

Doctoral Thesis

PhD in Management

**The influence of color in work and trade settings:
Complementary colors, mood states and retail environment**

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The views expressed herein are of the strict responsibility of the author.

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To Vera and Clara, the colors of my soul.

*“But I see your true colors
Shining through
I see your true colors
And that's why I love you
So don't be afraid to let them show
Your true colors
True colors are beautiful
Like a rainbow”*

by Billy Steinberg & Tom Kelly
in *True Colors*

“The assumption that color is perhaps no more than mere decoration is absolutely false and counterproductive. Sensible color design, one that understands the ultimate goals, can only be solved through the integration of art and science”

Frank Mahnke (1947-2015)

President of the IACC (International Association of Color Consultants – founded in 1957) from 1988 to 2015.

Director of the AICCE, founder and lecturer of the IACC seminars in the United States, and author.

He dedicated his life to the study of color and how it can be used to create beneficial and healthy surroundings for human beings in the places they live, work, and heal from illness.

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Abstract

This thesis seeks to discuss the influence of color in work and trade settings, to assess the implications of their applicability in both organizational behavior and retail environment. This investigation was sprung with a preliminary literature review about the influence of space and color in organizational behavior. Subsequently, our major research queries were outlined and three focal studies following a within-subject design about color thus ensued. We first sought to understand the emotional processes behind the choice of complementary colors. Bearing in mind that the literature about complementary colors and emotions is scarce, we analyzed the association between complementary colors and mood states (Chapter I). Through an experimental study, 39 participants were instructed to choose colored cards at four different moments through time, after the induction of an emotional state. Four emotion conditions were evoked by means of autobiographical recall (i.e., happiness, sadness, balanced mood, unbalanced mood). Findings showed that complementary colors were preferred in the unbalanced mood scenario, suggesting that the color choice might rely on partially conscious mechanisms aiming at regaining a balanced state. Secondly, we investigated the interrelation between anthropomorphic packaging and color choices (Chapter II). A total of 259 participants were exposed to non-anthropomorphic and anthropomorphic packaging, considering a product from the real market (*Milaneza* pasta). Four different color conditions were rated in terms of attractiveness and purchase intention. Our findings suggested that anthropomorphism influenced product's attractiveness but did not affect purchase intention. Importantly, the green anthropomorphic package produced an almost complementary color contrast between the pasta and the package (vivid green vs. orange-red), leading to a higher color contrast perception that positively affected the product's attractiveness. In the third study, 436 participants assessed two retail scenarios – orange store and blue store – and two products – chocolate and soap (Chapter III). The products varied in color (red, orange, blue and beige), and were assessed in both stand-alone and embedded in the store situations, through image manipulation. Our results showed that there was a triple interaction resulting from retail environment color \times product color \times product category. Accordingly, we reinforce the idea that color should not be considered individually, but always in the context where it is inserted. With these three studies, we aim to contribute to the knowledge about the influence of color in human behavior. Crucially, we validate our prediction concerning the presumed effect of complementary colors, both emotionally and in retail settings. Here, we discuss the theoretical and practical implications of these findings.

Keywords: *Color; complementary colors; workspace; mood states; organizational behavior; attractiveness; purchase intention; packaging; retail environment.*

Resumo

Nesta tese pretendemos discutir a influência da cor no comportamento organizacional e em contexto de marketing, assim como a aplicabilidade deste conhecimento. A investigação teve início com uma revisão de literatura acerca da influência do espaço e da cor no comportamento organizacional. De seguida, o nosso trabalho começou a delinear-se com maior definição, e foram desenvolvidos três estudos sobre cor, com design intra-sujeitos. Em primeiro lugar, tivemos como objetivo o entendimento sobre os processos emocionais que desencadeiam a escolha de cores complementares. Tendo em conta que a literatura sobre cores complementares e emoções é escassa, analisámos a associação entre cores complementares e estados emocionais (Capítulo I). Através de um estudo experimental intra-sujeitos, 39 participantes escolheram cartões coloridos em quatro momentos diferentes, depois da indução de um estado emocional. Foram induzidas quatro condições emocionais (i.e., felicidade, tristeza, equilíbrio emocional, desequilíbrio emocional) através da redação de um episódio autobiográfico. Os resultados revelaram que os cartões que apresentavam as cores complementares foram preferidos quando o *desequilíbrio emocional* foi evocado, sugerindo que a escolha de cores pode estar baseada em mecanismos psicológicos parcialmente conscientes, procurando de forma inconsciente recuperar um estado emocional mais equilibrado. Em segundo lugar, investigámos a inter-relação entre embalagens antropomórficas e escolhas de cores (Capítulo II). Um total de 259 participantes escolheram entre embalagens antropomórficas e não antropomórficas, considerando um produto existente no mercado (massa *Milaneza*). Foram avaliadas quatro cores diferentes em termos de atratividade do produto e intenção de compra. Os resultados mostraram que o antropomorfismo beneficia a atratividade do produto, mas não afeta a intenção de compra. Adicionalmente, a embalagem antropomórfica de cor verde produziu um contraste entre cores quase complementares entre si (verde vívido vs. laranja avermelhado), considerando a massa e a embalagem. Este maior contraste entre cores terá produzido uma percepção que afetou positivamente a atratividade do produto. No último estudo, 436 participantes compararam imagens de dois ambientes de loja – loja laranja e loja azul – e dois produtos – chocolate e sabão (Capítulo III). Os produtos analisados divergiam apenas na cor (vermelho, laranja, azul e bege) e foram avaliados de duas formas: (i) individualmente; e (ii) adicionados ao ambiente de loja através de manipulação digital da imagem. Os resultados demonstraram que houve uma tripla interação resultante do ambiente de loja × produto × categoria de produto. Validámos a ideia de que a cor não deve ser considerada individualmente, mas sempre no contexto onde está inserida. Com estes estudos, pretendemos contribuir para o conhecimento sobre a influência da cor no comportamento humano. O presumido efeito produzido pelas cores complementares, decorrente de fatores emocionais e de percepção, foi validado através da nossa investigação. Por último, implicações teóricas e práticas acerca destes resultados são discutidas.

Palavras-chave: *Cor; cores complementares; espaço de trabalho; estados emocionais; comportamento organizacional; atratividade; intenção de compra; embalagem; ambiente de loja*

INTRODUCTION

When this research work started, we decided to initiate a project focused on the influence of color in management. At first sight, it may seem that the two fields are difficult to relate, but after careful analysis, we concluded that both concepts could be integrated naturally. Color is present in everyday life and affects our perceptions and decisions at several different contexts – including managerial ones. Therefore, it is possible to create interesting synergies among these concepts.

The first approach that emerged in the context of this research work was an exploratory analysis on the influence of color in the most diverse management contexts. Specifically, we referred to: (i) workspaces influencing organizational behavior; (ii) store environment influencing consumer behavior; (iii) packaging influencing marketing decisions.

Considering the reviewed literature, there is little research about color in an organizational context (Küller, Ballal, Laike, Mikellides, & Tonello, 2006; Labrecque, Patrick, & Milne, 2013). We also identified a research gap related to color combinations (Pridmore, 2011). Hence, the effect of colors when applied alone has been widely studied, but not the effect of color combinations. Particularly, the balance caused by complementary colors, and the assumption that psychological processes might be behind color choices, became an increasingly interesting issue. Research on color perception states that complementary colors lead to a balanced sensation (Schwartz & Krantz, 2016). The physiological aspects intrinsic to the referred balanced sensation are clear, but the psychological associations are not conclusive at all. Moreover, research about the influence of complementary colors with managerial implications is almost nonexistent. Namely, with applicability in organizational contexts (e.g., promote wellbeing and improve performance) and marketing (e.g., management policies that focus on consumer behavior such as increasing product attractiveness, brand engagement, or purchase intention; the way the product is presented – in which color plays a fundamental role – is one of the most powerful marketing tools).

Color undoubtedly has a significant role in people's lives. It is present in more aspects than people might think at first, or even conscientiously know (Whitfield & Whelton, 2013). The color effects in human behavior have been widely studied, including with the aid of new technologies (e.g., neuroimaging, eye-tracking) in diverse scientific fields, from neuroscience to psychology (Shevell & Kingdom, 2008). However, as these authors state, color remains a complex research topic, when compared to other visual attributes, given the richness and

symbolism of color obtained through cultural history. Furthermore, several studies mentioned the intricacy in color research, due to the complexity of factors that may be considered in experiments (e.g., light, individual preferences, culture, space and color attributes) and the used methodologies (Elliot & Maier, 2014). Even the terminology used in the literature needs to be more precise and clearer, to avoid ambiguous expressions such as *the use of good color design* as a recommendation (Küller, Mikellides, & Janssens, 2009).

Besides the pertinence of studying color in the most diverse areas of knowledge, the environmental context has also an extreme influence in human behavior (both at the psychological and physical levels). Physical space has specific attributes that could vary and be manipulated with direct implications in organizational and consumer behavior. For example, color may affect employee performance in an organization (Küller et al., 2009). Likewise, dominant colors and light could influence not only the consumer's intention to purchase but also price perception (Babin, Hardesty, & Suter, 2003).

Due to the aforementioned factors, we decided to proceed with a research work based in the interconnection of three areas of knowledge (i.e., color, psychology, and design), where management arises as a central field. We assume that color is an attribute with a huge implication in several areas of management, including organizational and consumer behavioral policies. Figure 1 shows how did we consider the different areas in our research work.

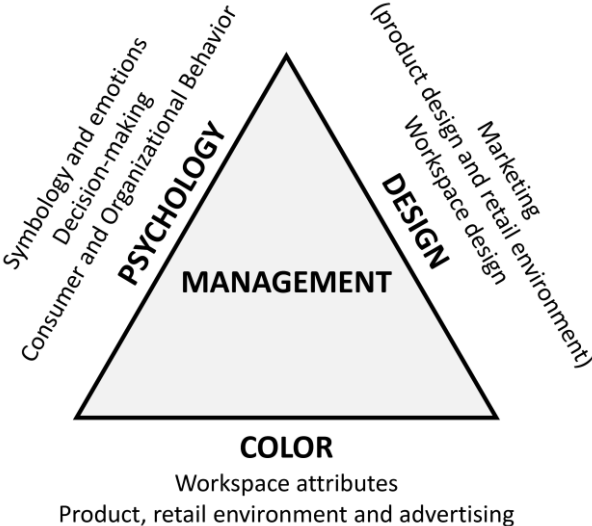


Figure 1
The interrelation between research fields.

1. Theoretical Background

1.1. Color.

The first studies related to color and its influence in psychological functioning seem to report back to Johann Wolfgang von Goethe and his work «Theory of Colors», first published in 1810 (Elliot & Maier, 2014). To define color, and to facilitate the work in this specific field, three main attributes were created: hue, saturation and value (Fairchild, 2013). Hue (or gradation) refers to wavelength, and that is what people normally think about when they refer to color (e.g., red, blue, yellow). Saturation (named *chroma* by some authors) is the intensity of a specific hue, i.e., more or less grey, considering a variation in a gray scale. Value or lightness is the brightness scale for each color, as the amount of black or white which turns a green tone in a light or dark green (Mahnke, 1996). Colors could also be associated to temperature (e.g., yellow as a warm color, and blue as a cold color), and contrast between colors may produce different effects (e.g., light-dark, chromatic-achromatic, complementary, intensity, cold-warm). These particularities about color must be considered when implementing design objectives and constitute a basic tool for developing concepts in a spatial context (Mahnke, Meerwein, & Rodeck, 2007).

To understand the process of color perception, it is vital to know the visual mechanisms that subtend it. Color is not a material property. It is, however, a perception generated by the brain due to the existence of light (Vandewalle et al., 2010). Basic visual processes are important to understand the mechanisms underlying color perception. With two types of photoreceptors in the retina, called cones and rods, it is possible to recognize color and light (Conway, 2002). Rods are sensitive to the intensity of light and are not able to distinguish among light of different wavelengths. Cones are responsible for recognizing colors and are divided into three classes, through which it is possible to perceive every color presented in the real world. Wavelengths are differently recognized by cones, which are organized into three color sensitivity types, depending on wavelength: short (S), medium (M) and long (L) wavelengths. Therefore, these three kinds of cones are referred to the perception of blue, green and red, respectively.

Research on color is truly extensive, interconnecting diverse areas of research, such as psychology (e.g., personal factors, emotions, preferences, associations), physiology (e.g., biological reactions), and history (e.g., trends, fashion, style, cultural factors, symbols). Thus, several concepts and interrelations could emerge and be surprisingly interesting.

In line with this, knowledge about color has been applied in different contexts, originating definite results related to marketing and consumer behavior (e.g., Porat &

Tractinsky, 2012; Ryu & Jang, 2008; Yildirim, Akalin-Baskayab, & Hidayetoglu, 2007; Michon, Chebat, & Turley, 2005; Brengman & Geuens, 2004), organizational behavior (e.g., Kwallek, Soon, & Lewis, 2007; Küller et al., 2006; Ainsworth, Simpson, & Cassell, 1993), or environment and health (Ghamari & Amor, 2016).

1.2. Space and environment.

People spend many hours of their day in different types of spaces, but the spatial quality is often relegated to second or third plan. The perception of space depends not only on individual perception, but also relates to the physical characteristics of the environment, affecting human behavior. It is true that space determines behavior, but spaces are as they are because someone has idealized them, consciously or unconsciously. Considering organizational behavior, it is very common to find dysfunctional organizations (habits, personal relationships, internal rules) that also exist in dysfunctional spaces (Morgan, 2006). When improvements are implemented to change these organizational variables, the results concerning efficiency are significant.

Although there are several indicators with practical applicability in the organizational context, there is still much work to do. Changing or redirecting habits and behaviors is a slow process and requires persistence and dedication. Sometimes basic rules about internal procedures need to be rethought and implemented, leading to success. That is why redesigning workspaces plays a key role in organizations, because when aligned with the principles of the organization, it would allow a good functional performance through the achievement of comfort and well-being. Restructuring the organization, bearing in mind this alignment, is simpler and more efficient. To realize the best way to intervene, examples of research conclusions are presented next.

There are different space elements that affect sensory perception (Manav, 2013). Research has focused on aspects such as size, texture, light and objects' position considering the viewer (Sanoff, 1991). Three different categories of spatial attributes are also considered (Yildirim et al., 2007): environment (temperature, noise, music, light, odor), design (architecture, color, materials, patterns, textures, layout) and social factors (customers and employees).

