

ColorErg - Color Ergonomics in Fashion Design

Fernando Moreira da Silva

*CIAUD – Research Centre in Architecture, Urbanism and Design
Faculty of Architecture, University of Lisbon
Lisbon, Portugal*

ABSTRACT

We all have a personal relationship with Color. Often we give ourselves an instinctive color treatment, just by choosing clothing of a particular color, or putting around us certain colors in our homes or gardens. Most of our reactions are, however, unaware and it is only when we begin to use color in an informed way that we can take advantage of this extraordinary life force in order to improve the quality of life and our well-being. The colors we use can provide protection against many physical ailments as well as can give us emotional inspiration. Obviously the clothes also protect us from the elements, being a form of personal expression, protecting us from the world around us and affecting the way we feel and think. *ColorErg* is a research project which aims to study physical, physiological and psychological color effects, in its interaction with human beings through clothing, underlining the importance of color ergonomics. The main objectives focus on the acquisition of scientific knowledge in the area serving as a projective tool for fashion designers, as well as to contribute, through the dissemination of its results, as a reference to the use of color to users in general.

Keywords: Ergonomics, Color, Fashion Design, Sustainability, User Centered Design

INTRODUCTION

“Colour is a property and the language of form” (Mahnke, 1993)

Nature provided us with color to fuel our body and spirit. Color enriches our entire system, giving us vital energy as supplement which is an essential part of life.

By observing nature, color often appears as a means of defense and conservation, as with plants and poisonous animals whose showy color warns potential predators, or even a function of attraction that allows plants reproduction and mating calls of certain animals. The human being, in its evolution, inherited psychological and physiological reactions to color, although they cannot be controlled nor explained objectively make color as a necessary medium for the information, communication and understanding of the environment. In this respect Michael Lancaster (1996:8) states that color has the function to attract attention, convey information add emotions and stimulate illusions. (Gamito and Silva, 2009)

As highly colored beings, our forms are made of vibrant and ever-changing Colors and the Human Being answers colors actively or passively in everything we do. Light waves affect us in every minute of our lives and enter our energy system, whether we are awake, whether we are sleeping, visual or blind. Our growth, blood pressure, pulse, Ergonomics In Design, Usability & Special Populations I (2022)

temperature, muscle activity, immune system, etc., they are all affected by light rays. The colored rays affect not only our bodies but also our emotions, dispositions and mental faculties.

We all have a personal relationship with Color. Often we give ourselves an instinctive Color treatment, just by choosing clothing of a particular color, or putting around us certain colors in our homes or gardens. Most of our reactions are, however, unaware and it is only when we begin to use color in an informed way that we can take advantage of this extraordinary life force in order to improve the quality of life and our well-being. Humans are not the only ones to be affected by Color. In the animal and vegetable world, color may mean survival or extinction. Color is used to attract, camouflage, as a sign of danger or send sexual signals. Color is instinctive to life and it is so important for our species as it is for the animal and plant kingdoms. There are many ways to introduce color in our system. Through the understanding of the physiological and psychological color effects, we can select the best colors for our clothes to our home and work environments. We can all learn to use color so we may take advantage of it:

- through the power of color in the food we eat and drink;
- the color techniques as therapy to heal, maintain health or alleviate many aches and imbalances (not a new idea, since there are many ancient systems of healing by Color developed throughout the world).

Of course you cannot forget color symbolic, religious and cultural power. Always used in religious rituals, Color is the language of the soul. There is a color language which we have lost and we have to learn it again, which brings benefits to our health, happiness, and perhaps even for the survival of our planet. There are very few studies on the subject, and even these are merely descriptive of a period or time. Until now there has never been an attempt to understand the global phenomenon. Does the one who determines trends, designs and manufactures Fashion has proper training on Color and its potential (for good and for bad)? Is that when people possess more knowledge about the use of color and the effects it produces in every one of us, we will wear and use Fashion differently?

ColorErg is a research project which aims to continue a former study on the physical, physiological and psychological color effects, in their interaction with the human beings through clothing. Since this is closely linked to fashion, the study will also address Fashion as a variable. The main objectives focus on the acquisition of scientific knowledge in the area that can serve as a projective tool for fashion designers, as well as to contribute, through the dissemination of its results, as a reference to the use of color to users in general.

