Complementary Color Scheme Which Appeared in Women’s Fashion Collections of New York, Milan, Paris, and London

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Abstract

The main objective of this research was to understand the characteristics of complementary color scheme through the analysis of contemporary women’s fashion color coordination as they appear in the ‘Collections’.

Data collection of 115 was done through review of ‘prêt-à-porter Collections’ of four cities: Milan, London, New York, Paris. Statistical analysis of frequency and also qualitative interpretation of characteristics of complementary color harmony characteristics which appeared in four collections were completed.

The main findings were as followed:

1. Only 115 complementary color schemes out of 4968 two color combinations appeared. Compared the comparative ratios of appearance frequency between the two color combination and the complementary color harmony, London showed the highest, and followed by New York, Milan and Paris.

2. The combined color type of ‘red+green’ was the most frequently appeared, and followed by ‘violet+yellow’ and ‘orange+blue’. For the type of tone harmony, the contrast tone showed the most, and followed by the similarity and identity. According to the type of complementary color combination, the type of tone harmony used differently. Some differences showed in the types of color harmony and tone harmony between collections.

3. The complementary color scheme which shown in four collections harmonized two opposite colors mainly through the strong tone contrast and this could cause tension along with interest in the image. The complementary colors intensified and brought out the attributes each other.

More details, high contrast of two complementary colors of yellow and violet created a vibrant look especially when used at higher saturation. Sometimes, however, some tone variations of two hues neutralized the strong effect and sometimes enhanced each other. When they used in similarity tones or identity tones in light colors, the tension was reduced and became softened but still presented nice harmony.

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In the type of 'red+green' color harmony, the various color combinations were demonstrated, mostly through tone manipulation of green color. The similarity tone harmony, which used the most, could effect a better sense of harmony and present more sophisticated looks. When used in contrast tone harmony, some changes in its own color which have only one color of two the excessive intensity led a good harmony. The 'orange+blue' color harmony was shown the least and used three tone harmony almost the same ratio. In this color harmony, blue amplified its energy and brilliance of orange and seemed to work better when one color was at a lower intensity than the other. In harmony with a similarity and an identity tone, this color harmony produces a stable and calm image.

(4) The complementary scheme appeared more frequently in the S/S collections than in A/W collections and showed some differences in the types of color harmony and tone harmony between seasons, however, no big differences between collections.

Key words: color harmony, color wheel, color tone harmony, complementary color scheme, type of complementary color combination

I. Introduction

Color is that magnificent aura that envelops us with endless, subtle nuances, elating, depressing, soothing. We respond to it physically and psychologically, consciously and unconsciously. Even before style it is color that makes us notice a particular garment on a store rack. Color helps distinguish and identify objects, it changes apparent size or shape, and it provides key sales appeal. 1)

People respond intuitively, emotionally and even physically to color. The same colors can look differently or inappropriate in various settings or lighting conditions.

Everyday one put together many elements of his/her own attire. One's choice of the colors one mixes and matches can make a significant impression on how one looks to others. Colors are very powerful tools to influence the way we feel. Some work together, and get along just fine: others always fight. 3)

There are certain colors that look good together, while other colors look so painful. How do we learn which colors look OK together?

Color theory is a body of practical guidance to color mixing and the visual impacts of specific color combinations. It has long had the goal of predicting or specifying the color combinations that would work well together or appear harmonious. The color wheel has been adopted as a tool for defining these basic relationships. 4)

As color theory analyzes only the relationships of pure colors, it does not take color lightness and saturation into account. While the color scheme can use any tints, shades, and tones, color theory pays attention only to the hue component. In other words, color schemes are more often described in terms of logical combinations of colors on a color wheel. In color theory, a color scheme is the choice of colors used in design. Color schemes are used to create style and appeal. Colors that create an aesthetic feeling when used together will commonly accompany each other in color schemes. A basic color scheme will use two colors that look appealing together. More advanced color schemes involve several colors in combination, usually based around a single
Once understand the basics of color theory, one can start learning how to combine those colors into a harmonious whole. Color harmony serves to describe the relationships certain colors have to one another, and how they can be combined to create a palette of color. It is the idea behind why a certain color scheme seems to fit a pleasant combination of colors. Among different types of color schemes, the complementary color scheme is made of two colors that are opposite each other on the color wheel. This scheme is intrinsically high-contrast. In aesthetics, both negative colors and complementary colors offer contrast that ganglia in the eye accentuate in a center versus surround fashion.

