   b.Zöllner Illusions   c. Helmoltz Square Illusions

d. Hering Illusions   e. Müller-Lyer Illusions

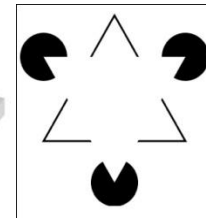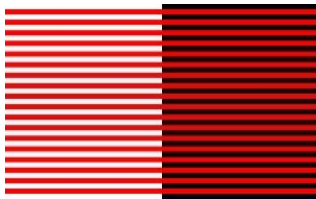f. Ponzo Illusions   g. Fraser's Spiral İllusion   h.Cafe Wall Illusion

i. Ebbinghaus Illusion   j. Contrast Color Illusion   k.Checker-Shadow Illusion   l. Kanizsa Triangle Illusion
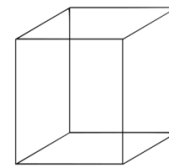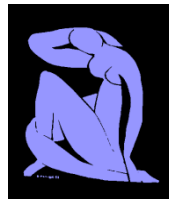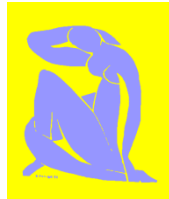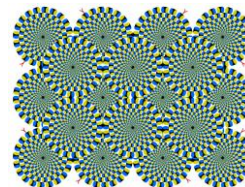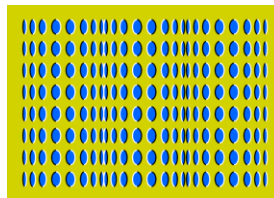
m.Bezold Effect Illusions   n. Necker Cube Illusions

o. Ellipse Illusion   -   Rotating Snakes

a. http://viperlib.york.ac.uk/categories/137-size-illusions

b. (Fermüller, C. ve Malm H. 2004.Vision Research 44 s. 727–749)

   http://imgkid.com/zollner-illusion.shtml

c. http://www.nmsba.com/neuromarketing-blog/3144477

d.http://www.michaelbach.de/ot/lum_herGrid/index.html,(Chen ve Peng, 2013)
e. http://www.optical-illusion-pictures.com/distort.html,(Chen ve Peng, 2013)

f .http://www.biltek.tubitak.gov.tr/gelisim/psikoloji/algilab.htm#ponzoyansilma,

   http://www.moillusions.com/ponzo-illusion-collection/

h. ttp://twistedsifter.com/2014/09/the-cafe-wall-illusion/

i. http://www.michaelbach.de/ot/cog-Ebbinghaus/

j. http://tr.wikipedia.org/wiki/Optik_ill%C3%BCzyon
k.http://www.biltek.tubitak.gov.tr/gelisim/psikoloji/algilab.htm#ucboyutlualgi

l. http://www.optical-illusion-pictures.com/famous.html

m. Dr. John Andraos, http://www.careerchem.com/NAMED/Optical-Illusions.pdf

http://www.michaelbach.de/ot/col-isoluNuBleu/index.html

n. http://tr.vectorhq.com/vector/necker-cube-and-impossible-cube-31869

http://imgarcade.com/1/cube-optical-illusion/

o.(Avcı Tuğal, 2012:126)

Figure 1. Optical Illusion Samples

Visual perceptual illusions, which are an extensive and interdisciplinary phenomenon, affected various disciplines in the light of the aforementioned scientific studies. As a result of this effect, a wide range of optical illusions were used in many various disciplines, such as architecture, engineering, etc., and by many artists, craftsmen, and designers. Moreover, the illusion affected various art movements, including the optical and kinetic art movements

Recently, it has been observed that the optical illusion types are frequently used on clothing models, styles, silhouettes, and fabrics found in the field of fashion design. The purpose of this study is to discuss the studies conducted concerning the clothing design practices in which the optical illusions are used. The effects of the fashion perception of some studies and various optical illusion types on clothing design in terms of the visual perception are discussed with examples.