Given the current prevalence in open space floor plans, studies have been developed to analyze the dynamics of specific tasks, layouts, distances and work areas (Hua, Loftness, Heerwagen, & Powell, 2011). For example, if a task is perceived to be of low demand, people tend to seek external stimuli to work, instead of focusing on the task. Solutions in open space

can promote socialization among collaborators (Becker, 2002), but on the other hand can produce stress and fatigue, depending on the type of organization and considering that their performance is being constantly evaluated (Castanheira & Chambel, 2010). A study of Spaceworks Design Group (2015) found that job satisfaction increases when employees have their own desk, optimal temperature in the room, and natural light.

For example, the concept of *interstitial spaces* was developed given its importance for the creation of positive stimuli among employees (Furnari, 2014). This type of spaces exists for sharing experiences among different departments. Employees interact informally with each other in a limited timeline and share common interests such as hobbies and workshops. Therefore, the space is viewed as a means of productive interaction between individuals and can be used as a tool to achieve specific objectives.

In some cases, specific activities involve a reduced workplace area, with a small desk. People need to stay in the same place during the day, continuously, such as call centers. These kinds of conditions create stress and burnout situations. Typically, call-center employees describe their work as «dull, monotonous, demanding and stressful». Research on workspace can contribute significantly to produce valid indications for more positive results. Thus, well-being could be enhanced as well as productivity. Colors, scenic views or plants, can positively influence work satisfaction (Stone, 2003). Other spatial attributes, such as density, should be also considered. Highly dense work areas will trigger higher levels of perceived crowding, transfer intentions, tardiness and dissatisfaction (Amabile, Barsade, Mueller, & Staw, 2005; May, Oldham, & Rathert, 2005). Likewise, high levels of workload will generate high levels of perceived agglomeration and dissatisfaction.

The spatial attributes can be perceived differently depending on the quality of the existing light. Considering light as an independent variable, investigation showed that there is a direct relationship between light and mood states. Mood states are more negative when lighting is too dark and more positive when lighting is considered ideal (Küller et al., 2006). When the lighting becomes too bright, mood states tend to be more negative again.

In a context of marketing and consumer behavior, the study of space has been widely developed. The influence of the spatial environment on customers and employee's behavior has been studied by researching the following queries: how does space influence a purchase (Bellizzi, Crowley, & Hasty, 1983)? How long do customers stay in a store (Spence, Puccinelli, Grewal, & Roggeveen, 2014)? What is the relation between price fairness and perceived affect, arousal, and perceptual qualities of the space (Babin et al., 2003)? In organizational behavior, the study of space characteristics has measured the impact of factors

such as creativity (Korte, Kuijt, & Kleij, 2011) innovation (Dul & Ceylan, 2014), performance (Oztürk, Yilmazer, & Sibel Ertez, 2012) and mood (Kurt & Osueke, 2014). Space as a stimulus for creativity, could have direct consequences on the development of innovative products (Dul & Ceylan, 2014). Research has shown that physical elements such as plants, flowers, the disposition of windows, the type of existing lighting, could be determinant for employees' behavior and work quality (Amabile et al., 2005). This could also stimulate mood and, consequently, a higher number of original ideas in organizations.

The considering of the described interactions involved in the most diverse spaces people normally inhabit can lead to innovative practices and wellbeing. In this context, space is a stimulus for positive and productive interaction between individuals. Spatial attributes should be used as a tool for specific objectives in organizations.

1.3. Color in organizational behavior.

Color, as one of the key elements of the workspace, exerts a considerable effect on organizational behavior. Tradition, culture and symbolic value in the choice of colors in the work place, assume a great influence. The preference for the predominance of white color ends up happening in most workspaces, as it is recognized as an appropriate color for these environments. This choice reveals the lack of knowledge from organizations in this specific area, since they ignore the direct influence of careful (or careless) color selection on the behavior of space users.

With the aim of synthesizing the past research on color in organizational behavior, as well as the used methodologies, we reviewed the major research works in these topics (Table 1). In this synthesis, three types of elements were considered: (i) performance or accomplishment at work; (ii) physical space; and (iii) personal considerations. Firstly, is mainly related to productivity, mood, tasks, performance, job satisfaction, motivation, creativity, product innovation and management environment. All of them are mostly related to internal factors in the organization, such as management processes or organizational methodologies, and the results are more dependent from each other than from personal characteristics. Secondly, the importance of spatial conditions: the quality of work environment itself determines the company's evolution in terms of creativity or product innovation (Dul & Ceylan, 2014). Factors such as color, daylight, furniture, smell, sound, windows view, were considered. Thirdly, personal considerations could interfere with specific evaluation. Different aspects like individual preferences, emotions or culture influences, might cause specific perceptions about products and spaces (Chebat & Morrin, 2007; Kurt &

Osueke, 2014) leading to conclusions that show the impact of these kind of qualities in this specific research area. As opposed to the first type of elements, personal considerations are related to factors external to organization. It depends only on individual characteristics as if they were prints produced by personal history. Thus, it doesn't have to do with management procedures, personal organizational relations or workplace environment.

Although neutral color environments (white and gray) are preferred primarily for workspaces, employees performed poorly compared to those where multiple colors are applied. It was concluded that there is a considerable difference between perceived performance (by the self) and real performance. In neutral color spaces, performance and satisfaction tend to be perceived as superior, but research showed that this perception does not correspond to reality, after performing the tasks (Kwallek, Lewis, Lin-Hsiao, & Woodson, 1996).

Several colors have been tested. For example, before conducting an experimental study concerning green color, the initial perception was that the space would produce tranquility and comfort. However, after careful data analysis, it was concluded that the continued permanence in green colored environments, generally generated mental confusion (Kwallek & Lewis, 1990).

Experimental research has also demonstrated that anxiety, stress and distraction are enhanced when work tasks are performed in spaces where red color is predominant. However, performance levels for tasks that require minutia and detail are higher in these environments when compared to the same spaces, in blue or in green. Also, emotional states of negative valence, such as depression, are developed when tasks are performed in environments where blue color is predominant (Kwallek, Lewis, & Robbins, 1988).

Nonetheless, the way color influences behavior is not linear, as it is directly related to the individual sensitivity to environments. People who are introverts or negative tend to be more affected than others, leading to their performance being notoriously affected (Kwallek et al., 2007). Moreover, the type of activity that is related to the space itself should be in line with the characteristics of that space (light, colors, decoration, furniture) (Korte et al., 2011).

For evaluating the needs of various subsystems in interaction (Morgan, 2006) it would be useful an organizational diagnosis, where variables such as mood and performance were measured. A spatial intervention, where color works as one of the most impressive tools, would allow a gradual transformation to a new organizational culture. Space attributes influence organizational behavior. Hence it is essential to intervene at this level, so that

objectives set out in the organization are met. Obviously, this is a process that involves change.

According to the logic of chaos and complexity, and to analyze the behavior of individuals in organizations, it would be interesting to see how there is an appropriation of the workspace, and what influence occurred in performance of daily tasks, and mood. The concept of “space crafting” could be developed from this analysis, being a working tool to use in the organization, so that everyone could have an active and integrative role in it. The patterns found could be identified and manipulated with the main aim of balancing the entire structure (social, emotional, physical). Small changes can have important effects and great transformation. This effort must start with the identification of specific facts to work on.

The organizational environment is naturally generated by the actions of individuals who are part of it. Now, in a reality where information comes to us from a chaotic and disproportionate manner, and where time management is an increasingly complex and difficult process, investing in creativity (or creative actions) should be a priority for organizations. Creative processes, minds, relationships, even a new way of seeing and living spaces.

The organizational structure would benefit from vitality (create is to give life, generate), which often does not exist, or has been lost in time. In organizations – which are dynamic systems, more importantly than open or closed systems – it is crucial to host creative methodologies. The manipulation of the workspace (individual or together) to create well-being and, consequently, increase work performance should be a policy to establish. This would represent a change in the social environment, affecting work identity and consequently, performance. Just as a proactive personality has a determinant role in work engagement and job performance (Bakker, Tims, & Derks, 2012), the work place environment could also be a transformable and active tool highly impacting the organizational structure.

Considering organizations as species, and knowing that all species look for a warm and balanced environment (even though there are numerous symbolic meanings to *warm* and *balanced*), why not implement a methodology that enables all organizational structures go against this ideal? Why not – through the satisfaction of individual needs – meeting the collective and, at the same time, creating the most robust and healthy organizational culture? Maybe it would be a “flapping of butterfly wings” which, over time, would produce the long-sought vitality.

Table 1

Descriptive summary review of major organizational behavior research related to space and color.

| Authors (Year). Title. Journal. | Independent variables | Dependent variables | Methodology | Major findings |
|---|-------------------------------|---|---|--|
| 1. Kwallek et al. (1988). Effects of office interior colors on workers' mood and productivity. <i>Perceptual and Motor Skills</i> . | Hue (blue vs. red). | Typing task and mood. | N=36 (\$15 paid). Task of typing business forms for 20 min. Eight State Questionnaire was used to assess anxiety, stress, depression, regression, fatigue, guilt, extroversion, and arousal. The four walls were painted. | The subjects who moved to the different-colored office made more errors than those subjects who remained in the same-colored office. Anxiety and stress scores were higher for those who remained in the red office. Depression scores were higher for those who remained in the blue office. Arousal scores were higher for those who switched to the different-colored office. |
| 2. Kwallek & Lewis (1990). Effects of environmental color on males and females: A red or white or green office. <i>Applied Ergonomics</i> . | Hue (red, green, white). | Productivity and mood in males and females. | N=222. Mean age=18.6. POMS (The Profile of Mood States) was used for mood. The 4 walls were painted. Furniture with neutral colors in each office. The POMS test was completed outside the office (color white). 45min were spent inside each office. | Preference for the white office, but more errors were made in the white environment. Subjects who worked in the red office rated it as distracting, but made the smallest number of errors. Less confusion-bewilderment reported by subjects in the red office than by the subjects who worked in the green office. |
| 3. Ainsworth et al. (1993). Effects of three colors in an office interior on mood and performance. <i>Perceptual and Motor Skills</i> . | Hue (red, blue-green, white). | Performance and mood. | N=45. Experiment for 1 hour. Pre-test and post-test. Performance was measured with the word type errors task. Eight State Questionnaire of Curran and Cattell was used (for anxiety, depression, and arousal). Three groups for three offices. | There were no significant differences between the three groups on mood and performance. Probably the effect was too small (only 15 subjects per group) or longer participation is required. |

| Authors (Year). Title. Journal. | Independent variables | Dependent variables | Methodology | Major findings |
|--|---|---|---|--|
| 4. Kwallek (1996). Office wall color: An assessment of spaciousness and preference. <i>Perceptual and Motor Skills.</i> | Hue (red, green and white). | Preferences and environmental characteristics (spaciousness). | N=124. Experiment in three offices: subjects were instructed to observe the environment; after that, they would go to a neutral area and then entered to another office. Questionnaires about perception and color preferences, outside the offices. | The white office was favored in terms of several environmental characteristics (spacious and pleasant) and also preferred over many other colors as an appropriate office color. Red office was rated as the most unpleasant. Exposure time may have influenced overall perceptions, since this experiment only assessed first impressions. |
| 5. Kwallek et al. (1996). Effects of nine monochromatic office interior colors on clerical tasks and worker mood. <i>Color Research and Application.</i> | Nine office colors (white, gray, beige, green, blue, purple, red, orange, yellow), two saturation levels (high or low), two value levels (dark or light), warmth or coolness of the colors, and gender. | Clerical task performance (proofreading), mood (six states) and color preference. | N=675 (students received credits for participation). Mean age=18,89. POMS questionnaire was used for mood. MCT (Minnesota Clerical Test) was used for performance. A third questionnaire was used for color preferences in each office. The 4 walls were painted. 45min spent in each office. | More proofreading errors in the white office. Saturation seemed to be a predictor of differences between females and males. With highly saturated colors men experienced more dysphoric feelings (depression, anger, confusion) than women. No relationship between mood and specific hues was found. |
| 6. Stone (2001). Designing effective study environments. <i>Journal of Environmental Psychology.</i> | Study setting (private or open-plan), environmental color (blue, red, or white), and study material (reading or math comprehension). | Mood, satisfaction, motivation, and performance. | N=144. Median age=19. Color was manipulated in a colored panel, in one of the walls, facing the desk. The MAACL state form was used to assess mood. Students received credit which could be applied to one of their psychology courses. | Negative mood was slightly greater for students given the reading task. Positive mood was slightly higher when students studied in a blue carrel, compared to a red carrel in the open-plan setting. Satisfaction with performance and motivation were not affected. Performance was significantly lower in the reading task in the red environment. |

| Authors (Year). Title. Journal. | Independent variables | Dependent variables | Methodology | Major findings |
|---|---|--|---|---|
| 7. Stone (2003). Environmental view and color for a simulated telemarketing task. <i>Journal of Environmental Psychology</i> . | Task type (low or high), environmental color (red or blue) and environmental view (scenic or no scenic picture). | Mood, satisfaction, motivation, and performance. | Two experiments. N=128. Median age=19. Audiotapes with the demanded tasks were created. The MAACL state form (Multiple Affect Adjective Check List) was used to assess mood. Questionnaires. Students received credit for their psychology courses. | Mood and performance satisfaction tended to be affected by the environmental design. Motivation was not affected by any manipulations. Performance appears to be affected by environmental color or view. |
| 8. Kaya & Epps (2004). Relationship between color and emotion: a study of college students. <i>College Student Journal</i> . | Hue: five principles (i.e., red, yellow, green, blue, purple); five intermediate (i.e., yellow-red, green-yellow, blue-green, purple-blue, and red-purple), and three achromatic colors (white, gray, and black). | Relation between color and emotion. | N=98. Mean age=21. Color stimuli referenced from the Munsell Color System. Color samples used on computer, by Freehand 10.0 software. Experiment tested students individually, for about ten minutes. The responses were recorded on an observation sheet. All colors were presented on a neutral background. | The highest number of positive emotional responses was from the five principle hues. The color 'green' mainly associated with positive emotions (relaxation, comfort) because of nature. The color 'green-yellow' had the lowest number of positive responses (associated with disgust, sickness, vomit). Color 'white' had the largest number of positive responses. |
| 9. Kwallek et al. (2005). Effect of color schemes and environmental sensitivity on job satisfaction and perceived performance. <i>Perceptual and Motor Skills</i> . | Hue: white, blue-green and red. | Job satisfaction and performance. | Specific tasks; worked regular hours for 4 consecutive days in the same office. Three groups of participants (n=90). Offices with different color schemes but identically furnished. \$200 were paid upon completion of the experiment. | Those in the white and blue-green offices reported higher perceived job performance and satisfaction, than those in the red office. However, research suggests that workers' perceived performance and job satisfaction do not necessarily correspond to their actual productivity and task performance. |