Parring complementary colors is not something we easily found in our daily wear. There are other color combinations, however, that show up frequently in our photo stream without us really understanding why those colors worked together. Today we want to explore how to successfully combine complementary colors and unpack the theory behind some of our go-to color schemes.

Fashion is an art, and even if we don’t consider ourselves artistic, understanding color theory based on color scheme can help us match colors in our closet and coordinate our clothes to create stylish outfits for every mood and occasion.

The main objective of this research is to understand the way of effective use of contrast color combination through the analysis of complementary color scheme which appeared in contemporary female fashion as they appeared in the ‘Collections’ of four major fashion centers.

II. Theoretical Background

1. Color Basics

The average human eye can distinguish some 350,000 different colours, but we do not have names for all of them. A number of systems have evolved that try to identify and define colour scientifically. The first was devised by the English physicist Sir Isaac Newton in 1666. He identified the colours of the spectrum – the seven prismatic colours – red, orange, yellow, green, blue, indigo and violet. He believed that these colours could be related to the musical scale, suggesting colour ‘tones’ and ‘harmonies’, and since then colour has often been discussed in musical terms. Newton constructed a six-spoke colour wheel (indigo and blue were merged), which is still used to describe pigments and subtractive colour today.

To describe a color with reasonable accuracy, three basic properties have been designated to identify the dimensions, or qualities, of color.

1) Hue: the name of a color like red.

2) Value: the degree of lightness or darkness in a color.

3) Intensity (saturation or chroma): the degree of purity or strength of a color (hue) or how bright or muted the colors are. For example, an intense red is one that is a very strong, pure red color. When a lighter or darker color is added to a color, the intensity will be less bright.

2. Color Wheels and Harmonic Schemes

In color, harmony means an aesthetic arrangement of part to form a pleasing whole. If the science of color harmony is knowing which colors to use, the art is knowing what order to put the colors in, and what proportions of
Harmonic colors are sets of two or more color relationships that work well together and produce a color scheme that looks attractive. They are described by their relative positions around the color wheel.

Color schemes call upon everything about color aspects, names, theories, personal coloration, and effects because they combine all of them. Color schemes are structured guidelines to experiment with color harmonies, but they are not automatic guarantees of beauty that assume the artist’s role or deny flexibility. Color scheme formulas show the number and wheel relationship of hues in a scheme. Schemes can be based on one to five or more hues, but several different kinds of scheme might have the same number of hues. So the formula tells both how many hues are in the scheme format and how they relate on the hue wheel. Also the color scheme is an overall mood for one’s painting, illustration, or graphic design, and some moods are easier to achieve than others.

Among three basic properties of color, hues involved in any formula depend on two things: the theory used and the number of colors on the wheel. Different theories arrange hues differently; however, there are traditionally two types of color schemes: related and contrasting. Related color scheme use hues close to each other on the color wheel and include monochromatic and analogous types: all others are contrasting, using opposing hues.

P. Moon and D.F. Spencer’s theory is one of the typical theory of color harmony in color theory. In their theory, harmony colors are represented by using w-space based on Munsell color space. They defined that the color harmony is pleasant color arrangements if two colors under the following assumptions: First, two colors can be clearly distinguished. Second, two colors are located in simple geometric positions in w-space. From this assumption, all colors are classified into harmony colors or inharmonic colors in this theory and harmony colors are classified into three categories of identity, similarity, and contrast.