Methodology

In this study, a 'visual analysis method' was used to investigate the clothing models with optical illusions. The theories in relation with the optical illusion and the effects of the optical art movements on clothing design were scanned through this method. Analyzing the findings in terms of both the surface and the model cuts, the effects of the optical illusion on the fashion sector were tried to be revealed

The visual analysis method includes investigating the documents such as films, videos, photographs, magazines, books and web pages visually. At the first stage, the theoretical data directing the study were collected. At the second stage, photographs, images, drawings were classified. At the third stage, the analysis forms were prepared and evaluated in terms of the specified criteria (Çileroğlu ve Kıvılcımlar, 2014; Ağaç ve Sakarya, 2015). In the study, by examining the clothing designs found in visual catalogs of designers and brands with optical illusions on their websites, magazines, and newspapers through the visual analysis, the clothing styles with optical illusions were analyzed in terms of the characteristics of the surface, model, pattern and design. In these analyses, dresses, coats, overalls and swimsuits

were the most frequently observed clothing models with optical illusions for women; whereas, only coat was found to be the model with optical illusions for men.

Findings

The phenomenon 'optical illusion,' which has a special place in the field of visual arts, and the attractiveness of the elements constituting it made people investigate this subject and conduct tests and practices in various disciplines (Sarnıç, 2011). Optical illusion and the Optical Art, emerged in the '60s by being affected by the optical illusion, manifested themselves mostly in the fields of fashion and textile. Many designers have designed clothes with visual optical motions by making use of the works of the optical artists and by using more black and white (Karaçalı, 2008).

As a fashion designer must have a good designing perception, it is also one of the most important steps for a designer to make the clients perceive the product accurately. In addition to the efforts of designer towards making his or her product be perceived accurately, the behaviors, knowledge of a client, and the way he or she perceives that product are also important. At this stage, the product design plays an important role in marketing, because the visual difference brought with the design affects the perception of a client, and the production style affects the behaviors of a client (Mozota, 2005).

With the help of the developing technologies in the fashion sector, and the changing fashion perception, diversity emerged in both the area of usage of products and the reasons for preferring the optical illusions. To use the stripes on clothes in order to create a perfect body impression plays a key role in creating the optical illusion, and helps the creation regarding the colors and fibers (Sarnıç, 2011).

Many designers in fashion world use the colors and styles on their designs by providing optical illusions. According to the criteria determined after a visual analysis scanning in accordance with the purpose of this study, three visual boards with pictures were established. One of these boards included designs with different optical illusion styles, and was called ''Clothing Designs with Optical Illusions.'' The second board was called ''Stripes Clothing Designs with Optical Illusions,'' due to the fact that stripes were used frequently in optical illusion samples. The third board was called ''Clothing Designs with Optical Illusions Showing the Body Slimmer,'' due to the fact that it included the models providing a slimmer look by using color contrasts and various illusions.
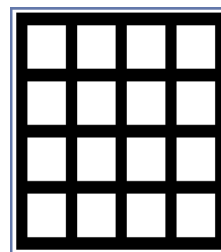
a. Elsa Schiaparelli- 1937   b. Life Magazine -1965 c. Roberto Capucci-1965 d. Kansai Yamamoto - 1973
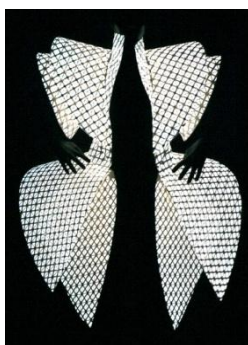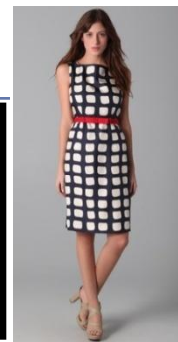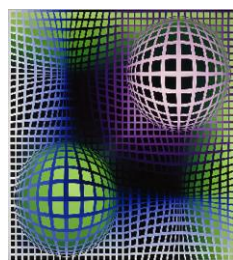

e. Ichiro Suzuki - 2013 - World 3796 Necker Coat Pattern-2015   f. Herman Grid Illusion - Milly Adrianne -..