| Authors (Year). Title. Journal. | Independent variables | Dependent variables | Methodology | Major findings |
|--|--|---------------------------------|--|--|
| 10. Küller et al. (2006). The impact of light and colour in psychological mood: a cross-cultural study of indoor work environments. <i>Ergonomics</i> . | Light and color. | Psychological mood. | Real work environments, at different seasons, in four countries (n=988). Questionnaires, with most of the scales pre-tested in a pilot study. 12 scales for mood. Lighting conditions in a 4 graded scale. Color measured in 3 grades (no color, neutral and some color). | The mood was more negative when light was too dark, and more positive when the lighting was experienced as just right. When it became too bright the mood declined again. Good color design might contribute to a more positive mood. |
| 11. Yildirim et al. (2007). Effects of indoor color on mood and cognitive performance. <i>Building & Environment</i> . | Indoor color (yellow vs. violet). Gender and age. | Mood and cognitive performance. | Two-stage work (n=250 each) was carried out in a café/restaurant. Furniture and decorations remained the same. Bipolar scales (items from positive to negative). Questionnaires. | Violet interiors were more positively perceived when compared to yellow. Space evaluation from males was more positive than females. Younger customers were more positive towards the perception of atmospheric attributes. |
| 12. Kwallek et al. (2007). Work week productivity, visual complexity and individual environmental sensitivity in three offices of different color interiors. <i>Color Research and Application</i> . | Hues (white, predominantly red, predominantly blue-green). | Productivity. | N=90 (\$200 paid). Mean age=33,2. Office tasks were performed for 4 consecutive days. 1 self-report questionnaire and other 4 questionnaires (QMSSA, ICBT, EPI, JASAS). The 4 walls were painted. Rooms identically furnished. | The influence of interior colors on productivity was dependent on individuals' stimulus screening ability and time of exposure to interior colors. Colors as an environmental stimulus, had an effect on performance based on individual environmental sensitivity. Future research should assess other skills such as creativity and problem solving. |

| Authors (Year). Title. Journal. | Independent variables | Dependent variables | Methodology | Major findings |
|---|--|--|--|---|
| 13. Chebat & Morrin (2007). Colors and cultures: Exploring the effects of mall décor on consumer perceptions. <i>Journal of Business Research</i> . | Hue (warm vs. cold colors). | Shopper perceptions: product quality, mood, environmental quality. | Pretest (n=160); questionnaire and interviews, using photos. Experiment (n=587); color manipulation using plants and flowers. | Cultures (French-Canadians vs. Anglo-Canadians) had opposite product quality perceptions, when influenced by different colors in malls décor. Perceptual enhancements were mediated largely by cognitive rather than affective mechanisms. |
| 14. Küller et al. (2009). Colour, arousal and performance: A comparison of three experiments. <i>Color Research and Application</i> . | Hue (red vs. blue). Colorful vs. neutral (gray). | Arousal, performance, mood. Measured by EEG (electroencephalogram) and EKG (electrocardiogram). | Experiment 1 (n=12): colorful and gray rooms were compared. Experiments 2 (n=25) and 3 (n=20): red and blue rooms were compared. Different tasks were performed in each room (3h). 16 seven-grade scales to report mood. 36 seven-grade scales to report the perceived quality of the rooms. Physiological and psychological assessments. | Color affected many different levels (the perception of the room, physiology and emotions). Strong colors, especially red, and patterns, caused excitement. Sometimes this effect turned the reverse, after a while. Introvert or negative persons were more affected than others, causing low performance. |
| 15. Korte et al. (2011). Effects of meeting room interior design on team performance in a creativity task. <i>Ergonomics and Health Aspects</i> . | Spatial characteristics of meeting rooms: neutral, with high arousal and with high psychological safety. | Team performance and creativity (mediated by mood). | N=30. Performance of two creativity tasks in three different rooms. Questionnaires. Participants were paid (45€), and the best performing group will earn €90. No one knew each other before. Design of spaces design based on a pilot study (n=60). | Physical space affected arousal and the impression of the meeting rooms. An interaction effect between meeting room interior and task was found. It may be concluded that the meeting room interior has to be adapted to the type of creativity task to gain optimal results. |

| Authors (Year). Title. Journal. | Independent variables | Dependent variables | Methodology | Major findings |
|---|---|---|---|---|
| 16. Oztürk et al. (2012). The effects of achromatic and chromatic color schemes on participants' task performance in and appraisals of an office environment. <i>Color Research and Application</i> . | Chroma (chromatic – yellow/red – and achromatic – grey). | Performance and environmental appraisal. | N=60. Colors were applied in a plywood sliding panel. Tasks performances tests (for performance) and questionnaires (for environment appraisal). | Chroma significantly affected performance and space appraisal. Accuracy and performance scores were better in the room with the chromatic scheme. The achromatic scheme was thought to be more formal and harmonious, whereas the other was found to be more attractive, pleasant, satisfying and dynamic |
| 17. Dul & Ceylan (2014). The impact of a creativity-supporting work environment on a firm's product innovation performance. <i>Journal of Product Innovation Management</i> . | Physical work environment (e.g., furniture, daylight, colors, windows, sound, smell) and management environment (e.g., teamwork, job autonomy, coaching supervisor, challenging job). | Creativity-supporting work environment and product innovation performance (through NP new product productivity and NP success). | 207 firms were invited. 103 firms participated. Various industrial sectors. It was used a framework consisting in a 9 social-organizational and 12 physical work environment characteristics. Questionnaires. Financial reports analysis. | Firms with creativity-supporting work environments have: more new products (NP) in the market, and more NP success in terms of NP sales. NP productivity partly mediates the relationship between creativity-supporting work environment and NP success. |
| 18. Kurt & Osueke (2014). The effects of color on the moods of college students. <i>SAGE Open</i> . | Evaluation of an existing environment (interiors and exteriors): students' union complex on the university camps. | Psychological effects of colors in interior spaces: mood. | N=490. Survey and questionnaires. Direct observations and assessments. | Students said that exterior colors were well combined. In general, students were satisfied with the color schema, whether interior or exterior (sense of belonging to the space). There is no need to use more different colors in the complex. |

1.4. Color in consumer behavior.

The visual aspect is one of the most influencing cues for consumers. Particularly, packaging establishes an important connection between the product and the consumer – it takes part in the selling mechanism by communicating products' qualities (Giovannett, 1995).

Considering the influence of chromatic stimulus on brand recognition and identity, color has been registered as a trademark. The symbolic meaning attributed to color leads to an inseparable connection between brands and consumers' mind (Hoek & Gendall, 2010). There is a relationship between color and brand personality, since visual perception inevitably entails individual emotional associations (Heller, 2012). Thus, when an individual looks at a colored package, emotional associations are activated, which in turn will cognitively affect the meaning of that color. This meaning – which will always be individual – depends on each person's life story, culture, personality, and past experiences. It also depends on the context. It will be cognitively different to look at a blue package knowing from the outset that it is a dishwashing detergent and look at a blue package knowing that it is a juice. Even considering all these individuals, several studies have been carried out that explore the emotional and symbolic associations of colors. However, it is plausible to consider that the results obtained are valid for a clear majority of people. For example, the colors yellow, pink and white are associated with sincerity; red and orange are associated with excitement; the blue color is associated with competence; purple, pink and black are associated with sophistication; brown is associated with robustness (Labrecque & Milne, 2012).

Transferring the symbolic universe of color for brands, there is a greater match with the consumer. When colors are associated with a specific brand, personality dimensions for that brand are subsequently reflected (e.g., sophistication is connotated with black), which are also emotionally recognized by the consumer. This combination leads to empathy and familiarity with the brand. The color also indicates the positioning of the product. Products which are targeted to the upper classes communicate elegance and aesthetics. Therefore, they might use cooler and darker colors in the packages (e.g., black is very used for this purpose). In contrast, less differentiated products may use brighter colors in their packaging (e.g., white is widely used; the designation *white label product* for private labels has appeared as a white label symbol (i.e., blank tags that could be renamed at any time) (Ampuero & Vila, 2006).

Brands can adopt strategies that involve the choice of certain colors, considering their main competitors, and the market positioning that they intend to achieve (Ampuero & Vila, 2006). This is the case of the Pepsi Cola brand that added blue to its original red color, to differentiate itself from their competing brand, Coca-Cola. McDonald's changed the red and

yellow color combination (speed, efficiency, excitement) to start applying green (healthy lifestyle, calmness and nature), to disconnect from the fast food concept (Aslam, 2006). These are only some examples demonstrating that the knowledge about the influence of color is quite pertinent to apply, in trade settings.

2. Research objectives: Three studies about color

After the exploratory analysis concerning the interaction between management and color, as aforementioned, we firstly considered starting a field experiment in a call-center environment. The objective was to measure the influence of color on specific attributes of the organizational behavior. We quickly concluded that the experience would be very time-consuming given the time limit we had and because of all the bureaucratic processes involved. Following the literature review, we developed specific questions of scientific interest related to the influence of color on organizational and consumer behavior. The experiments were outlined according to the fields we were expecting to work on. Figure 2 shows the research timeline.

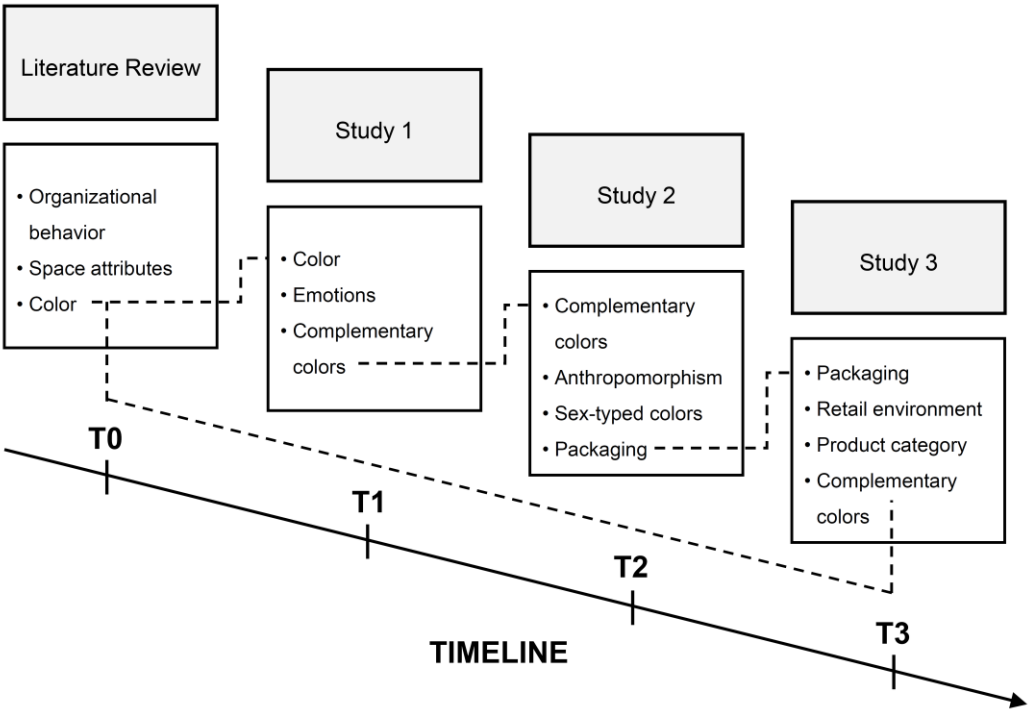


Figure 2
 Research timeline. Dotted lines represent the links between study research questions.

The first study included in this thesis (Chapter I) arises subsequently to this premeditated organizational approach through field experiment, which was not carried out. Bearing in mind that there is always a psychological process inherent to color choices (Kurt & Osueke, 2014), we firstly investigated the connection between color and mood states (Chapter I). The objective of this first study was to analyze the relationship between complementary colors and mood states, considering the hypothesis that states of emotional balance would be associated to the choice of complementary colors. Mood is related to emotions. Several studies have assessed the influence that factors such as the physical and psychological environment may have to generate a more positive or negative mood (Campillo, Ricarte, Ros, Nieto, & Latorre, 2016; Korte et al., 2011; Yalch & Spangenberg, 1990). As we have mentioned above, the choice of colors is mainly dependent from psychological and cultural aspects, physiology, personal history and context. Also, color research frequently addresses the influence of specific hues (i.e., colors) in human behavior, but relations between colors are scarcely addressed (Labrecque et al., 2013). By understanding the relation between complementary colors and the emotional factors inherent to the choice of those specific colors, it would be possible to apply that knowledge in consumer behavior. Thus, diverse areas such as retail environment, packaging, or online shopping, would certainly benefit from it. In fact, in our first experimental study, we concluded that the choice of complementary colors relies on psychological mechanisms.

Secondly, we chose to focus our research work on the influence of complementary colors in a marketing context (Chapter II). Packaging is one of the most powerful instruments to connect the brand with consumers (Mininni, 2016). In marketing, brand image has a strong connection with how the product is presented. In the second study, and to deepen the understanding of the complementary colors effect, we investigated how colors influence anthropomorphic packages, in terms of attractiveness and purchase intention. In this case, the product category and the package itself played a determinant role in the considered context. The complementarity was assumed between the color of the package design and the color of the product, which was visible from the transparency of the package. We concluded that there was a contrasting effect between the colors of pasta and the package color, which led to an increasing of attractiveness.

Thirdly, we proceeded with another study to analyze the influence of the dominant color of the retail environment in consumer behavior (Chapter III). Here, we intended to explore if complementary colors between retail environment and products also affected product attractiveness, as we concluded in our previous study. By manipulating the color of

two different types of products and two retail scenarios, we investigated how color perception might influence consumer attitudes. Specifically, we analyzed the effect of color perception in product attractiveness and purchase intention. We also tested the previously suggested complementary colors effect in retail environment, and its relationship with product type.

In summary, the new insights obtained from the three studies mentioned can be applicable to management. The knowledge of the emotional processes associated to complementary colors, allows further research in other contexts. Whether it is the color effect in organizational behavior, or the relation between packaging context and product color, or the relation between retail environment and product category, we found that there is indeed a significant outcome that clarifies the effect of complementary colors in diverse managerial fields.

CHAPTER I

Note: This paper has been submitted to a peer review journal and is awaiting reviewers' comments and decision. An earlier version of this paper was presented as a poster at the *15th TIBER Symposium on Psychology and Economics*, Tilburg University, Tilburg, The Netherlands, August 26th, 2016.