### 3. Complementary Color Scheme

Complementary colors defined as two colors which lie directly across from each other on the color wheel. The exact hue ‘complementary’ to a given hue depends on the model in question, and perceptually uniform, additive, and subtractive color models, for example, have differing complements for any given color. The use of complementary colors is an important aspect of aesthetically pleasing art and design. When placed next to each other, complements make each other appear brighter. Although these artistic complements may not be precise complements under the scientific definition, most artistic color wheels are laid out roughly like the HSV color wheel.

The complementary color of a primary color (red, blue, and yellow) is the colour we get by mixing the other two (red + blue = purple; blue + yellow = green; red + yellow = orange). So the complementary color for red is green, for blue it’s orange, and for yellow it’s purple.

The complementary color scheme is a classic choice when contrast is to be achieved. As this uses two hues opposite each other on the color wheel, the opposite warm and cold hues intensify each other.

When complementary colors used together, a vivacious color combination is produced. These two color combinations have a nice sense of harmony, even when they used two light colors.
As the colors get darker, contrast becomes more important. For example, two dull colors look distracting, and two vivid colors create such tension that the border between them vibrate.\(^{22}\)

Sometimes the opposing colors create maximum contrast or maximum stability. The high contrast of complementary colors creates a vibrant look especially when used at full saturation. This scheme tends to draw attention to the color: it often is best to use them in unequal amounts, or with varying intensities, to create the most harmonious result. Therefore, this color scheme must be managed well so it is not jarring.\(^{21,22}\)

1) Color Tone Harmony

What tone means? It’s how light or dark a color is, rather than what the actual color or hue is. Every color can produce a variety of tones.

The tone of a color is the result of the interaction of two factors: value or brightness, and chroma or color saturation. The tones range from vivid and bright to subdued and dark. This two-dimensional color system makes it easier to classify color data, to grasp the pattern of researched colors or to make time series analysis. The Hue and Tone System, which is intuitive and systematic, was developed for psychological study and marketing color research. It is based on the Munsell System with reference to the ISCC-NBS naming method. As a base, chromatic colors are organized in 10 hues and 12 tones, and there are 10 achromatic colors. PCCS( Practical Colour Coordinate), Japan also suggested the classification of color tone which can be easily used for fashion merchandising.\(^{23,24}\)

PCCS system can be divided into three major color tone harmony : identity, similarity, and contrast. The identical color tone harmony can be easily achieved a good color harmony because of their chroma commonness, in spite of different hues. This color tone harmony projects image of calm and consistent unity. In general, the characteristics of similarity color tone harmony looks calm, stable, harmonious and peaceful. The contrast tone harmony demonstrated strong, vivid, keen, and dynamic image along with the brilliant and impulsive look. The greater the difference of contrast, the stronger the excitement and attention.\(^{25,26,27}\)

III. Methods

1. Sample selection:

First, two color combinations which appeared in Pret-a-porter Collections\(^{1}\) of four cities: Milan, London, New York, Paris, from the periods of 2004 S/S to 2009/10 A/W were chosen.\(^{28}\) Among them, data collection of 115 complementary color schemes used for the final data analysis.

2. Measurement:

The Korea Textile Color Guide was used as measurement criteria. Identical tone was defined as lightness 10 or below, saturation at 10-20. Similar tone was defined as lightness 20-50, and saturation at 20-80. Contrast tone was defined as lightness at 60 or above, and saturation at 100 and above. For achromatic colors, total 6 hues of 3 primary colors and 3 secondary color in color wheel are used.

3. Data analysis:

Statistical analysis of frequency and qualitative interpretation of characteristics of complementary color coordination were completed.
IV. Result and Discussion

1. The Frequency of two Color Combinations and Complementary Color Harmony Appeared in Four Fashion Collections

The results to study the frequency of two color combination and complementary color harmony appeared in four collections from '04 SS to '09/'10 AW have been presented in Table 1.