A user-centered research methodology has been used, with participatory design, using survey methodologies, direct observation and active research, supported by mechanical means, in laboratory.

COLOR AND ERGONOMICS

Colour has always been a concern of every civilization, from the more remote and primitive till the more developed and actual ones. Therefore, the comprehension of the color phenomena has been a research objective for philosophers, theorists, artists and scientists.

Color can greatly influence your ergonomics and your fashion design project when it is applied appropriately. However, it can really mess things up when it is not used in support of our cultural and psychological understanding of color. But when you get it right it can be a game changer.

Michel Pastoreau (1997) defends that nowadays colors can only be understood when related with the colors from the past, with which they are in continuity or rupture. Far more than the color use, humans have tried to control and explain the color phenomenon, ever since prehistoric times.

“Although the idea of “color” may seem a simple concept, it conjures up very different ideas for each of us. To the physicist, color is determined by the wavelength of light. To the physiologist and psychologist, our perception of

Ergonomics In Design, Usability & Special Populations I (2022)

color involves neural responses in the eye and the brain, and is subject to the limitations of our nervous system.” (Lamb & Bourriau 1999:1)

“Color and light [...] have great impact on our psychological reactions and physiological well-being. Research has proven that light and color affect the human organism on both a visual and non visual basis. It is no longer valid to assume that the ‘only’ significant role of light and color is to provide adequate illumination and a pleasant visual environment.” (Mahnke 1996:3)

Frieling points out the major responses to light of a certain color: red color is devastating; blood pressure is inconsistent, there is a higher heartbeat, induces dryness in the throat and headaches. The subjects have a tendency to move away from the source. Yellow light leads the subject to the tendency to move away from the source, and a subjective sensation in hands. "Yellow causes tension at the same time releases and activates the motor activity". The violet-blue (and blue) light "... leads to calmness and to the ability to concentrate". The green light "... has a similar effect to the stimulus of the light scale heterogeneous tendencies." (Frieling, 1990)

Cheskin (1947), from the Color Research Institute of America, when conducted tests involving four different interior spaces, each of which of a single color (red, yellow, blue and green), including table chair and typing machine equally colorful, for subjects using the machine. The results were as follows:

- Red Room: increased blood pressure and pulse, overstimulation, difficulty of working.
- Blue Room: blood pressure and pulse rate decreased, the activity decreased.
- Yellow room without any effect on blood pressure or pulse rate.
- Green Room: was produced monotony. No other effect registered.

Other research carried out by Mahnke (1996) concludes that the ultraviolet light may have a wide range of physiological effects such as "a decrease in pulse rate, a dropped in blood pressure, skin temperature changes in metabolism and a reduction in reaction time, an improvement in health and resistance to certain types of infections."

The principles of physiology and psychology are fully interconnected. Both are controlled by neurological processes, although the exact nature of the process that controls the psychological reaction is effectively unknown. Graham (1997) presented a thread that outlines the path between a biological cell and psychology, in order to overcome the existing hole in medical theory.

COLOUR PSYCHOLOGICAL ASSOCIATIONS

“Research on the psychological aspects of color is difficult for the mere reason that human emotions are none too stable and the psychic make up of human beings varies from person to person.” (Wright 1998:28)

Even without detailed knowledge about the psychological effects of color, it is well known that it can affect our moods, our disposition. There are some colors that are exciting and inspiring, just as there are others that are depressed. How often we use expressions like "I feel blue", "green with envy", "red with anger", without thinking about the meaning that lies behind each of these words. Our feelings and emotions are directly affected by the hormonal balance or imbalance in our body. Once this is affected by the colors, they have, of course, an indelible influence in our feelings and dispositions.

The psychological effects of color have been extensively investigated through the use of colorful cards, instead of using painted compartments. As Sivik (1997) concluded, "... there is considerable disparity between the conclusions drawn by cards or buildings". Hesselgren (1987) states: "Most of the tests on the preference of colors now indicate the effect of the color contrast between color under investigation and its background (usually white)."