Feeling blue? Just add orange: Complementary colors and balanced mood states

1. Abstract

Color is gradually gaining standing in behavioral research. Although experimental studies have seldom addressed the impact of specific color combinations, physiological literature on visual perception has shown that complementary colors lead to a balanced sensation due to a perceptual hue cancellation phenomenon. As research on the association of complementary colors and emotions is still scarce, here we aim to analyze the relation between complementary colors and balanced mood states, and non-complementary colors and unbalanced mood states. Through an experimental within-subject design, participants were instructed to choose colored cards after the induction of an emotional state. We applied combined colored cards using six colors (three primary and three secondary) in which all 21 combinations were assured: (i) isolated colors; (ii) analogous colors; and (iii) complementary colors. Four emotion conditions were evoked by means of autobiographical recall (i.e., happiness, sadness, balanced mood, unbalanced mood). Findings from 39 participants show that complementary colors were preferred in the unbalanced mood scenario. We suggest that the color choice might rely on feed-forward top-down mechanisms aiming at regaining a balanced state – which might not be indispensable in situations where a balanced state has already been attained.

Keywords: *Color; complementary colors; mood states; decision-making; psychology.*

2. Introduction

Color has become an increasingly important variable in behavioral research, marketing, organizational behavior, and psychology (Elliot & Maier, 2014; Kwallek, Woodson, Lewis, & Sales, 1997; Labrecque et al., 2013). Yet, color remains a unique and

complex research topic, as compared to other visual attributes, given its richness and symbolic meaning (Whitfield & Whelton, 2013). Several authors (e.g., Elliot & Maier, 2014) pointed out the intricacy in color research, due to the complexity of factors that may be considered in experiments (e.g., light, individual preferences, culture, space and color attributes).

Previous behavioral studies on color have mainly focused on consumer and organizational attributes, exploring the influence of hues, saturation and brightness (or value) on goal-directed behavior (see, for a review, Labrecque et al., 2013). According to Mahnke (1996) and Mikellides (1990), the hue is the color itself (e.g., yellow, green, blue), saturation is the intensity of a pigment in a particular hue or color (e.g., red orange, yellowish green), and the brightness refers to its lightness or darkness (e.g., light green, dark blue). Literature concerning the influence of color and space in human behavior found significant differences between warm and cool colors as well as chromatic and achromatic schemes. For instance, blue (a cool color) was found to induce a depressive mood (Kwallek et al., 1988), whereas red (a warm color) induced better performance in accuracy tasks, such as typing words and zip code proofreading (Kwallek et al., 2007).

However, color research remains controversial. Previous research showed that certain colors trigger specific stimuli. For example, red accelerates the heart rate and blood pressure, whereas blue has the opposite effect (Liu, Ji, Chen, & Ye, 2014). Yet, there are other factors that can revert these physical reactions: (i) brightness and hue; (ii) the amount of each color; (iii) the harmonious way in how colors are applied; (iv) the type of surface where color is applied; (v) the effect of color over time; and (vi) the meaning of color itself versus the meaning of colored objects, as both variables could be perceived in different ways (Ghamari & Amor, 2016; Mahnke et al., 2007; Mikellides, 1990). Particularly, when comparing hue, saturation and brightness, Valdez and Mehrabian (1994) concluded that only saturation and brightness have a significant effect on emotions.

In a psycho-physiological context, and evaluating the effect that color might have in human behavior, experiments have been conducted providing fundamental clues for future studies. Specifically, extreme color monotony (e.g., when everything is white or grey) leads to understimulation, producing irritability and difficulties in concentrating, causing annoyance over time (Mahnke et al., 2007). Moreover, colored light affects human neurohormonal pathways in the brain, namely melatonin and serotonin pathways, impacting on human health (Radeljak, Zarkovic-Palijan, Kovacevic, & Kovac, 2008). As the activation or inhibition of physiological processes in the human brain seem to afford hormonal regulation, it is possible

that emotional disorders (e.g., depression, post-traumatic stress disorder, seasonal affective disorder) might benefit from the conscientious use of color.

2.1. Complementary colors.

Considering the reviewed literature, there is little research concerning specific relations between colors, namely complementary ones (Pridmore, 2011). Complementary colors are oppositely located in the colour wheel. Depending on the considered color system (e.g., RGB, CMYK, HSL), complementary color classification may slightly change (although there is always a comparative relation between warm and cool colors). In contrast, analogous colors are next to each other (i.e., adjacent) in the color wheel (Itten, 2001) (Figure 3).

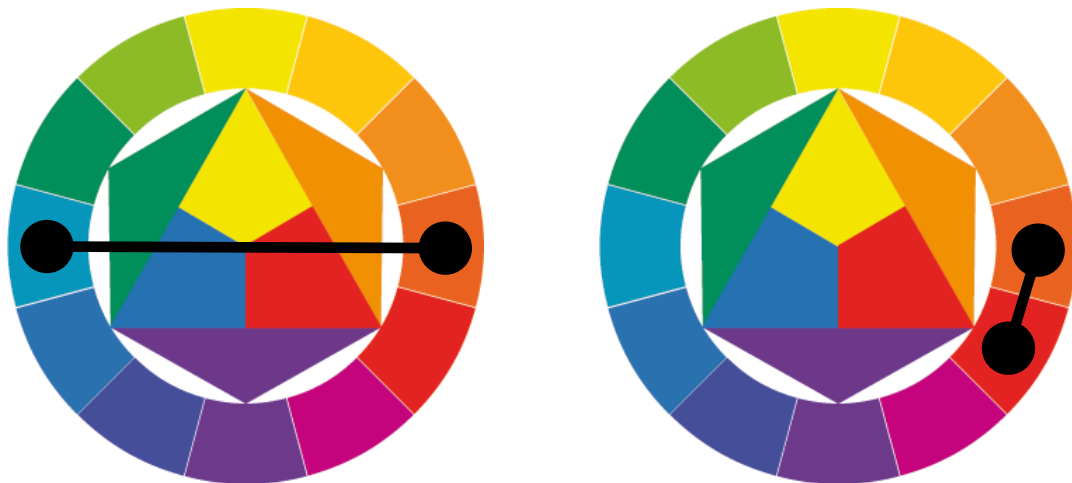


Figure 3

Itten color wheel representing two complementary colors (left: blue and orange) and two analogous colors (right: orange and red) – Adapted from Itten (2001).

Previous physiological literature on color has shown that the perception of complementary colors leads to a sort of balanced sensation due to a hue cancellation phenomenon (Lennie, 2012; Schwartz, & Krantz, 2016). Moreover, Mahnke (1996) posited that complementary colors, when used together, produce a high contrast and visibility (e.g., an orange life raft against blue water, or red blood against green surgeons' scrubs). However, experimental studies have seldom addressed the impact of such specific color combination (i.e., complementary colors) on psychological variables. Specifically, the reviewed literature does not explore harmony through complementary colors and its effects in human behavior or affect.

The perception of color is determined by the activity of opponent mechanisms, which could be considered as the combination of three three-dimensional axes: red-green axis, blue-yellow axis, black-white axis. Similarly, color contrast could be enhanced by the existence of double-opponent color cells. This means that red color is redder if preceded by green, and vice-versa. Moreover, these sequences of opposite color stimulus show stronger responses than others that are not opposite to each other (Conway, 2002, 2009).

Considering the additive color theory of light (i.e., the synthesis of color wavelengths), some colors are perceptually mixed together when existing in the same pixel of visual space (e.g., the mix between blue and green light stimulus generates a cyan color), complementary colors never perceptually mix, as red and green do not ever become a reddish-green color (Longstaff, 2011). This is a physical phenomenon and is called perceptual hue cancellation, also related to the concept of successive contrast (or afterimage). Physically, it is called afterimage due to the occurrence of visual fatigue leading the eye to start generating the complementary hue that it is seeing. This is the reason why surgeons wear green or blue-green surgical gowns, so they are not disturbed by afterimages while working at the operating room when seeing red blood (Mahnke, 1996). Hence, when used together, the visual stimulus produced by complementary colors seems to originate a neutral effect (physical effect), leading to a harmonious and balanced colour perception (Mahnke et al., 2007). These physiological findings about visual color stimulus and complementary colors, led us to the following research question:

RQ: Is the harmonious perceptual sensation afforded by complementary colors also manifested in terms of affects?

Previous research on complementary colors has mainly focused on the physical approach, instead of exploring the behavioral influence of such color combination (Pridmore, 2011). Moreover, most of the studies on the influence of color have explored the difference among warm and cool colors (Babin et al., 2003). Depending on the considered warm and cool colors, it would be possible to analyze the conclusions concerning complementary colors, as research focused on warm and cool colors often relates to colors oppositely located in the color wheel. Even though most of the studies analyze isolated colors (and not pairs of colors), their conclusions are relevant to determine associations concerning the behavioral effect of colors. Accordingly, prior studies investigating interior spaces (Bellizzi et al., 1983; Crowley, 1993; Kwallek et al., 2007) identified the relevance of complementary colors in

different contexts. For instance, blue shopping interiors were more likeable than orange ones, and the purchase intention was also higher in the blue condition, as opposed to orange interiors (Babin et al., 2003). But again, this study entailed a comparison between the two complementary colors (blue and orange) individually – and not applying them together in the same space. Similarly, Bellizzi et al. (1983) found that, considering blue and green in contrast with yellow and red, and regardless of color preference, subjects were physically drawn to warm colors (i.e., sat closer to red and yellow walls), although they had considered cool colors as more attractive and pleasant. A study on social media (Pinterest) using colored images found that red, purple and pink had a higher effect on diffusion (i.e., number of repins), when compared with blue, green, yellow-green, and yellow images (Bakhshi & Gilbert, 2015).

2.2. The emotional effect of colors.

Beyond the effect of color on physiological variables, the emotional association to colors is definitely relevant (Lee & Andrade, 2010; Terwogt & Hoeksma, 1995; Trudel, Murray, Kim, & Chen, 2015). Although mood is related to emotions, it differs from them as well as from affects and feelings, as they are less intense and specific, usually being generated by a stimulus (Aranguren, 2013; Isen, 1993; Russel, 1980). Several studies have assessed the influence produced by color on emotions (Dael, Perseguers, Marchand, Antonietti, & Mohr, 2016; Valdez & Mehrabian, 1994) and mood (Hyodo, 2011; Yildirim, Hidayetoglu, & Capanoglu, 2011). When light passes through the eyes, the vibrations of wavelengths are transformed into electrical impulses transmitting information to the brain, and consequently to the endocrine glands, producing hormones (Kurt & Osueke, 2014). Each color has a specific effect on the human body, originating a psychological response due the physical stimulus. Psychological reaction to color could be determined by memories, culture and personal history (Aves & Aves, 1994), being a means of communication for subjective experiences, such as emotions (Dael et al., 2016). For example, red is associated with the subjective experience of anger, as it leads to the physiological increase of blood circulation (Drummond & Quah, 2001), and grey has a more negative connotation, such as grey weather (Allan, 2009).

When it comes to physical environments, Kurt and Osueke (2014) stated that red was found to reflect a positive mood, strength, warmth, and energy, whereas green had a relaxing and refreshment effect. Environmental characteristics could influence perception and satisfaction leading to human comfort, such as lightness (Oberfeld, Hecht, & Gamer, 2010),

color, odor and size of indoor plants (Qin, Sun, Zhou, Leng, & Lian, 2014). Consider, for example, the findings concerning the use of the colour pink in prison cells (Schauss, 1979) – the inmates placed in pink cells became less aggressive than others.

Mood can cause energy changes (physical) or sense of order and disorder, which then might affect the perception of a space or even the performance of a task (Jalil, Yunus, & Said, 2012). As a direct relationship with the world of emotions, mood is also related to the results of one's personal experience and state of mind, and could be experienced as negative or positive (Aranguren, 2013). Mood with positive affect tends to be linked to memory interconnections, and facilitate the activation of ideas, leading to creativity and self-confidence. Positive emotions are linked to verbal fluency, whereas negative emotions are associated to a good graphic fluency (Bartolic, Basso, Schefft, Glauser, & Titanic-Schefft, 1999), and can be used to promote critical and analytical thinking (Ambady & Gray, 2002; De Dreu, Baas, & Nijstad, 2008; Kaufman & Vosburg, 1997). To our knowledge, literature concerning the links between color and balanced mood is very scarce. An early study on the association between colors and mood has shown that a «calm, peaceful and serene» mood (Wexner 1954, p. 432) is more frequently associated to the colors blue and green than to yellow, purple, orange, brown, black or red. Despite investigating the mood *serenity* that we might associate to *balance*, only individual colors were used. We did not find any further evidence in the literature for the association between aggregated colors and balanced or unbalanced mood states.

Crucially, the mentioned studies show some distinct behavioral effects produced by colors oppositely located in the colour wheel. Also, the fact that there is a physiological circumstance (i.e., visual and sensorial) in the balanced eye perception when looking at complementary colors, led us to build a research focused on the combination of these specific relations among colors. Bearing in mind the complexity of the color phenomenon and the importance of continuing to develop research about specific color combinations, as mentioned by Elliot and Maier (2014), here we aim to investigate color combinations and mood states. The reviewed literature indicates that despite the developed experiments on color, and the evidence of visual mechanisms (i.e., hue cancellation phenomenon), there is no solid evidence of the behavioral effect evoked by complementary colors.

Here, we analyze the association between complementary colors (when used together) and mood states, as a variable that might affect behavior. Mahnke et al. (2007) stated that the use of complementary colors may avoid monotony, restlessness, and lack of concentration,

leading to a balanced sensation. We thus predict that in a choice task, complementary colors might be chosen in response to the induction of a balanced mood state.

3. Method

To investigate the association between complementary colors and mood states, we used an experimental within-subject repeated measures design in which participants were requested to choose colored cards (8x16cm), reflecting their mood. The mood evoked was the within factor with four levels: balanced mood (B), unbalanced mood (U), happiness (H) and sadness (S).

3.1. Pretest.

We conducted a pretest to investigate the most suitable shape for the colored cards by means of a short online questionnaire. As our task required the presentation of two combined colors, our online questionnaire was composed of three options for combining orange and blue colors, as an example (option A – a square divided in four equal squares; option B – a square divided in four equal triangles; option C – a rectangle divided in two equal squares). After a short section dedicated to the collection of personal details, the participants were required to answer the question: «How much does the following figure convey harmony, tranquility and balance?». We sought to find the most harmonious representation of shapes, to apply it to the colored cards of the following experiment. Figure 4 indicates the three options that were shown.