g. Gareth Pugh -2007   h. Victor Vasarely "Boo"- Masahiro Nakagawa and Rica-1995

i. Chanel -2014   j. Viktor & Rolf-2009 Paris Fashion Week   k. Roman: Blue – Black Dress – 2015

a. http://viperlib.york.ac.uk/categories/137-size-illusions

b. (Fermüller, C. ve Malm H. 2004.Vision Research 44 s. 727–749)

   http://imgkid.com/zollner-illusion.shtml

c. http://www.nmsba.com/neuromarketing-blog/3144477

d..http://www.michaelbach.de/ot/lum_herGrid/index.html,(Chen ve Peng, 2013)
e. http://www.optical-illusion-pictures.com/distort.html,(Chen ve Peng, 2013)

f. http://www.biltek.tubitak.gov.tr/gelisim/psikoloji/algilab.htm#ponzoyansilma,

   http://www.moillusions.com/ponzo-illusion-collection/

h.http://twistedsifter.com/2014/09/the-cafe-wall-illusion/

i. http://www.michaelbach.de/ot/cog-Ebbinghaus/

j. http://tr.wikipedia.org/wiki/Optik_ill%C3%BCzyon
k.http://www.biltek.tubitak.gov.tr/gelisim/psikoloji/algilab.htm#ucboyutlualgi

l. http://www.optical-illusion-pictures.com/famous.html

m. Dr. John Andraos, http://www.careerchem.com/NAMED/Optical-Illusions.pdf

   http://www.michaelbach.de/ot/col-isoluNuBleu/index.html

n. http://tr.vectorhq.com/vector/necker-cube-and-impossible-cube-31869

   http://imgarcade.com/1/cube-optical-illusion/

o. (Avcı Tuğal, 2012)

Visual Board 1 - Clothing Designs with Optical Illusions

The findings obtained considering the board of Clothing Designs with Optical Illusions shown in Visual Board 1 can be identified as follows:

The design of an artificial blue silk coat with the depiction of two faces and a vase, produced with the designing cooperation of Elsa Schiaparalle with the famous artist Jean Cocteau in 1937, is shown in Visual Board 1.a. The optical illusion, also known as 'the Rubin vase,' could be considered as the first example adapted into the cloth in terms of the relationship between Figure and Ground among the principles of Gestalt's Perception Theory.

Larry Aldrich, the art collector, fashion designer and the founder of Young Elegante, is one of the designers who uses theme 'Op Art' most successfully. He got the attention of people with his designs and cloths designed being inspired by the works of Riley, Stanczak, Vasarely, and Anuszkiewicz (Özmen, 2010). In Visual Board 1.b, the perception of depth and asymmetry in eyes emerges with the optical effect given to the sleeveless dress with crew neckline from the work of the Optical Art of Bridget Riley, published in the magazine *Life* in 1965.

It is understood that it was inspired by the work 'Vega' of Victor Vasarely (1957), an optical artist, on the surface of the dress design belonging to Roberto Capucci (1965), shown in Visual Board 1.c. It appears that the football-like shapes are sequenced side by side in an order with the changes applied in the sizes of black and white squares.

The trousers part of the bodysuit designed by Kansai Yamamoto (1973) was designed in the form of a half circle (Visual Board 1.d). The curved lines starting from the knee level encircles the whole cloth in a spiral way, and the emerging pattern continues on the front and in the middle of the cloth symmetrically. Moreover, this pattern reminds of the Hering Illusion. Stripes are in accordance with the 'constancy principle' of the Gestalt Theory.

Visual Board 1.e depicts the three-dimensional square and rectangle blocks belonging to Ichiro Suzuki (2013), designed for the brand 'World.' In clothes designed as a coat for women and men in different models and cuts, the surfaces created with the effects of various colors with light and dark tones preferred by designers manifested a strong and attractive optical effect (Ağaç and Sakarya, 2015).