It is believed that most of color effect is based on associations of education from childhood, such as the sky and sea are blue, the grass is green, etc. The principles are applied in architecture due to taste associations, which can be translated into benefits to the overall effect of the building. The second way of experiment involves the projection of light of a particular color directly onto the retina of a subject so as to compare the physiological reactions. (Ellinger, 1941 and 1957)

Ergonomics In Design, Usability & Special Populations I (2022)

Some colors can calm us, while others can stimulate our mental activity. Through the process of restoring balance of Color energy directed to the pituitary, it is possible to restore the metabolic and emotional balance. This can relieve stress, tension, anxiety or depression. Certain colors can help us to deal with our feelings of loneliness, frustration or pain. The use of color to modify the emotional energy also results in the change of perception of the world and our way of living. Once color is directly linked to the subconscious, we can use it to diagnose and treat a problem at a deep level.

So far we have developed some studies based on relevant literature data and experiments with users, crossed with scientific research conducted in several countries, which have already conducted to some psychological associations to some of the most used colors.

We also added a survey by inquiry, questionnaire based, and involving 623 people from Portugal and UK, both gender, with ages between 23 and 72. Here we present some of the results, as example:

RED – vital, powerful, ambitious, hot, intimate, sensual, determined, friendly, brave, antidepressant, furious, impatient, angry;

ORANGE – hot, insurance, creative, stimulant, entertaining, cheerful, with humor, independent, antidepressant;

YELLOW – cheerful, light, bright, mentally stimulating, logical, smart, orderly, optimistic, clear thinking, fearless;

BLUE – cold, clear, relaxing, mentally calm, brings peace, tranquility, wisdom, spacious like the sea or the sky, sensitive, hopeful, faithful, believer, flexible, quiet;

WHITE – peaceful, cathartic, cold, isolated;

BLACK – comforting, mysterious, female, protective, restrictive.

OUR PERSONAL COLOURS

A group of scientists from USA have recently discovered that there is a connection between children's color of the eyes and their personalities: children with dark eyes are more gregarious and extroverted than the clear-eyed.

We all tend to have one or several colors that best express the kind of our personality and make us feel comfortable and give extra vitality and inspiration. A person's color is the one that captures the essence of that person entire personality. It will not necessarily give her any extra energy but, if the person is already feeling good, it will create the maximum impact, projecting the full force of her personality (Wright, 1998).

Many people are led to change their own colors for hair coloring or the use of colored lenses. They are subconsciously driven to the personality usually associated with certain colors, they think they are missing. Looking at the colors that people use most often, we get to know a bit more about them. There are several types of psychological tests that lead to a higher analytical knowledge of our personal colors. One of the most widely known and applied is *Max Luscher Color Test* which was developed in order to be used by psychiatrists, psychologists and physicians in order to provide them with relevant information about a particular person by knowing his or her colors choice.

The *Luscher Color Test* was devised by psychologist Max Luscher in 1969. Its effectiveness has been known in advertising and industry (automotive and fashion) for years. It's uncanny what this test can reveal consistently. What's far more revealing is our unique living relationship with color, which is revealed over time and in a variety of contexts under many influences. <http://www.johnpaulcaponigro.com/blog/136/the-luscher-color-test-online/>, accessed in 12.10.2012

This personal knowledge about colors meaning and what they reveal about our personality, can lead to a better use of Color in Fashion. (Rossignol, 2001)

Ergonomics In Design, Usability & Special Populations I (2022)

We can synthesize the essential data collected and interpreted, by stating that if we prefer to wear *red*, we are impulsive, excitable and energetic; there is a demonstration of ambition and a taste for seeing things happen quickly; we like to be the best in everything we do; we can be a little insensitive to others' feelings, since we like to be the center of attention; red means vital force, with our nervous activity pushing us to achieve results and succeed; the habit of wearing red may indicate that we attach great importance to sexual desire and eroticism - this energy may be best used in the form of creative force, leadership, as well as development and expansion; or that we are bold and outgoing, but we tend to get angry and bad-tempered if we cannot make our way.

If our preference is *yellow*, we have an interesting and stimulating personality; we like to be active and involved in what is happening - alive and vital, can cope well with life's challenges; it represents spontaneity and communication; we are active, ambitious, willing and researchers; there is a desire and hope of greater happiness, which implies a conflict in which it is necessary to free ourselves; it pushes us in search of the new, the modern, the development and the informal.