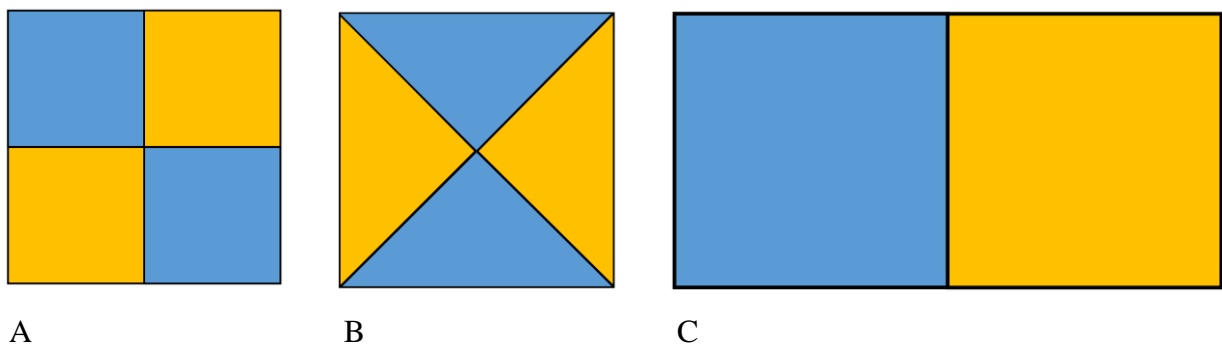


Figure 4

Options A, B and C for the pretest. Respondents had to answer the question: «How much does the following figure convey harmony, tranquility and balance?»

The answers could be rated from 0 to 10, with 0 representing the least harmonious and 10 representing the most harmonious. The presentation order of Figures A, B and C was random. Considering the RGB system, orange was defined as $R = 255, G = 192, B = 0$, and blue was defined as $R = 91, G = 155, B = 213$. The data was collected and analyzed through Qualtrics. Participants were approached via email and invited to answer a questionnaire on color perception. A total of 96 independent respondents participated, aged between 25 and 75 years old (65 females). A repeated measures ANOVA was conducted and revealed significant differences between the three options, ($F(2,190) = 4.20, p < .05$). Option C yielded the highest preference score ($M_C = 4.56; SD = 2.13$), followed by option A ($M_A = 4.35; SD = 2.38$) and, finally, option B yielded the lowest score ($M_B = 3.89; SD = 2.44$). For this reason, we decided to use option C for the subsequent testing.

3.2. Participants.

From 72 eligible participants, 39 people (21 females) were recruited, as they matched the following criteria: (i) showed up for each of the four experimental moments; (ii) passed in the Ishihara's Color Blindness Test (Ishihara, 1972); and (iii) understood the purpose of the study and answered the questions accordingly. Thirty-three participants were excluded – twenty-one did not show up for all experimental moments, five did not correctly understand the purpose of the study, four did not pass the Color Blindness Test, and three revealed not to be engaged with the experiment). Participants were aged between 18 and 45 years old ($M = 27.31, SD = 8.82$). Regarding education, 51.3% of the participants were undergraduates with High School Degrees, 38.5% had Bachelor Degrees and 10.3% had a Master Degree. The procedures were in accordance with the ethical standards of the 2008 Declaration of Helsinki. Prior to participating in the experimental tasks, the participants read and signed an informed consent and received information concerning the experimental hypothesis only after completion of all experimental sessions by all participants. Participants could freely quit the study at any time and they were informed that their answers were confidential. This study was conducted within the guidelines of the American Psychological Association (6th Edition) and approved by the local university ethics committee.

3.3. Measures and procedures.

Participants were tested individually in a testing room with both daylight and artificial light, to homogenize the daylight conditions. These conditions were measured by a lux meter, varying between 320lx and 780lx, depending on the period of the day. The testing room was

small and had neutral colors (furniture, walls, floor and ceiling were white and light grey). The room had few distractors and participants had to complete a questionnaire, at four different time points (i.e., a different day for each condition, one-week interval between conditions). The testing setting is shown in Figure 5.

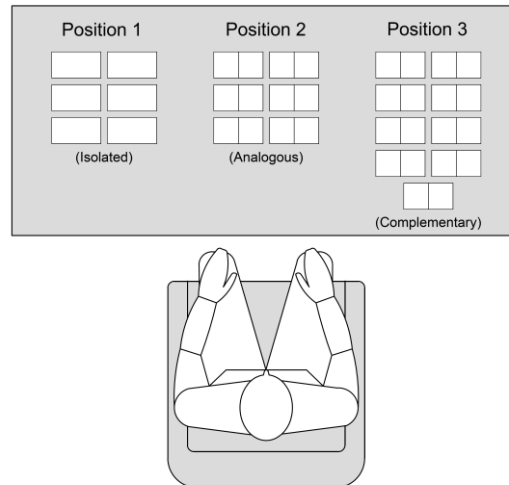


Figure 5

The experimental setting (21 colored cards on the table). The three color-groups (isolated, analogous, complementary) were randomly moved from their positions (1, 2 and 3).

We used a printed questionnaire and 21 colored cards divided into three groups. The *isolated colors* group was composed by primary and secondary colors, individually. The *analogous colors* group included two combined analogous colors (i.e., side by side on the color wheel). The *complementary colors* group was composed of complementary colors and opposite colors in the half colour wheel. These groups will be henceforth named as isolated, analogous, and complementary. Colors were chosen from the Itten colour circle (Itten, 2001) and were defined in RGB system, as follows: blue (R = 47, G = 125, B = 196), yellow (R = 255, G = 233, B = 25), red (R = 235, G = 28, B = 28), orange (R = 253, G = 144, B = 13), green (R = 77, G = 174, B = 15), purple (R = 127, G = 66, B = 161). The colored cards from the three groups described above are represented in Figure 6.

Participants were required to complete the online short version of the Ishihara Color Blindness Test, with eight plates (Ishihara, 1972). The 21 cards were laid out on a white table, divided into the three aforementioned groups, and remained covered with a white paperboard, until the beginning of the experiment. The questionnaire was composed of four sections: (i)

personal details including self-assessment for optimism, happiness and spirituality; (ii) the short form of the State-Trait Anxiety Inventory (STAI) (Marteau & Bekker, 1992; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983); (iii) autobiographical recall through the elaboration of a text (Martinez & Zeelenberg, 2015); and (iv) a measurement of mood state through a Visual Analogue Scale (VAS) (Celine, Herman, Shaw, & Morton, 1992; Monk, 1989) followed by the choice of one colored card. The complete timeline is shown in Figure 7.



Figure 6
The 21 colored cards (8x16cm).

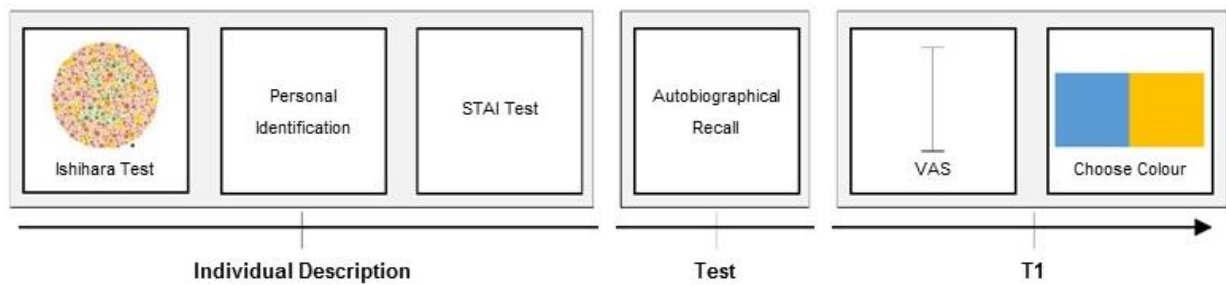


Figure 7

Timeline. The experimental study was divided into three parts: individual description, test using autobiographical recall, and measure of the evoked emotional state followed by the color choice.

Every section, except the first one, was repeated for each condition, in all testing sessions. The presentation order of the colored cards was random. Instructions given to the participants included a detailed explanation of every section. We strengthened the importance of taking time to think about one's feelings, to truly consider one's mood state in the card choice.

The experiment started with the color blindness screening, using the Ishihara Color Blindness test, short version with eight plates (Ishihara, 1972). The test was always presented on the same computer, to assure the same image characteristics. If participants failed more than one answer, they were excluded from the experiment. Next, participants were presented with the short version of STAI – a measure of trait anxiety and a measure of state anxiety, composed of six items and a 4-point Likert-type scale informing about the state of anxiety (1 = Not at all, 2 = Somewhat, 3 = Moderately, 4 = Very much). Higher scores indicate a greater anxiety state, with a minimum score of 6 and a maximum score of 24.

Afterwards, autobiographical recall (Martinez & Zeelenberg, 2015) was used to induce mood states (i.e., happiness, sadness, balanced mood, unbalanced mood). Participants were required to write a short essay (max. one page) related to an episode that happened to them, recalling each of the mood states described above. For each condition, which occurred in different days, a brief explanation about the condition was given. Participants were requested to deeply personify each recalled experience to attain the desired mood state.

Mood states were assessed by a Visual Analogue Scale (VAS), by requesting participants to mark, with a dash, a 10cm vertical line. The top of the line represented the maximum level for the analyzed mood state, and the bottom of the line, represented the minimum level of that same mood state (e.g., for happiness, «very happy» and «not happy at all»). Each subjective answer was consequently converted to a numeric value (0 to 10). Low

scores in the scale show a slighter feeling while high scores indicate stronger feeling. The answer reflected if the mood state induction occurred. A Latin Square was used in order to control interference between the conditions, particularly a 4x4 Latin Square with BUHS (balanced mood, unbalanced mood, happiness, sadness), SBUH, HSBU and UHSB sequences. Participants were randomly assigned to each sequence.

3.4. Statistical analyses.

IBM SPSS Statistics 24.0 was used for conducting the analyses. A One-way ANOVA with repeated measures was computed to assure that the anxiety state, as given by the STAI results, of the participants before emotion induction did not differ between mood conditions. Afterwards, participants were organized into two groups depending on their color choice: (i) those choosing cards from the *isolated* or *analogous* groups (hereafter called *non-complementary*); and (ii) those choosing cards from the *complementary* group. Accordingly, t-tests were performed to test for significant differences in the strength of the mood between the participants who chose non-complementary colors and those who chose complementary ones. Additionally, tables of frequencies were performed to showcase the distribution of color choice frequencies (warm colors, cool colors and mixed colors), for each experimental condition. The following categorization was considered: warm colors for yellow, red and orange; cool colors for blue, purple and green (Itten, 2001); mixed colors for a combination of a warm and a cool color.

4. Results

Descriptive statistics were calculated for each mood condition. Table 2 shows the mean and standard deviation for the VAS induction and STAI scores under each condition.

Table 2

Descriptive statistics for VAS and short form of STAI under each mood condition.

| | Mood condition | | | | | | | |
|-------------------|----------------|-----------|-----------|-----------|-----------|-----------|----------|-----------|
| | Balance | | Unbalance | | Happiness | | Sadness | |
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| VAS ^a | 7.90 | 1.54 | 5.01 | 2.29 | 8.07 | 1.75 | 5.18 | 2.90 |
| STAI ^b | 11.77 | 3.09 | 11.85 | 3.68 | 12.54 | 4.10 | 11.90 | 3.51 |

Note: ^a Visual Analogue Scale (converted subjective score 0-10); ^b Short form of State-Trait Anxiety Inventory (score 6-24)

As mentioned above, a repeated measures ANOVA was computed and no significant differences were found between mood conditions ($F(3,114) = .517, \eta^2_{\text{partial}} = .013, p = .672$). We thus proceeded with confidence that the anxiety levels would not constitute an interfering variable in the selected colors.

4.1. Color choice after emotional recall.

Significant differences were found between mood state induction, as assessed by the VAS scale, revealing an effective emotion induction through autobiographical recall, particularly in balanced and happiness conditions. T-tests were conducted using the color group as the grouping variable with two levels i.e., *non-complementary* group (NC) and *complementary* group (C) and the strength of the mood as the dependent variable. Figure 8 shows VAS means for each condition and associated standard errors.

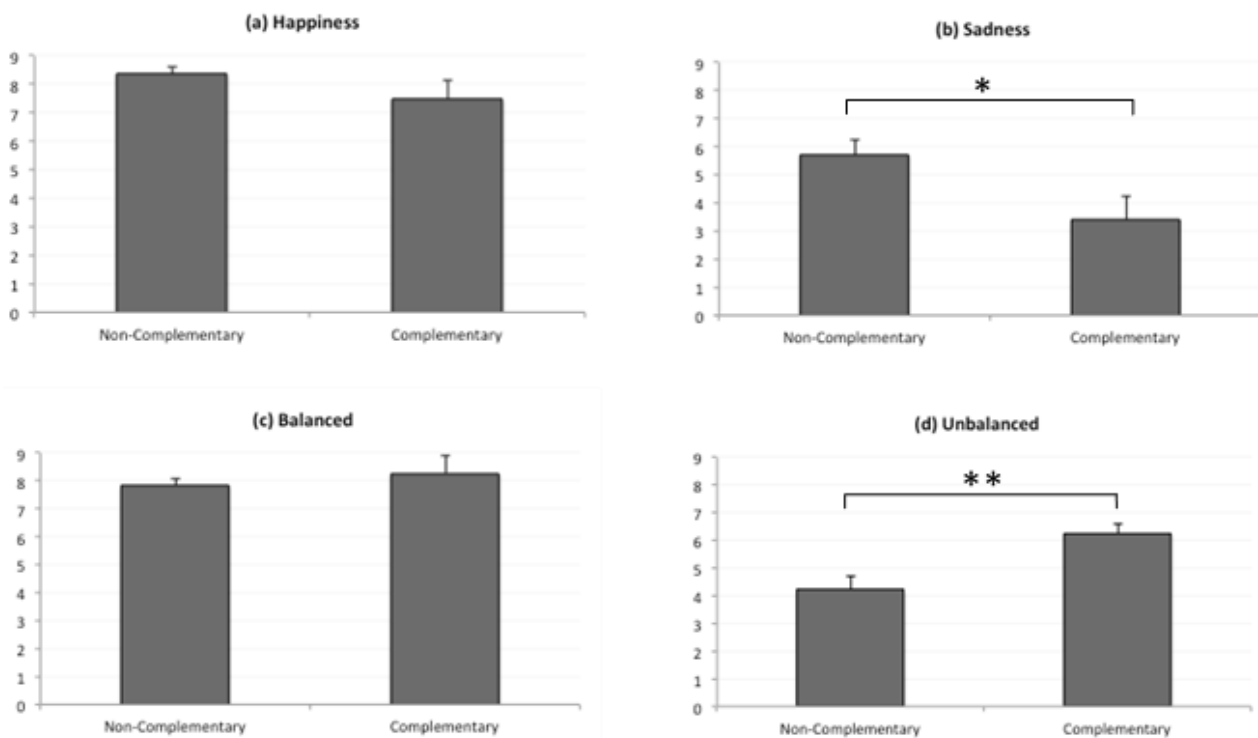


Figure 8

VAS means and standard errors associated under the four conditions: happiness, sadness, balanced, and unbalanced. Significant differences are given by * $p < .05$ and ** $p < .01$.