Models with black and white squares became very popular in the winter and summer of 2015. During the visual analysis conducted, it was seen that those printed surfaces are generally called as 'the Grid Square Print.' The optical effect provided by the ghost marks on which the grey spots emerge at the intersection points of the segments of grids belonging to the Hermann Grid Illusion, depicted in Visual Board 1.f, is apparent on the surface of the dress applied.

Gareth Pugh is a young designer who is famous for his firm, eccentric, and modernist style, and who shows up on stages with his impressive works. The surface of 'the Lighted Coat' by Pugh (2007), depicted in Visual Board 1.g, has diagonal lines and squares. The brightness and motion effects were provided through a special fabric used in the coat reminding of a Samurai costume, which was included in the collection named 'Fashion in Motion.'

On the surface of the coat and trousers designed by Masahiro Nakagawa and Rica (1995), it was inspired by one of the works of Victor Vasarely, called 'Boo,' and by similar various works (Visual Board 1.h). In this design, the depth effect was provided with thin white stripes on a black background, and on some parts, the circles on the cloth were made to appear in 3D

by changing the angle of the stripes. It can be suggested that the body part of the coat appears as three-dimensional circles, and the arms part of the coat leaves an impression of depth on the viewer.

The futuristic dress with optical illusion designed to show the waist slim by Chanel for the 2014-2015 Paris Fashion Week is depicted in Visual Board 2.i. Around the waist part of the dress, the contrast was provided with the color black, appearing like a blouse on the upper side and like a skirt on the below side. A slimmer look was provided using the fabric of Lycra surrounding the waist. That the upper part of dress with white color was cut short, widening towards the waist part, and that the skirt part was low and wide around the waist create a perception of space in viewer. In Visual Board 1.j, the upper part of the dress designed by Viktor and Rolf (2009) for the Paris Fashion Week is strapless, and the below part includes a riding skirt. An illusion was emerged with the space provided around the hip part. The optical effect depicted in Visual Board 2.i and j serves as a model for the principle of organization, just as in Kanizsa Triangle, one of the optical illusion examples, through filling the gaps found in the stimuli, and for the principle of closure of the Gestalt Theory, and for a trend of object perception as a whole, instead of as disconnected pieces from each other.

The dress in Visual Board 1.k, which created arguments and conflicts about the actual color of a dress (What color is this dress?) on social media around the world, belongs to the British brand 'Roman.' Even though the actual color of the dress was blue and black, many people claimed that the color of the dress was golden yellow and ice blue. Even in a poll started on a website about the color of the dress, 60% of the participants reported that they saw the color white where the actual color is blue. The reason of this 'color conflict' is the light illusion. According to scientists, the human brain identifies the color of objects depending on the lights reflected by the objects around it. Therefore, the color of an object is perceived depending on the colors of the objects around that object. Due to the light utilized on the background of the dress picture, some people cannot perceive the blue color, and instead, they see it as either white or ice blue close to white (http://www.haberler.com/dunyayi-ikiye-bolen-kiyafet-7015588-haberi/). This situation is defined by the Checker-Shadow Illusion, one of the illusions of brightness and contrast. The grey squares with identical color tones are perceived as having different color tones due to the shadow of the cylinder (Fig. 1.k).

| a. Alviani -1964 | b.Vertical Stripes Dress | c. Dorothy Perkins .. | d. Marc Jacobs -2013 |

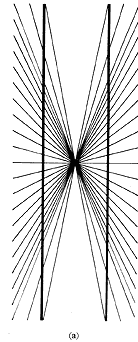e. Burda-2015 -Ebay.Com-2015   f. Jean Paul Gaultier-   g. Bridget Riley, 1964/Lisa Perry-2013
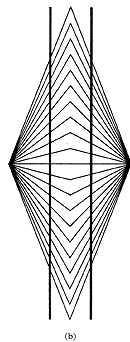
h. Topshop-2013   i.Hering Illusion - Zuhair Murad – 2012   j. Blanka Matragi-2012

a. (Özmen, 2010)