The total 4968 of two color combinations appeared in four collections from '04 SS to '09/'10 AW. They showed in Paris (37.2%) the most, and followed by Milan (31.0%), New York (16.9%), and London (15.0%). Although, in case of New York and London collections, the total number of designs which contained in 'Collections' was about a half of Milan and Paris, the order of their frequency ratio would not be changeable.

Compared the comparative ratios of appearance frequency between the two color combination and the complementary color harmony, London showed the highest (3.1%), and followed by NY (3.0%), and Milan (2.1%) and Paris (1.9%) and the average ratios is 2.3%. Therefore, it could be said that the complementary color harmony is not the popular or easy to use color combination type for fashion.

2. Frequency of color harmony and tone harmony of four collections according to their types

The result from the examining the frequency of color harmony and tone harmony of four collections according to their types is presented in Table 2.

In the combined color types of complementary color scheme, the type of 'red+green' used the most (54.8%), and followed by 'violet+yellow' (33.9%) and 'orange+blue' (11.3%). For the tone harmony, the contrast tone was most frequently shown (51.3%), and followed by the similarity (33.9%) and identity tone (14.8%).

It showed some differences in the types of color harmony and tone harmony between collections. The frequency of 'red+green' combination showed very high ratio in New York (76.0%) and London.
The frequency of color harmony and tone harmony according to their types and collections

<table>
<thead>
<tr>
<th>City</th>
<th>Complementary Color Harmony</th>
<th>Tone Harmony</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>4(16.0%)</td>
<td>19(76.0%)</td>
</tr>
<tr>
<td></td>
<td>(10.3%)</td>
<td>(29.0%)</td>
</tr>
<tr>
<td>Milan</td>
<td>13(40.8%)</td>
<td>13(40.8%)</td>
</tr>
<tr>
<td></td>
<td>(33.3%)</td>
<td>(20.6%)</td>
</tr>
<tr>
<td>Paris</td>
<td>18(51.4%)</td>
<td>15(42.9%)</td>
</tr>
<tr>
<td></td>
<td>(46.2%)</td>
<td>(23.8%)</td>
</tr>
<tr>
<td>London</td>
<td>4(17.4%)</td>
<td>16(69.6%)</td>
</tr>
<tr>
<td></td>
<td>(10.3%)</td>
<td>(25.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>39(33.9%)</td>
<td>63(54.8%)</td>
</tr>
<tr>
<td></td>
<td>(100.0%)</td>
<td>(100.0%)</td>
</tr>
</tbody>
</table>

Types of color combination and Their Types of Tone Harmony

<table>
<thead>
<tr>
<th>Tone harmony</th>
<th>Identity</th>
<th>Similarity</th>
<th>Contrast</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow+Violet</td>
<td>2(5.1%)</td>
<td>7(17.9%)</td>
<td>30(76.9%)</td>
<td>39(100.0%)</td>
</tr>
<tr>
<td></td>
<td>(11.8%)</td>
<td>(17.9%)</td>
<td>(50.8%)</td>
<td>(31.8%)</td>
</tr>
<tr>
<td>Red+Green</td>
<td>10(15.9%)</td>
<td>28(44.4%)</td>
<td>25(39.7%)</td>
<td>63(100.0%)</td>
</tr>
<tr>
<td></td>
<td>(58.8%)</td>
<td>(71.8%)</td>
<td>(42.4%)</td>
<td>(54.9%)</td>
</tr>
<tr>
<td>Orange+Blue</td>
<td>5(38.5%)</td>
<td>4(30.8%)</td>
<td>4(30.8%)</td>
<td>13(100.0%)</td>
</tr>
<tr>
<td></td>
<td>(29.4%)</td>
<td>(10.3%)</td>
<td>(6.8%)</td>
<td>(10.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>17(17%)</td>
<td>39(39%)</td>
<td>59(51.3%)</td>
<td>115(100.0%)</td>
</tr>
<tr>
<td></td>
<td>(100.0%)</td>
<td>(100.0%)</td>
<td>(100.0%)</td>
<td>(100.0%)</td>
</tr>
</tbody>
</table>