The results showed no differences in the strength of the mood under the balanced condition, ($t_{(37)} = -0.702, d = 0.29, p = .87; M_{NC} = 7.82, SD_{NC} = 1.53$ vs. $M_C = 8.27, SD_C = 1.62, CI [-1.76, 0.85]$) and under the happiness condition ($t_{(37)} = 1.507, d = 0.51, p = .14; M_{NC}$

= 8.37, $SD_{NC} = 1.29$ vs. $M_C = 7.49$, $SD_C = 2.38$, CI [-0.30, 2.07]). Nevertheless, there were statistically significant differences in the mood strength under the unbalanced condition ($t_{(37)} = -2.972$, $d = 0.98$, $p = .005$; $d = 0.98$, 95% CI [-3.43, -0.65]). Participants in the *complementary* group showed a stronger unbalanced mood than participants belonging to the *non-complementary* group ($M_{NC} = 4.23$, $SD_{NC} = 2.42$ vs. $M_C = 6.27$, $SD_C = 1.37$). Also, statistically significant differences were found in the mood strength under the sadness condition ($t_{(37)} = 2.188$, $p = .035$; $d = 0.83$, 95% CI [0.17, 4.43]), i.e., participants in the *non-complementary* group showed a stronger mood than participants from the *complementary* group ($M_{NC} = 5.71$, $SD_{NC} = 2.84$ vs. $M_C = 3.41$, $SD_C = 2.48$).

4.2. Color choice frequency.

Figure 9 shows color choice frequencies for the four mood state conditions, putting in evidence color choice when taking into consideration warm vs. cool categorization across mood conditions.

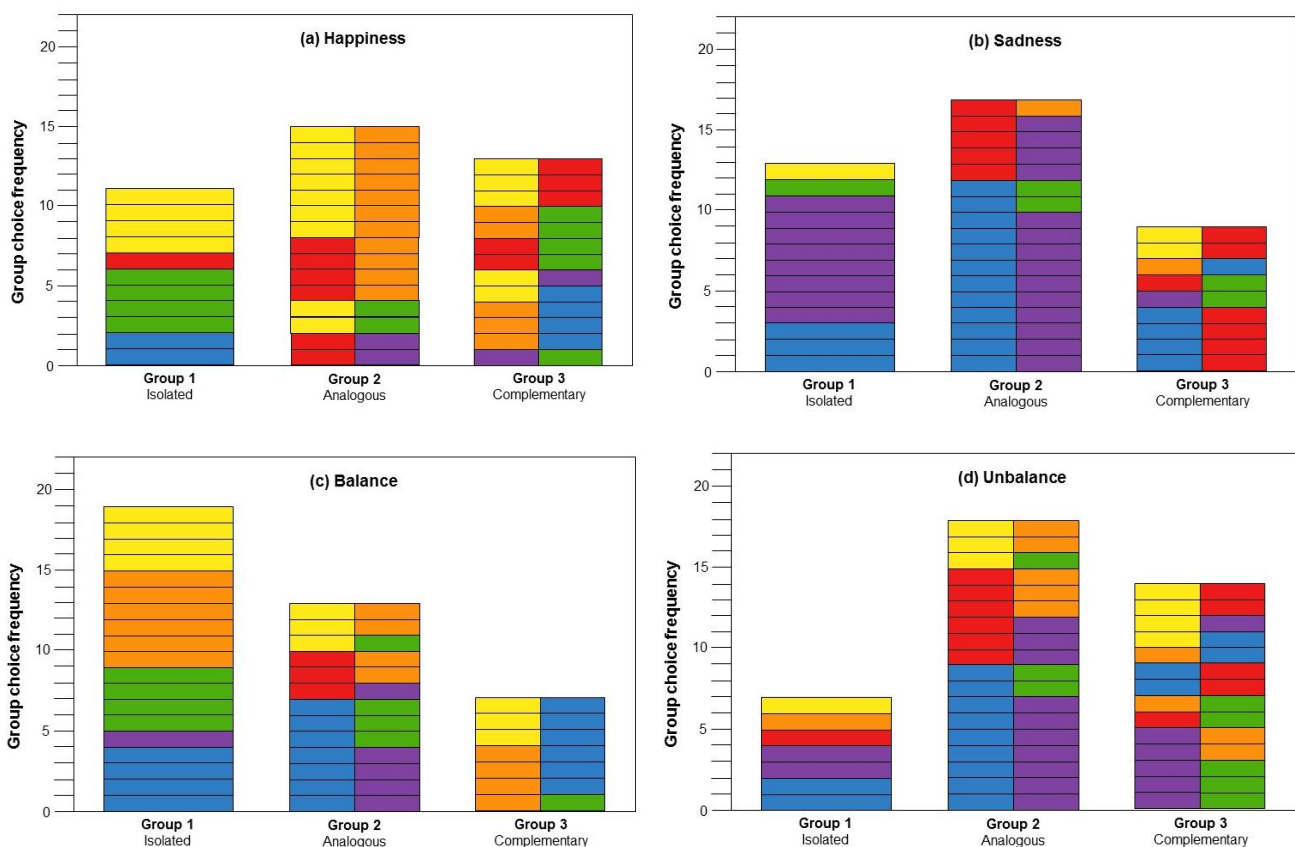


Figure 9

Color choice frequency for each condition: happiness, sadness, balanced and unbalanced moods before grouping into complementary and non-complementary groups for statistical purposes.

Color choice frequencies reveal the same percentage of people choosing cool colors in the balanced and unbalanced conditions (41%). Nevertheless, we can see an inverse pattern in relation to the other categories. That is, more people select warm colors in the balanced condition comparing to the unbalanced condition (35.9% vs. 25.6%) and less people select mixed colors in the balanced compared to the unbalanced condition (23.1% vs. 33.3%). On the other hand, when the induced emotion is happiness, almost half of participants choose warm colors (48.7%) and less of them select cool colors (23.1%). On the contrary, when sadness is induced 64.1% select cool colors and only 10.3% decide to choose warm colors. Table 3 shows the complete distribution of percentages.

Table 3

Absolute frequencies of warm, cool and mixed color choices and associated percentages.

| | Mood condition | | | | | | | |
|-------|-----------------------|----------|-------------------|----------|------------------|----------|----------------|----------|
| | <i>Balanced</i> | | <i>Unbalanced</i> | | <i>Happiness</i> | | <i>Sadness</i> | |
| | <i>ni</i> | <i>%</i> | <i>ni</i> | <i>%</i> | <i>ni</i> | <i>%</i> | <i>ni</i> | <i>%</i> |
| Warm | 14 | 35.9 | 10 | 25.6 | 19 | 48.7 | 4 | 10.3 |
| Cool | 16 | 41.0 | 16 | 41.0 | 9 | 23.1 | 25 | 64.1 |
| Mixed | 9 | 23.1 | 13 | 33.3 | 11 | 28.2 | 10 | 25.6 |
| Total | 39 | 100.0 | 39 | 100.0 | 39 | 100.0 | 39 | 100.0 |

5. Discussion

We aimed to investigate the association between complementary colors and mood states. Previous literature seems scarce to conclude specific emotional associations related to complementary colors. Our results did not confirm the prediction that complementary colors are chosen in response to the induction of balanced mood states. Indeed, we did find such a pattern (highest choice of *complementary* colors) when an unbalanced emotion was evoked. However, when sadness was induced, mostly colors from the *non-complementary* group were chosen. These results may be due to three factors, that we explain bellow: (i) the existence of feedback top-down neural mechanisms; (ii) the symbolic association between colors and emotions; and (iii) the individual meaning attributed to the analyzed emotional states.

Top-down processing is based on a hierarchical organization which starts from complex higher order brain processes that influence lower-level sensorial perceptions (Gilbert & Sigman, 2007). Traditionally visual perception is described as following feed-forward bottom-up mechanisms by which lower level sensorial processing cascades into progressively more complex cortical processing (Clark, 2013). Accordingly, emotional reactions to stimuli occur automatically. However, the feelings and the decisions based on these feelings result from the higher brain processing of these emotional changes (Damasio & Carvalho, 2013). Such bottom up processing might explain why one would choose red as a higher manifestation of their impulsive emotional state. However, top-down feedback mechanisms (such as attention and expectations) might exert important influences on visual perception itself, altering receptive field properties (Gilbert & Li, 2013). In other words, our previous experiences and visual history might influence perception that, in turn, will influence behavior. As such, a question remains: is the choice of the color red a manifest of impulsivity, or the consequence of it? Here we find that participants choosing complementary colors showed a stronger unbalanced mood. We propose that such a choice is not a manifestation of an unbalanced mood, but a process to attain a balanced mood state by means of top-down feedback mechanisms. Crucially a color choice associated with the unconscious individuals' need to emotional rebalance nicely fits previous literature and brings new insights concerning the power of color in the environment around us. We are not suggesting that color does not interfere in mood states. We are simply adding that, with this in mind, one might actively seek a colour combination in order to attain the mood quality one is unconsciously seeking. Thus, individuals in a balanced mood tend not to choose complementary colors, as they do not strive to regain balance.

As Kwallek et al. (1988) stated, blue was found to be associated to a depressive mood. Also, cool colors are associated to negative emotions, as opposed to warm colors which are associated to positive emotions (Dael et al., 2016). Our results show that when sadness was induced the most preferred colors were blue and purple (cool colors), either isolated or combined two by two. In the happiness condition, mostly warm colors were chosen, with prevalence for yellow and orange, supporting the association between colors and emotions suggested by Hyodo (2011). In line with the considerations above, and considering the unbalanced condition, and the fact that cool colors were mostly chosen in the *non-complementary* group, we reinforce the hypothesis that cool colors are not associated with situations of emotional balance – they might be related to unbalanced situations, instead.

It is conceivable that the concepts of sadness-happiness might be more commonly understood by people than the concepts of balanced-unbalanced emotions. In this case, individuals might interpret the former in a more consistent way. As our results demonstrate, a significant effect on sadness – as participants tended to choose non-complementary colors –, it is plausible that the participants' selection was based on an easy recognition of sadness as a strong and clear emotion.

These considerations, lead us to assume a development of a feedback top-down mechanism theory, applied to the analyzed emotional states and color groups. We recall that our formulated hypothesis was based on the association between complementary colors and balanced mood states. However, if we were to conclude that the concept of an unbalanced mood state was in some way associated – as an individual interpretation – with a volatile negative emotion that might quickly become positive, then our prediction would be satisfied. Hence, when an unbalanced situation is recalled, individuals tend to evoke also the post-unbalanced situation (i.e., how they sought to solve the unbalanced mood). This psychological mechanism might have led to a choice for the complementary color group in this condition.

This study is not without limitations. Although the used procedure for the color cards seemed to contribute to a better understanding regarding the association between colors and emotions, a similar methodological design could be tested, in which participants choose from a single colored card (physically or virtually), thus preventing an eventual perceptual color confound. We recommend that further research analyzes each color parameter individually, manipulating color combinations, to investigate the relation between different parameters (e.g. brightness and saturation), complementary colors and mood states. While we assumed the Itten (2001) color wheel as a model, as we expected that the intended effect would be verified, independently of the variations of saturation and brightness, the same experiment could be replicated in other color systems (e.g., RGB, CMYK).

To sum up, we verified that complementary colors were chosen when unbalanced mood states were induced, and non-complementary colors were chosen when sadness was induced. These results confirm and extend prior research that found emotions to be associated with different color choices (e.g., Dael et al., 2016). This fact has tangible implications for research and practical issues. Others stated that color choices are dependent on the context, as well as on the object properties (Destefani & Whitfield, 2008; Palmer, Schloss, Xu, & Prado-León, 2013; Schloss, Strauss, & Palmer, 2013). For example, we might consider contexts involving work and retail spaces, and related to consumer behavior (i.e., marketing context). Bearing in mind the influence of color in spaces (e.g., shops, offices,

workspaces), we know that people need to stay in those environments for relatively long periods, thus developing an affective and behavioral relation with the physical space. Considering the object of study (mood states and complementary colors) the colors applied in a space can be combined in such a way to induce balanced mood states as much as possible – this would be beneficial for waiting rooms, treatment rooms, and work spaces. Yet, in marketing settings the situation would be different, as the perceptual processes require immediate online activation (e.g., advertisements, packaging, outdoors). In this case, emotional balance is not so much a relevant goal to attain, as the reactions to color manipulation are intended to be more immediate – marketers strive to boost sales and product attractiveness.

Here we shed new light on the mechanisms subtending the association between color and emotional states. We reinforce the idea that color choices are indeed cognitively and affectively driven, and that associations to mood states may be related to psychological processes, such as the feedback top-down mechanisms and individual interpretations of mood states.

CHAPTER II

Note: This paper is now at the final round of revision at a peer review journal and we are waiting for the Editors' decision. An earlier version of this paper was presented as an oral communication at the *1st International Youth Marketing and Media Forum*, IPAM, Universidade Europeia, Lisboa, Portugal, February 9th, 2017.

The influence of color in anthropomorphic packaging: Purchase intention and product attractiveness

1. Abstract

In this paper we investigated how anthropomorphism and color influence consumers' purchase intention and product attractiveness. A total of 259 participants were exposed to non-anthropomorphic and anthropomorphic packaging, considering a product from the real market (*Milaneza* pasta). Four different color conditions were rated in terms of attractiveness and purchase intention: green, orange, blue and pink. Our findings suggested that anthropomorphism influenced product's attractiveness but did not affect purchase intention. Importantly, the green anthropomorphic package produced an almost complementary color contrast between the pasta and the package (vivid green vs. orange-red), leading to a higher color contrast perception that positively affected the product's attractiveness. Moreover, there was no significant correlation between the choice of sex-typed colored packages and the gender of the respondents' children. Finally, we discuss the theoretical and practical implications of these findings.