b. http://www.parisciel.com/blog/en/style-tips-tall-women/#.VXnNlPntmko

c. d..http://shainizam.tumblr.com/post/68044562919/trend-alert-striped-dresses

e. http://sewing.patternreview.com/patterns/64345

   http://www.ebay.com/itm/Womens-Celeb-Monochrome-Black-White-Striped-

f. http://www.lyst.com/clothing/jean-paul-gaultier-optical-tulle-onepiece-swimsuit-nude/

g. http://nymag.com/thecut/fashion/shows/2013/fall/new-york/rtw/lisa-perry.html

h. http://jewelry-junkies.myshopify.com/products/optical-illusion-black-white-body-dress

i. http://fashionfetishism.com/2012/03/08/zuhair-murad-collection-2012/

j. http://bestdress.com.ua/main/hc/3510-blanka-matragi-2012.html

Visual Board 2 – Stripes Clothing Designs with Optical Illusions

The single-dimension symbol (length) that the eye can see is called a 'line.' In terms of geometric characteristics, lines are divided into three groups: straight lines, curved lines, and broken lines. As the optical illusion is related to the visual perception, it is also related to the magnitude and geometric characteristics of an object. In this respect, in the studies they conducted, scientists examined the various effects of lines on visual perception. In Visual Board 3, it can be seen that the fabrics with vertical, horizontal and diagonal lines were used with various cuttings on the clothing models of various designers and brands. It is known that stripes, depending on their varying densities used on clothes (sizes, intervals, tones, directions), exert some sensory effects on people. Among these senses, the perception that the vertical lines are longer and thinner, and the horizontal lines are shorter and thicker takes the first place (Visual Board 3.b). This perception common in recent studies conflicts with Helmholtz's (1967) Square Illusion (Fig. 1.c). The Square Illusion reports that the horizontal lines serve as a longer and thinner appearance. In the tests conducted concerning this subject by various researchers (Thompson, 2008; Thompson and Mikellidou, 2009-2011), this illusion, when applied to the clothes for women as two-dimensional shapes, was shown to be confirmed (Swami, 2012). On the other hand, lines create different optical illusions in the eye, depending on the shapes and figures on clothing design. For example, a horizontal line on the hip level of a dress may cause the body look shorter.

The optical artist Alviani's attention towards the applied arts includes furniture, interior decoration, and typography. Many fashion designers, such as Andre Courreges, Geoffrey Beene, James Galanos, Merrimeko, and Rudi Gernreich, have benefited from the optical illusions of Alviani in their works. The positive-negative dress with horizontal lines appearing as a sack dress, designed by Alviani (1964), has brightness on the waist level and a gradient transition on the edges of skirt and neck (Visual Board 2.a).

The dress with horizontal lines produced by the brand 'Dorothy Perkins,' depicted in Visual Board 2.c, has a broken line effect on the cups on the sides. On his maxi dress, depicted in Visual Board 2.d, Marc Jacobs (2013) created various cups and cuts with optical effects through the motion of contrast thick black and white lines in different directions.

Considering the dresses designed with linear fabrics, depicted in Visual Board 2.f, the designers created the hourglass shape by using the contrast lines with different thicknesses vertically, horizontally and diagonally with special effects. The models with hourglass shape could make the body look fitter with contrast colors.

On the grenadine one-piece swimsuit designed by Jean Paul Gaultier, the horizontal lines with contrast colors were designed according to the body form. The lines continue through the line from waist to chest in thin shape, then thicken on the chest, and again become thin around the shoulders. The horizontal thin lines going downwards in triangle shape to the level of hip then rotate from this triangle level to the edge of the skirt vertically, and thicken. The rotation of lines were so well designed that the skirt of swimsuit is perceived as shorts (Visual Board 3.g).

The maxi dress design by Lisa Perry (2013) bears a resemblance to the print design of Brigitte Bauer (1966) on swimsuit. Lisa Perry was inspired by the black and white lines becoming narrow towards a chosen point, and by the work 'Intake' of Bridget Riley (1964), and this design provides a perception of depth. Given the 'Constancy Principle' of the Gestalt Theory, the curved black and white lines are perceived as if they would continue.