We can also apply this to other colour as *dark blue*: we are intelligent, self-confident and have a great feeling depth; we feel a responsibility for others and like to make decisions; we need tranquility around us and we must be surrounded by attention, tenderness, affection and love; the noisy people disturb us; we may suffer from mental stress, leading us to the lack of action and relaxation.

If our preference is *white*, as this color contains all other colors on the spectrum, it shows that we have a positive, well balanced and optimistic personality; we possess high values and we must be open-minded and communicative. On the contrary, if we prefer to use *black*, it shows that we have a strong will power, we are disciplined and always opinionated; it also demonstrates that we have an organized and independent character, being sometimes too stubborn and independent; we have a lack of confidence in ourselves and have an innate ability to lead life with efficiency; this color represents renunciation and those who choose to wear it constantly want to renounce everything as a stubborn protest; however, the black used on occasions demonstrates that we have control on ourselves in order to communicate an authoritarian image. (Chiazzari, 1998)

COLOURS AND SEASONS AND THE STATE OF MIND - THE COLOUR BIORHYTHM

It is also possible to associate colors to Seasons of the Year. There are personalities linked to a particular season, to the detriment of others. Traditional Chinese Medicine associates each of the seasons to a color and an element, and these, in turn, are associated with different body parts and organs. Whether we can have our favorite colors, there are also many colors to which we are connected, depending on our mood, state of mind and emotions. These changes in our color preferences can give a valuable indication of the changes in our energy levels, disease and areas of our lives where there is an imbalance that needs attention. If we want to create balance and harmony in our lives, we need to appreciate the importance of giving life to our natural rhythm. (Fraser & Banks, 2004)

The understanding that life is not constant and that our activity levels and energy change through the seasons of the year, help us to develop a sensitivity to nature and, once again, to the cycles of nature. The colors we choose to wear and that exist around us, tell us if there is an imbalance in the area that needs our attention and to be healed. Ideal for a balance in our biorhythm is building our own biorhythm colors letter. If we find that certain colors are missing, it is likely to feel the lack of their energy in our system.

FASHION AND DRESSING FOR HEALTH

The colors we use can provide protection against many physical ailments as well as can give us emotional inspiration. Obviously the clothes also protect us from the elements and is a form of personal expression, protects us from the world around us and affects the way we feel and think. The tissues act as color filters, enabling certain chromatic waves to pass through our skin. This means, for example, in the case of a green tissue, the natural light

Ergonomics In Design, Usability & Special Populations I (2022)

which passes through the fabric absorbs green vibration and green passes into our system.

White clothes allow all wavelengths of light to pass and thereby to "feed" us with equal amounts of different colored energies. On the contrary, black color away all the light from us and this is the reason why black clothes often form a layer of protection around us. The use of black often draws energy and can have a negative effect on our health detriment, since the body needs light energy in order to function normally as a living organism.

For many reasons there is a strong relationship between our clothes colors and the effect that their energies have on us. The colors we use can give us protection against many physical problems and also provide emotional support and inspiration.

We must choose colors depending on the harmonization with our Colour-Season type and related with

- our energy levels of the moment
- our physical health status
- our state of mind

The State of the Art correlating color and clothes, or fashion, is still not very significant. So, several studies using quasi-experiment methodology were implemented. We worked with 12 different sample groups, each of them composed by 10 women with ages between 21 and 58. During 2 and half years we developed experiments in UK and Portugal, which results crossed with the literature evidences led us to important conclusions, but still not totally conclusive.

These are the achieved main results:

RED

TO WEAR: When we need to raise the morale, or we feel tired and lethargic or we need to encourage physical exercise and a competitive spirit. Red helps positive progress and success, and to put our plans into action. We use red when we want to feel sexy and alive.

TO AVOID: When we get tired easily, or when we suffer from constipation, myalgia, mononucleoses, or chronic fatigue syndrome. Do not use it if we have a colored physique, high blood pressure, or if the anger easily. Also avoid if we are nervous or tense.

YELLOW

TO WEAR: When we want to be alone, so that we become detached or impartial. Yellow promotes rational thinking and reasoning, and can improve memory. It aids communication, sharing and self-expression. Yellow is a good color for accessories. The golden yellow promotes shine and vitality, as well as the ability to meet new challenges. Yellow is adding value and confidence builder.