Keywords: *Anthropomorphism; color; packaging; consumer behavior.*

2. Introduction

Branding strategy is a key factor for the most successful brands. Several products are launched to satisfy the same kind of needs, mainly within the fast-moving consumer goods industry. With a very strong competitive environment, brands need to develop new strategies, to survive and maximize profitability (Alalauri, Thunström, & Fristedt, 2016). Private labels have recently experienced a major growth (Forbes, 2014), which makes consumers even more demanding. Packaging is one of the features that can be operated in a brand strategy, proving

to be a key differentiator (Kazanjian, 2013). As Mininni (2016) states, packaging is one of the most powerful instruments to connect the brand with consumers. The characteristics of a package (e.g., color, material, shape, graphics) foster consumers' desirability concerning that product, by developing an emotional connection with it (Kazanjian, 2013). Having an important role in the interaction with the consumer, packaging should create a unique visual and verbal language (Labrecque & Milne, 2012). Therefore, packaging exerts a significant impact in the buying process, as 70 percent of purchase decisions are made inside the store environment, even when consumers intend to buy products from a shopping list (Mohebbi, 2014).

The decision-making process is largely determined by aesthetics, namely design and color. Mohebbi (2014) stated that eye-catching graphic designs and color produce a lasting effect on purchase intention. The anthropomorphism technique – as one of the available techniques to differentiate packaging – is an important design tool to make packaging fun and to improve product attractiveness. Accordingly, brands are more appealing to consumers when they present similarities with people (Rauschnabel & Ahuvia, 2014). Moreover, anthropomorphism fosters a stronger relationship between brand and consumer. Also, color influences brand personality and can determine the way that people perceive products and brands (Labrecque & Milne, 2012). Each color has a specific meaning, modulating behaviors regarding consumers' choices. For instance, when compared to red, blue color is associated with a greater perception of crunchiness, when the product is creamier; orange color is associated with appetite stimulation (Chylinski, Northey, & Ngo, 2015); and, sex-typed colors – blue and pink – are associated with feminine and masculine, respectively (Cunningham & Macrae, 2011).

Despite the existence of research focused on the influence of color related to packaging, as well as color perception (Elliot and Maier, 2014), this research explores the interrelation between color and anthropomorphism. We suggest that the color effect might enhance the anthropomorphic technique, due to color symbology and color contrast. Here, we aim to reduce the research gap associated to the influence of color contrast in consumer behavior, namely, attractiveness and purchase intention. Additionally, we suggest that color meaning through sex-typed colors (i.e., blue and pink) applied to packaging in this specific context, might interfere with parents' choices.

2.1. Anthropomorphism.

Anthropomorphism occurs when human-being characteristics (i.e., human traits, emotions, ambitions) are applied to nonhuman entities, such as animals, spiritual deities, technology, natural phenomena, or objects (Epley, Waytz, & Cacioppo, 2007; Kiesler, 2006). Anthropomorphism is different from personification. The first intends to transform a figure or object into a human being, through emotions, while the latter intends to transform the object into a living image, through imagination (Huang & Mitchell, 2014). Anthropomorphism acts as a conductor for the perception of a higher quality level of products, leading customers to develop a stronger relationship with them. Moreover, when consumers anthropomorphize brands, emotional attachment is created. Thus, brands become more familiar to them, leading to trustworthiness (Rauschnabel & Ahuvia, 2014).

Marketers intending to reinforce the consumer-brand connection might apply anthropomorphism to their products as a marketing strategy. Hence, consumers begin to consider brands to be worthwhile partners rather than money-making elements (Fournier, 1998). Consequently, consumers' relationship with brands turns to be stronger, as they can see them as humans (Puzakova, Kwak, & Rocereto, 2009). The emotional attachment created with anthropomorphic packaging results in a competitive advantage for brands, by enhancing the perception of product quality. Additionally, people tend to associate the product with themselves through the brand integration into their self-identity. This process also helps to produce a deeper relationship with anthropomorphic products (Rauschnabel & Ahuvia, 2014). Managers and designers responsible for brand strategy must carefully think about products' aesthetics, as it plays a determinant role in products' success. Therefore, brands and products preference are enhanced, as consumers' brands perception might identify brand personality choosing the one with which they best identify, thus increasing sales (Landwehr, McGill, & Herrmann, 2011; Puzakova et al., 2009). The emotional attachment for anthropomorphized brands is applied to both packaged and non-packaged products, also increasing brand love (Rauschnabel & Ahuvia, 2014). Specifically, the attention of consumers is automatically activated when facial expressions are presented (e.g., people prefer car fronts with a smile) (Landwehr, 2015). The interest of anthropomorphism as a technique is that even if people don't usually purchase specific type of products, they seem more appealing.

According to Triantos, Plakoyiannaki, Outra, and Petridis (2016), children revealed to be more interested in anthropomorphized products, as these stimulate the children's natural curiosity. As a result, this practice is frequently applied in children's products. Additionally, there is a natural association between anthropomorphism, color and the perception of fun packaging. Thus, products become more appealing to children, increasing their intention to

purchase. However, children's purchase intention is based on the guidance transmitted by their parents over the years, structuring their way of thinking at the moment of purchase (Mau, Schuhen, Steinmann, & Schramm-Klein, 2016). This learning process related to the acquisition of purchase aptitudes occurs during the early years of children's life, becoming more effective when they train competent purchase decisions together. Therefore, is recommendable that children be used to the simple information about products, to be able to evaluate them in a natural way. Nevertheless, despite playing a very important role in the development of the children's way of thinking, when it comes to making a purchase decision, the learning process acquired from their parents loses strength when they are physically present at the Point-of-Sale (POS), as there are many stimuli that distract and influence them (Mau et al., 2016). Being in the retail environment with their parents, children have to face not only the supermarket environment overcrowded stimuli, but also their own motivations and feelings at the moment.

Although anthropomorphized packaging products attract children, there is no previous research evaluating the impact of anthropomorphism in adults specifically in pasta category. Furthermore, the effect evoked by the anthropomorphic technique is applicable to the generality of consumers: it helps to recognize the values represented by a brand, promoting authenticity in brand experience (Rose & Wood, 2005). Consequently, we posited the following research question:

RQ: Does anthropomorphism influence purchase intention and attractiveness?

2.2. Color.

Color has been used as a marketing tool, in different contexts (Elliot & Maier, 2014). Specifically, color is applied to create store environments, to improve the consumer's experience, and to boost the appearance of websites enhancing brand engagement (Labrecque, Patrick, & Milne, 2013). In fact, color acts as an identity card for brands, as part of their personality, becoming a distinguishing characteristic among other brands. Color also influences the perception that consumers have of each brand. According to Labrecque and Milne (2012), colors enable people to easily create a perception of the identity of brands. For example, blue logos are associated to an increase of perceived brand competence, and black logos are associated to the induction of the concept of sophistication (Beneke, Floud, Rono, & Sherwood, 2015). On the other hand, the same authors stated that purple is more associated with spontaneous responses and brand loyalty when compared to orange. Thus, color has

several marketing implications, which include brand positioning and communication. Accordingly, packaging is a means of materialization of brand identity, where color is used as an instrument (Schuldt, 2013). However, color seems to be more important in triggering associations in people's mind than in brand personality perceptions (Labrecque et al., 2012).

Brands that intend to enhance the functionality of their products, should use the blue colour, and those that intend to promote a social-sensory image might use red color (Bottomley & Doyle, 2006). Subsequently, symbolic meaning of color should always be considered to transmit the right message related to brands. Concurrently, it is important to consider the specific industry of the products, because the same color could have different interpretations depending on the product (Jonauskaitė, Mohr, Antonietti, Spiers, Althaus, & Anil, 2016). For instance, purple is the most appealing color in the chocolate's category (Beneke et al., 2015). On the contrary, the same authors stated that orange is the color that less attracts consumers in this industry. The fact that purple is the color of the chocolate leader Cadbury, explains the influence that unconsciously is exerted in the decision-making process (Singh, 2006). Apart from personal color preferences, it is possible to generalize preferences. Blue to green-blue hues are the most preferred colors, fostering highly pleasant ratings on those products, while others, like orange and yellow, are the least preferred, triggering highly unpleasant ratings; green is neither liked nor disliked (Jonauskaitė et al., 2016). There is a general dislike for yellow and a general preference for blue, whereas lighter and colorful hues are preferred instead of white, black or grey (Jonauskaitė et al., 2016).

Pink and green colors enhance positive emotions, especially when associated to facial expressions (Gil & Le Bigot, 2014). Hence, a face in a package could be more easily recognized as friendly and attractive. Gil and Le Bigot (2014) found that the symbolic meaning of colors have two origins: evolutionary and cultural (i.e., green has an association to natural environments and growth, but it is also related to ecological concerns). Pink color is related to unconditional love and kindness (Patil, 2012). In addition, orange stimulates the appetite and products with this color are considered inexpensive and friendly (Kissmetrics, 2014; Patil, 2012). Orange products are also associated with spontaneous buying and joy expressions (Dael et al., 2016).

Cunningham and Macrae (2011) stated that the colors of goods directed to children are, mainly, blue and pink – that is, sex-typed colors. Products directed to attract girls are, in most cases, pink; and the ones that intend to attract boys are mostly blue. Therefore, they are pressured to acquire products that better fit their gender, as a way of social inclusion. This may change children's purchase intention, as even if a young boy likes a certain pink item, it

would be difficult to purchase it only due to color association. Thus, color can be an obstacle for some customers to acquire certain products. These associations have an impact on children's behavior (Cunningham & Macrae, 2011) and, therefore, on family purchase intentions. Consequently, they lead people to associate feminine characteristics with someone who purchases pink items and masculine characteristics with someone who purchases blue items, without even knowing their personality (Cunningham & Macrae, 2011). Therefore, at the purchase moment consumers consider both color and its meaning (Cunningham & Macrae, 2011) and their own motivations and feelings (Mau et al., 2016).

2.3. The purpose of this study.

Color and anthropomorphism are specific techniques that are frequently used in brand strategy. They could activate the consumers' attention and influence the perceived attractiveness and, in the end, the purchase intention. This study focused on a specific product from *Milaneza* (pasta category), which was launched in the Portuguese market in 2014, as an innovative campaign targeted to families with children. *Milaneza* applied anthropomorphism to the packaging of this new pasta to attract the young children and their family. Here, we aim to understand if anthropomorphism could benefit from the symbolic meaning of color, specifically increasing purchase intention and product attractiveness. We have targeted an adult audience (including parents), since the purpose of this study is to analyze the adults' behavior toward this specific pasta package. Although we aimed to assess adult consumer choices, as these mostly fall upon adults, we verified if these had children to analyze the possible affect that children might have on the parents' choices, i.e. would a parent with a child choose a more child-friendly anthropomorphic package or a color that would be gender specific to his/her child?

Firstly, we have compared two types of packages with a similar product (i.e., anthropomorphic, and non-anthropomorphic packages with farfalle pasta) in terms of attractiveness and purchase intention. We have considered three colors: dark green, vivid green, and orange. The green color was chosen for the association to the brand identity, since *Milaneza* applies two types of green: dark green (applied in the non-anthropomorphic package) and vivid green (applied in the anthropomorphic package). The orange color was chosen due to its symbolic association to appetite stimulation, also being associated to spontaneous purchases and elated joy expressions (Patil, 2012). The orange package was a fictitious one being digitally manipulated. The mentioned factors contributed to define our assumption related to orange color, attractiveness, and purchase intention (H1). Secondly, we

have introduced two more colors: pink and blue. These two colors were chosen to analyze if families with young children were influenced to purchase these sex-typed colors (H2).

Accordingly, the following hypotheses were formulated:

H1: Orange color increases purchase intention and attractiveness of the Milaneza package.

H2: Parents are more willing to purchase products with colors that best fit their children's gender.

3. Method

To address the research question, an observation was firstly conducted, as a pilot test. The main objective was to perceive how consumers behaved when they have to choose a pasta product. The observation consisted in two major categories: movement attitudes (e.g., walk, stop, look, pick a product) and package evaluation (e.g., comparing prices, reading the ingredients). Afterwards, a questionnaire was structured and sent through online platforms to cross-check the information resulted from the observation findings.

3.1. Pilot test.

The first observation took place at Continente supermarket (i.e., one of the largest Portuguese retailers whose consumers represent all social classes) in Leiria Shopping, during the weekend (November 11th and 12th, 2016), from 9:00 p.m. to 10:45 p.m. and from 11:00 a.m. to 01:00 p.m., respectively, as many people tend to choose this schedule when they go shopping. Around 60 people were observed. A second observation was undertaken on a Saturday (November 19th, 2016) from 04:30 p.m. to 06:30 p.m. – carried out at El Corte Inglés supermarket (i.e., a smaller retailer whose majority of clients belong to higher social classes) in Lisbon, to extend the study to other upper social classes. Around 15 people were observed.

The researcher who observed the consumers played the role of a mystery shopper, allowing consumers to behave naturally, without feeling the pressure of being watched. This technique is called disguise observation and reduces the bias of results (Malhotra & Birks, 2007). The mystery shopper used an observation grid in which all relevant consumers' behaviors were recorded, to identify specific behavior patterns. Therefore, it was possible to collect information in a real setting, mainly regarding the consumers' movement and behavior toward the package when shopping for pasta, which allowed to verify whether they were

planning to purchase pasta or were buying on impulse; whether they asked for any opinion to choose the pasta package and, finally, to understand the main influencing factors when choosing a package to buy. We also registered the influence that children might have had when accompanying their parents (i.e., asking children's opinion when choosing pasta was registered in the observation grid). The following items were a sample included in the observation grid (from 24 items): «Walked through pasta corridor», «Stopped in the pasta corridor», «Looked to *Milaneza* brand at first», «Picked up the original *Milaneza* package», «Picked up the anthropomorphized *Milaneza* package», «Spent some time in the pasta section to read the package ingredients».

The main findings of the pilot test suggested that the patterns of consumers are standardized, and that they did not ponder when choosing a pasta brand. They either select the retailer's brand, in the case of *Continente*, or the original packaging of *Milaneza* or *Nacional*. In the case of *El Corte Inglés*, people gave more importance to price, pasta type, and quality than to packaging design.

3.2. Participants and procedure.

An online questionnaire was built on the Qualtrics platform and distributed through social media as well as in person at a study center and a school. A total of 330 participants filled in the questionnaire, however only 259 were considered valid for analysis, due to incomplete or inconsistent answers. Participants were aged 18 to 78 ($M = 32.5$) and 51.7% were males. Participants were asked if they had children and, in the affirmative case, if they were girls or boys. Additionally, they were also asked if they considered their children's opinion when purchase pasta. Concerning the large age-range of our sample, it reflects a convenience sample as we assessed consumers onsite and thus, to maintain the experiments' ecology, reflecting real-life consumer setting, we inquired all consumers aged 18 and above during the established time-period. The questionnaire was administered in Portuguese. Three researchers carried out a translation and back-translation procedure (Brislin, 1986) to assure consistency between the English and the Portuguese versions of the questionnaire.