In Visual Board 2.h, the direction of the lines used on the printed white bodycon midi dress

put up for sale by the American firm 'Topshop' is longitudinal and diagonal. An optical effect was provided through the diamond figure created with lines on the foreground, and the perception of a different linear layer coming through it.

The dress designed by Zuhair Murad in 2012 with black stripes on chiffon was motioned with angled, horizontal, vertical and diagonal linear effects (Visual Board 2.i). The lines formed in accordance with the body form (as in the example of Herring Illusion) are spread from a single center, and they create a depth effect. These centers include the side stitches on the waist, hip line, and knee, and make the body outlines more apparent and provide an optical illusion.

As seen in Visual Board 2.j, the black and white lines on dresses designed by Blanka Matragi (2012) were used in different thicknesses. The upper strapless of dress extends to the upper hip line. There are contrast squares on the strapless chest part. The skirt part includes thick black and white lines; when the whole circle opens up, the contrast on the lines becomes apparent.

a. Alexander McQueen- 2012   b . Herve Leger…   c. Herve Leger - 2013

d Optic Dress…   e. Miusol Brand   f. Ebay.com   g. . Stella McCartney-2012   h. Nikole Bakti Brand

| i.Jason Wu… | j. Panel dress | k. aliexpress.com | l.Herve Leger - |

a. http://www.opticalillusioncollection.com/2012/03/optical-illusion-dress-to-slim-down.html

b. http://www.gettyimages.com/detail/news-photo/model-walks-the-runway-at-the-herve-leger-spring-2009-news-photo/82703544

c. http://www.lwcloset.com/?p=39411

d. http://www.dailymail.co.uk/tvshowbiz/article-2416727/Olivia-Wilde-mesmorises-picks-award-mind-spinning-optical-illusion-dress.html

e. http://www.ebay.co.uk/bhp/womens-optical-illusion-dress

f. http://www.ebay.co.uk/bhp/womens-optical-illusion-dress

g. http://www.capitalfm.co.ke/lifestyle/2012/10/10/hot-trend-alert-the-optical-illusion-dress/

h. http://onedio.com/haber/ince-gosteren-elbiseler-44938

j. http://modumoda.com/2012/11/mucize-elbiseler-giy-ve-en-az-bir-beden-zayifla.html#.VTP_8iHtmko
k. http://www.aliexpress.com/item/New-Womens-Optical-Illusion-Colorblock-Cap-Sleeve-Bodycon-Party-Pencil-Dress-Bodycon-Business-OL-Dress
l. http://www.herveleger.com/on/demandware.store/Sites-HerveLeger-Site/tr_TR/Search-Show?q=bandage%20dress&start=39&sz=39

Visual Board 3 – Clothing Designs with Optical Illusions That Show the Body Slim

On the board consisting of the designs of dress with optical illusions that show the body slim, there are the following findings:

The surface designs in various textures, silhouettes and cloth forms that Alexander McQueen uses in his collections are fascinating and impressive. In Visual Board 3.a, on the dress designed by McQueen, the body form was made to look slimmer through the hourglass appearance by using the contrast of black and white. The optical illusion effect of a pencil-formed dress was created through extending the black horizontal lines starting from the armhole line, becoming dense around the waist, and diminishing gradually towards the skirt edge onto a white background gradually (Ağaç and Sakarya, 2015).

As seen in Visual Board 3.b, on the dress designed by the French brand 'Herve Leger,' the collar is in boat neck form (princess), and it is sleeveless. The upper body background is black, and on sides, there are thin triangle pointed edges. Whereas, on the narrow straight skirt

cut from the waist, the background on the upper body is white, and on sides, there are black triangles. The dress could be assessed in terms of 'Figure & Ground Relation' of the Gestalt principles. Because the background is black, the upper part of dress appears to be one size slimmer; however, this causes the skirt to be perceived as one size bigger than the actual size.