(69.6%), however, 'yellow+violet'(51.4%) appeared higher than 'red+green'(42.9%) in Paris and two types of 'yellow+violet' & 'red+green' showed the same ratio(40.6%) in Milan. The contrast type of tone combination was used the most in three collections of Milan(65.6%), Paris(57.1%), and New York(44.0%) but London. In London, the similarity tone harmony appeared the most (43.5%), and followed by contrast(30.4%) and identity(26.1%).

3. Characteristics of Complementary Color Scheme

To analyze the characteristics of complementary color harmony in latest women's fashion collections, what type of tone harmony used for each color combination type of complementary color harmony has been studied. The result presented in <Table 3>.

As shown in <Table 3>, the tone harmony showed a difference according to the type of complementary color scheme. For 'yellow+violet' color combination, the contrast tone was appeared the most(76.9%), and followed by the similarity (17.9%) and the identity(11.8%). The similarity tone was used the most for 'red+green' combination (44.4%), and followed by the contrast(39.7%) and the identity(15.9%). For 'orange+blue' combination,
the identity tone showed the most (38.5%) and the similarity and contrast tone used the same (30.8%).

Summing up the results of <Table 2> and <Table 3>, and the result of qualitative analysis of complementary colors in the four collections, the general characteristics of complementary color harmony were as followed.

The complementary color scheme which shown in four collections harmonized two opposite colors mainly through the strong tone contrast and this could cause tension along with interest in the image. The complementary colors intensified and brought out the attributes each other.

More details, the 'yellow+violet' color harmony mainly made the most of their characteristics. The high contrast of two complementary colors created a vibrant look especially when used at higher saturation. This hue contrast caused tension in the image and were especially attention-getting as shown in <Picture 1>31 and <Picture 2>32. Sometimes, however, some tone variations of two hues neutralized the strong effect of each color and sometimes enhanced each other. When they used in similarity tones or identity tones in light colors, the tension was reduced and became softened but still presented nice harmony.<Picture 3, 4>333435

4. The seasonal difference of frequency in complementary color harmony and tone harmony

The result that study the difference of frequency in complementary color harmony and tone harmony between seasons presented in <table 4>. The seasonal analysis revealed that the complementary color scheme appeared more frequently in S/S (65.5%) than in A/W(34.5%).

Seasonal comparison of complementary color and tone harmony showed a little difference between collections, however, no big differences between collections.
## Table 4

The frequency of each type of complementary color harmony and tone harmony according to each season

<table>
<thead>
<tr>
<th>Season</th>
<th>Color &amp; Tone Harmony</th>
<th>Complementary Color Harmony</th>
<th>Total</th>
<th>Tone Harmony</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Vió+Yel</td>
<td>Red+Gr.</td>
<td>Org.+Bl.</td>
</tr>
<tr>
<td>SS</td>
<td></td>
<td>26(35.1%)</td>
<td>41(55.4%)</td>
<td>7(9.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(66.7%)</td>
<td>(65.1%)</td>
<td>(53.8%)</td>
</tr>
<tr>
<td>AW</td>
<td></td>
<td>13(31.7%)</td>
<td>22(53.7%)</td>
<td>6(14.6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(33.3%)</td>
<td>(33.8%)</td>
<td>(46.2%)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>39(34.5%)</td>
<td>63(59.9%)</td>
<td>13(10.6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(100.0%)</td>
<td>(100.0%)</td>
<td>(100.0%)</td>
</tr>
</tbody>
</table>
IV. Conclusion

The result of analyzing the complementary color scheme which appeared in contemporary female fashion as they appeared in the 'Collections' of four major fashion centers as follows:

1) The complementary color scheme was identified as not the popular type of color combination for fashion. Only 115 complementary color schemes out of 4968 two color combinations appeared in four collections from '04 SS to '90/'10 AW. They showed the most in Paris, and followed by Milan, New York, and London, however, compared the comparative ratios of appearance frequency between the two color combination and the complementary color harmony, London showed the highest, and followed by New York, and Milan and Paris.