TO AVOID: If we are predisposed to criticism and suffer a loss of anchorage and stability. Yellow can encourage selfishness and is not advised if we give too much importance to material wealth. Yellow can cause irritability and a feeling of nausea. In this case we introduce the gold instead of yellow, which will encourage us to find our inner desires.

BLUE

TO WEAR: If we need peace and relaxation, and if we want to have an empty mind, when we suffer from mental fatigue. The blue helps to restore self-confidence, independence and responsibility for others. Blue brings insight and wisdom, encourages decision making, and helps us to connect to our intuitive sense. Also aids communication and strengthens our powers of speech.

TO AVOID: If we feel depressed, since the blue can make us feel worse. If we need to recharge, power or if we are nervous, since the blue does not give us this help. If we are totally relying in our mental faculties to achieve solutions, perhaps we need to stay more in touch with our emotions. In this case we must introduce some oranges

Ergonomics In Design, Usability & Special Populations I (2022)

our wardrobe.

BLACK

TO WEAR: If we are self-sufficient in authority and control, and we are in a position to protect. If we need to seek the advice or ideas of others, black protects us. We have to be in total control of ourselves, so that we can communicate an image of authority. We should always use the black with touches of another color strong, in order to counterbalance any negative effects.

TO AVOID: If we are depressed or desperate due to lack of self-recognition, self-denial. Black rejects the help of others and promotes isolation.

CONCLUSIONS

ColorErg has already achieved important results, which go far from the literature review on the research subject because of the project's empirical phase. We are implementing a mixed research methodology based on user-centered design and participatory design, using survey methods, as well as direct observation, active research, supported by mechanical means, and quasi-experiments with sample groups of women.

Through recent researches, we know which areas of the brain are activated, as well as we can measure the behavior of humans in what concerns color issues. So, it is intended to develop an experiment with users in order to check brain reactions to the different color dimensions, comparing the results with those obtained by the other previously used methods.

The main objectives focus on the acquisition of scientific knowledge in the area that can serve as a projective tool for fashion designers, as well as to contribute, through the dissemination of its results, as a reference to the use of color to users in general.

As expected results, we intend to achieve:

- Systematization of scientific knowledge reusable by all within the interaction Color / User, through clothing;
- Guidelines for the use and application of color in clothing design projects, in Fashion Design.

REFERENCES

- Cheskin, L. (1947), "Colors: what they can do for you", New York: Liveright Pub. Corp.
- Chiazzari, S., (1998), The complete book of colour, London: Element.
- Ellinger, R.G., (1953), "The organization of color", New York: Edward Bros.
- Feisner, E. A., (2001), Colour: how to use colour in art and design, London: Laurence King Publishing
- Fraser, T. & Banks, A. (2004), The complete guide to colour, Cambridge: Ilex Press Limited.
- Frieling, H. (1990), "The Color Mirror: The Quicktest for Character Diagnosis with the Colors of the "Frieling-Test", Berlin: Musterschmidt.
- Gamito M. & Silva, F. M. (2009), Cor no Mobiliário Urbano: um factor de Inclusividade, Orientação e Identificação, 5º CIPED, Brasil: Bauru.
- Graham, H. (1997), "Discover Color Therapy", New York: Ulysses Press.
- Hesselgren, S. (1987), "Hesselgren's Colour-atlas: Colour Manual", New York: T. Palmer.
- <http://www.johnpaulcaponigro.com/blog/136/the-luscher-color-test-online/>, accessed in 12.10.2012
- Lamb, T. & Bourriau, J. (Ed.) (1999). Colour: Art & Science. UK: Cambridge University Press (1st edition 1995).
- Lancaster, M. (1996), Colourscape, London: Academy Editions.

Ergonomics In Design, Usability & Special Populations I (2022)

- Mahnke, F. & Mahnke, R. (1993), *Color and Light in man-made environments*, New York: Van Nostrand Reinhold
- Mahnke, F. (1996). *Color, Environment, and Human Response*. USA: John Wiley & Sons, Inc.
- Rossignol, M.C., (2001), *O poder das cores: como influenciam o seu dia-a-dia*, Cascais: Pergaminho.
- Sivik, L. (1997), "Generality aspects of color naming and color meaning", Department of Psychology, Göteborg University.
- Wright, Angela, (1998), *The beginner's guide to Colour Psychology*, London: Colour Affects Ltd.