The coral mini dress designed by Herve Leger (2013) is sleeveless and has boat neck. As the vertical lines created with equal intervals on body thicken around the waist, the spaces narrow. This situation provides an optical illusion effect by making the waist look slimmer (Visual Board 3.c).

In Toronto International Film Festival (2014), the size of the dress with blue optical illusion, sleeveless and with crew neck, worn by Olivia Wilde (Visual Board 3.d), is optically block-printed up to the hip line. There are hourglass forms around the waist part of the dress, and there are triangle black and white cups up to the line of armpits and hip line. Thanks to the hourglass appearance provided, and to the black and white cups, the waist appears to be slimmer.

The dress designed by the British brand 'Miusol' has a black background, and there are white prints with strapless appearance on the front body. As a result, a strapless dress appearance was emerged. Two stripes with the appearance of two-cup lines starting under the chest horizontally, in the vertical form of the right and left sides on the front in the middle on the chest, were united together at the edge of skirt. Herein, the model looks slimmer, because the eye moves within a limited area (Visual Board 3.e).

In Visual Board 3.f.g.h.j. and k., including some of the fashion designers (Stella, McCartney, Jason Wu), and some brands (Nikole Bakti), there are control panels and dresses with a bandage texture that enable women to look slimmer. These dresses taking their places in the shop windows in recent years let your body look slimmer with tone and color effects.

Those models formed with the contrast panels consisting of dark and light colors make the body look slimmer. The optical illusion effect is provided by obtaining a taller appearance because the panels are vertical and in dark colors. As can be seen in Visual Board 3.1, the waist was made to look slimmer with the help of the gradient dark brown tone on the waist part of the dress, designed by the brand 'Herve Leger,' with a bandage texture. The fabrics and cuts of dresses with a bandage texture are diverse, and when they are worn, they both surround the body giving it a shape like a corset, and they don't limit the motion thanks to their comfortable texture. (http://onedio.com/haber/ince-gosteren-elbiseler-44938).

Results

Fashion, which can be identified as a social and psychological phenomenon, is being shaped according to the changes in people's lifestyles, and meets with clients with various consumer needs and expectations, and the fabric styles with new materials, different surfaces and textures, and technologies. In designing those surfaces and models, the fashion sector is being influenced by various disciplines, art movements, institutions and sociological events. On the models of clothing in fashion sector, the results reached in this study, implemented for revealing the optical illusion practices affecting the styles, silhouettes, and fabrics, are as follows:

- Designers use brightness-color contrasts (Contrast Color, Checker-Shadow, etc.) and the geometrical illusions (Helmoltz Kare, Hermann Grid, etc.) on the surface of fabrics

most frequently. Furthermore, using lines/stripes on clothes plays a key role in creating the optical illusion, and this creation provides help on colors and textures. With various designs implemented concerning the motion and light illusions, the futuristic models were revealed.

- In the study, as well as the models created with the effect of the optical art movement, there were also designs that were created with the effect of Gestalt's complementary principles. These principles can be classified as 'Closure,' 'Constancy,' and 'Figure & Ground Relationship.'

- In recent years, some designers and brands have been designing models regarding how to make the body form look slimmer with the help of the optical illusion effects. This condition is provided sometimes through color contrasts and vertical contrast panels, and sometimes through the models shaping the body like a corset when worn with bandage-textured fabrics, and not limiting the motion with its comfortable texture as well. Again, the 'silhouette' appearance, showing the body slimmer, was obtained through the 'hourglass' appearance, provided through various cuts and cups, and color contrasts used on models.

- The following could be considered among the fashion designers and brands who use the optical illusion frequently: the designers such as Elsa Schiaparelli, Roberto Capucci, Kansai Yamamoto, Gareth Pugh, Masahiro Nakagawa and Rica, Chanel, Alexander McQueen, Herve Leger, Stella McCartney, Marc Jacobs, Jean Paul Gaultier, Lisa Perry, Zuhair Murad, Blanka Matragi, and the brands such as Ella Moss, Miusol, Viktor & Rolf, Roman, Topshop, and Nikole Bakti.

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