2) The combined color type of 'red+green' was the most frequently appeared in complementary color scheme, and followed by 'violet+yellow' and 'orange+blue'. For the type of tone harmony, the contrast tone showed the most, and followed by the similarity and identity tone.

According to the type of complementary color combination, the type of tone harmony used differently. For 'yellow+violet' colors, the contrast tone used the most, and followed by the similarity and the identity. For 'red+green', the similarity tone used the most, and followed by the similarity and the identity. For 'orange+blue', the identity tone used the most and the similarity and the contrast tone used the same.

It showed some differences in the types of color harmony and tone harmony between collections.

3) The complementary color scheme which shown in four collections harmonized two opposite colors mainly through the strong tone contrast and this could cause tension along with interest in the image. The complementary colors intensified and brought out the attributes each other.

More details, the 'yellow+violet' color harmony mainly made the most of their characteristics. The high contrast of two complementary colors created a vibrant look especially when used at higher saturation. This hue contrast caused tension in the image and were especially attention-getting. Sometimes, however, some tone variations of two hues neutralized the strong effect of each color and sometimes enhanced each other. When they used in similarity tones or identity tones in light colors, the tension was reduced and became softened but still presented nice harmony.

In the type of 'red+green' color harmony, the various color combinations were demonstrated, mostly through tone manipulation of green color. The similarity tone harmony used the most for 'red+green' color harmony. The sharp contrast through the use of vivid or bright hues of red and green can cause some stress and unrefined look. Therefore, the 'red+green' color harmony could effect a better sense of harmony and present more sophisticated looks through similarity tone harmony or some changes in its own color to have only one color of two the excessive intensity.

The 'orange+blue' color harmony was shown the least and used three tone harmony almost the same ratio. In this color harmony, blue amplified its energy and brilliance of orange and seemed to work better when one color was at a lower intensity than the other. In harmony with a similarity and an identity tone, this color harmony produces a stable and calm image.

4) The complementary scheme appeared more frequently in the S/S collections than in A/W collections and showed a little differences in the types of color harmony and tone harmony between seasons, however, no big differences between
collections.

Conclusively, highlighting the good aspects of the contrast such as interesting combination of hues or tone harmony variations, while mediating the weak aspects such as excessive vibrance or visual strain would be some ways to appropriately bring complementary colors together. Two opposite color combinations have a sense of harmony, even when they use two light colors. As the color get darker, contrast becomes more important because of their complementary properties of two colors. In this research, complementary colors could be brought into harmony by reducing the saturation or tone variations. Varying the saturation or brightness of two colors could cause light and dark contrasts, of course, need to pay attention to prevent unexpected contrasts or tiresome. As a nice harmony can be achieved when two colors had a reasonable intensity, only one color of two opposite hues should have the excessive intensity. Combination of two dull colors may look distracting, and two vivid colors create some tension.

The another way to reach a good complementary color harmony may be as follows: the brighter the value, the lowered the saturation. As Chijiwi(1987) mentioned, dark colors with complementary light or dull colors may look quite nice. On the other hand, dark colors with vivid colors, or two dark colors, look harsh and unpleasant together, too much contrast in hue and not enough in tone.

Complementary color schemes are tricky to use in large doses, but work well when one wants something to stand out.

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33) Collections, 05/06 AW, I, Lon p.398.
34) Collections, 07/08 AW, I, Lon. p.305.
35) Collections, 08 SS, II, Par. p.65.
36) Collections, 09 SS, III, MI P.74.
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