In the first section, respondents were asked to report personal information (i.e., gender and age, shopping habits) to understand their lifestyle. They were asked questions about their behavior as consumers, such as: «Do you usually go to the supermarket with your children?», or «Do you always buy the same brand for pasta?». The *Milaneza* brand was introduced after these questions, to reduce the bias of results. In the second section, they were evaluated in terms of their attitude toward the brand (the scales' references are mentioned below). In the

third section, a non-anthropomorphized packaging of *Milaneza* showed up on the screen. Here, respondents were requested to evaluate its attractiveness and their purchase intention toward that product. Next, this procedure was replicated to the green and orange versions of anthropomorphized packaging. Thus, it was possible not only to evaluate the consumer's perception concerning the anthropomorphism technique, but also the influence of color. These packages differed from each other merely due to the color changes which were manipulated using Photoshop. Each package was randomly presented. Finally, in the last section, respondents were presented, in a random order, with the four anthropomorphic different packages of *Milaneza* pasta: the original non-anthropomorphized package (dark green), the original anthropomorphized package (vivid green), and the blue and pink versions of the anthropomorphized one (see Figure 10). Here, only purchase intention was evaluated. To define the color hue of each modified packaging, the original anthropomorphized packaging color hue (H) was considered, making them similar in terms of brightness (B) and saturation (S) (Green: H = 69, B = 83, S = 98; Orange: H = 32, B = 81, S = 96; Blue: H = 201, B = 93, S = 80; Pink: H = 349, B = 98, S = 47). The pink color had a significant lower level of saturation, as it was the color tone that best fitted the green packaging, in terms of visual appearance.



Figure 10

The five packages considered in the study.

3.3. Measures.

As we pretended to evaluate the consumer attitude toward the product (both visual stimuli and brand), we used the measures mentioned below. *Attitude toward the brand* and *Emotional attachment to brands* evaluate the consumer brand relation. Product attractiveness, Purchase intention and Purchase preference are also related to visual stimuli. The referred authors applied the same measures in similar contexts.

Attitude toward the brand. Seven items were adapted from Pecheux and Derbaix (1999) to assess respondents' attitude toward *Milaneza* brand, on a 4-point Likert-type scale (ranging from 1 = Definitely disagree to 4 = Definitely agree), consisting of two dimensions: Hedonic and Utilitarian.

Table 4

Attitude toward the brand (Pecheux & Derbaix, 1999).

| <i>Scale dimension</i> | <i>Scale item</i> |
|------------------------|-----------------------|
| <i>Hedonic</i> | I like it |
| | It is cheerful/fun |
| | It is great/brilliant |
| | I like it very much |
| <i>Utilitarian</i> | It is useful |
| | It is practical/handy |
| | It is useless |

Emotional attachment to brands. Ten items from Thomson, MacInnis, and Parl (2005) were used to assess consumers' feelings towards the brand, on a 7-point Likert-type scale (ranging from 1 = Describes poorly to 7 = Describe very well), consisting of three dimensions: Affection, Connection, and Passion. The items for Affection are «Affectionate», «Loved», «Peaceful», and «Friendly». The items for Connection are «Attached», «Bonded», and «Connected». The items for Passion are «Passionate», «Delighted», and «Captivated».

Product attractiveness. This measure was adopted from Yan, Sengupta, and Wyer (2014) and participants had to rate the product attractiveness of *Milaneza* pasta on a 7-point Likert-type scale (ranging from 1 = Very unattractive to 7 = Very attractive).

Purchase intention. Three items were adopted from Mackenzie, Lutz, and Belch (1986) to assess purchase intention on semantic differential scales. The items were likely/unlikely; probable/improbable; and possible/impossible. Sample item was «the probability that you will try *Milaneza* pasta when it becomes available in your area». Although we could have chosen a more complex scale from the literature, we chose the dichotomous scale for its simplicity and application speed in the online platforms. This option

allowed us to obtain a bigger sample, as chance participants would refrain from participating when they were required to take more of their time.

Purchase preference. In the last section, people were asked to arrange images according to their purchase intention, in which 1 = The most preferred package and 4 = The least preferred package (i.e., in descending order of preference).

4. Results

The analysis was conducted using SPSS Statistics 24. According to the Kolmogorov-Smirnov test results, none of the dependent variables followed a normal distribution. Therefore, distribution-free tests were used to analyze data, as these are the most proper methods to apply under these circumstances (Marôco, 2014).

To evaluate how orange color influences the purchase intention of *Milaneza* pasta, a Cochran's Q-test was applied to each measure: plausibility, possibility and likelihood, to analyze how they differed across the three different packages (non-anthropomorphic, green and orange). Regarding plausibility, the results showed that there were significant differences between the two measures (plausible/improbable) across the three packages ($Q(2) = 16.125$; $n = 253$; $p < .001$). Using a confidence level of 95%, the post-hoc analysis of multiple comparisons revealed that these differences occurred between the non-anthropomorphic package and the orange anthropomorphic one ($p = .001$ and $p_{aj} = .002$) as well as between the non-anthropomorphic packaging and the green anthropomorphic one ($p < .001$ and $p_{aj} = .001$). The same happened to possible/impossible ($Q(2) = 13.488$; $n = 254$; $p = .001$) and likely/unlikely measures ($Q(2) = 33.435$; $n = 253$; $p < .001$), between the same pairs of packages. For the first measures, the first pair had a *p-value* of .002 and an *adjusted p-value* of .006; and the second pair of packages had a *p-value* of .001 and an *adjusted p-value* of .004. For the second measures, both pairs revealed a *p-value* and an *adjusted p-value* lower than .001.

These results refute H1 by demonstrating that neither the anthropomorphism technique nor the orange color change the purchase intention of *Milaneza* pasta, since the non-anthropomorphic package has higher levels of plausibility, possibility and likelihood (36.84%, 35.94% and 39.96%, respectively).

Regarding the orange packaging attractiveness, an ANOVA test of Kruskal-Wallis showed that there was, at least, one package where the attractiveness was significantly different from the other ones ($p = .001$). By performing a multiple comparison of means, it was possible to learn that it was the non-anthropomorphic one, for having a distribution of

attractiveness significantly different from the green ($p < .001$) and the orange ($p = .039$) anthropomorphic packages. When analyzing the attractiveness means, it was possible to conclude that the anthropomorphism marketing technique makes the product more attractive ($M_{\text{green non-anthropomorphic}} = 4.16$; $M_{\text{green}} = 4.65$; $M_{\text{orange}} = 4.40$). However, the mean of the green package was higher than the orange one, refuting the hypothesis of the orange packaging colour to be considered as the most attractive product.

Finally, to evaluate if the willingness to purchase pink and blue pasta packages was the same between parents with only one or more daughters and parents with only one or more sons, a Mann-Whitney test was performed. This test showed, with 95% of confidence level, that the two different groups of parents have the same willingness to acquire the pink ($p = .697$) and blue ($p = .118$) packages, contradicting the initial expectations which pointed towards the purchasing of the package color that best fitted their children's gender. Moreover, evaluating their willingness to purchase the four packages, all together, by using the same test, it was possible to conclude that there is no significant difference in their willingness to acquire blue, pink, green ($p = .561$) and non-anthropomorphic ($p = .117$) packages. However, the non-anthropomorphic package reveals to have the lowest mean, showing that respondents preferred it (1 = the most preferred package; 4 = the least preferred).

5. Discussion

The present study was based on three main purposes: (i) to verify whether anthropomorphism would change the purchase intention and perceived attractiveness of the product; (ii) to find if the orange color would also change the customers' purchase intention and product attractiveness, comparing to the green color; (iii) to know if parents are more willing to purchase products with colors that best fit their children's gender, namely, pink and blue. The results suggest that anthropomorphism, as a marketing technique, makes products more attractive. However, it does not change the purchase intention of customers. Moreover, when comparing the different packages, all together, the most preferred product is the green anthropomorphic package.

The data from the systematic observation showed that customer behavior patterns are strongly standardized. Therefore, when people go shopping, they already know what they want to buy. In the pasta category, at Continente supermarket, they immediately select the retailer's brand for being the cheapest one, even if *Milaneza* is sold at a promotion price. In El Corte Inglés, they select *Milaneza* brand and others, such as *Nacional*, due to their higher income levels. However, they choose the non-anthropomorphic package, without even

looking for package alternatives. This may be explained by several factors: (i) customers have developed a stronger relationship with the traditional packaging of this brand, through repeated purchases, which leads them to continue purchasing it; (ii) the product is wrongly located on the shelf, so customers do not notice it; (iii) the hue of the green anthropomorphized package is different from the hue used in traditional packages, so, part of its identity is lost, preventing some customers from connecting it with the non-anthropomorphic package; (iv) finally, each country has its own culture, with specific behavioral patterns.

The orange color is known for stimulating the appetite, being associated with spontaneous purchasing, vibrancy and fun. However, according to the results, it does not make the product the most preferred one. When compared with the green package, for instance, the latest is preferred. This can be explained through the fact that the orange color has been studied in a very specific product – *Milaneza* pasta – and the color effect may change across product categories and industries. Also, orange is different from the generic colour of *Milaneza* brand (green), which might be a cause for distancing from brand identity. Once that this specific orange package is not available in the marketplace, there is no connection between consumers and the product.

On the other hand, the green anthropomorphic package was the most attractive. This might have occurred due the complementary color contrast produced between the pasta inside the package and the colored package itself. The transparent package material allowed to see the pasta, clearly, which colour was red-orange. In line with the literature about color contrasts, when both complementary colors are seen together, the maximum perceptual contrast happens (Itten, 2001; Martinez, Abreu, & Rando, 2018). This type of contrast (food vs. package) might be explored in terms of attractiveness, for other products or types of packaging.

Thus, it is paramount that a company research the market before launching a new product, to ensure that the appropriate packaging color is chosen. This can be done by asking people for their opinion on a range of colors and by testing different colors on the product, before deciding. Colors should comply with brand identity, to allow consumers to easily associate the products with the brand. People interact with brands, creating an opinion about them. This opinion comes from previous communication campaigns and from the relationship that they have developed with them. Thus, when a brand launches a new product, they automatically create some expectations about it. If customers cannot easily associate the product with the brand, because of colors, part of the brand image that the company has built

so far is not transferred to the new product, losing visibility and power. This principle is especially applicable, when referring to brands that are well recognized, such as *Milaneza*. According to a study performed by Marktest (2013), *Milaneza* is one of the brands with more predominance within the branded products in pasta category, by revealing the second highest share of shelf in 2013. Also, *Milaneza* has been the market leader in Portugal and is known by 92% of Portuguese people (Amorim, 2015).

As the results showed, there was no significant correlation between color (pink vs. blue) and gender of the consumers' children. The choice of parents did not focus on the colors pink and blue, revealing that there is no association between their children's gender and the color choices for this specific product. As the observation revealed, in most cases, women are the ones who shop for groceries. In the pasta category, they chose the one with which they are more familiarized with, giving more importance to flavor, texture, price and ease of cooking. Colors might be also considered in non-packaged products and when there is some toy or additional object attached to it. The placement of the products is also a strategic instrument.

When colors are considered, it is important to notice that each case is unique. Therefore, what works for a product category, may not work for another. This highlights the importance of market research and of testing products before important decisions. Accordingly, it is advisable that companies use anthropomorphism as a marketing strategy of differentiation, in competitive industries, such as FMCG. This allows companies not only to achieve different market segments, by creating different versions of the same product, but also to lead their competitors to do the same. On one hand, this would be beneficial for large companies, with a broad portfolio of products, which have the intention of differentiating themselves from their competitors, since this allows them to keep the brand active and innovative in the marketplace. On the other hand, it would not be advisable for companies with lower financial resources, because the investment required for communication could be risky.

5.1. Limitations and future research.

The present report entails some limitations. There are external stimuli that may influence participants in the decision making process, and in the point-of-sale, such as: environment influences (e.g. light, temperature, store appearance); consumers' involvement (high vs. low); their culture, values and health issues, which force them to define several purchase patterns (e.g., gluten-free or vegan diets); product category (e.g., there is higher probability of a repeated behavior concerning products – special prices and promotional

variables) (Rothschild & Gaidis, 1981); discriminative stimulus cues (e.g., models' actions in advertisements); vicarious reinforcing stimulus cues (i.e., when someone observes the outcomes of someone else's actions); experiential reinforcing stimulus cues (i.e., when consumers learn from the outcomes of their own actions (Aslin & Rothschild, 1987).

This study could also be extended to other product categories, brands, and colors. Previous research on product categories and color concluded that the category itself might be associated to a specific color, thus affecting consumer perception (Spence et al., 2014). Therefore, the color preference for different categories of products might be analyzed. Similarly, following the idea that a complementary color contrast effect produces an increase in terms of attractiveness, the same concept might be tested for other products and retail environments.

Future research could also focus on applying anthropomorphism to different product categories that are more appealing to children (e.g., candies, toys), evaluating their impact on purchase intention and attractiveness. Other colors could also be studied, to analyze how attractiveness changes across colors and product categories. It would also be interesting to evaluate the anthropomorphism technique in products directed at children, young people, adults, and elderly people, to evaluate the differences in consumer behavior across these age groups.

6. Conclusion

Here, we focused on anthropomorphism and colour, as marketing techniques, applied to packaging. Color of packaging (green, orange, blue and pink) was also studied. Both topics were investigated to assess their influence on purchase intention and on product attractiveness concerning *Milaneza* pasta. Purchase intention and product attractiveness were also associated with children's gender, to understand the influence on parents' purchase intention. Findings suggest that, although anthropomorphism does not change the consumers' purchase intention, it enhances product attractiveness. Furthermore, parents – regardless of their children's gender – demonstrated a similar willingness to purchase both pink and blue anthropomorphized packages. Thus, sex-typed colors (blue vs. pink) and the consumers' children's gender are not associated, in pasta category.

CHAPTER III

Note: This paper has been submitted to a peer review journal and is awaiting reviewers' comments and decision. An earlier version of this paper was presented as a paper at the *TAKE (Theory and Applications in the Knowledge Economy) Conference*, Poznań University of Economics and Business, Poznań, Poland, July 11th-13th, 2018.

White lie or true blue: Consumers' packaging choices depend on color of retail environment

1. Abstract

Color is one of the most elementary techniques used in marketing and produces behavioral effects reflecting real purchase attitudes. However, packaging color has seldom been investigated in-context. Here, we aim to study the putative effect that dominant retail environment colors might produce on attractiveness and product purchase intention, when products use similar store colors, and when products use complementary colors to those of the store. Moreover, we investigate if these choices are product dependent (e.g., do food and non-food products evoke the same packaging color choices in a given retail color context). We conducted an online questionnaire where 436 participants compared two scenarios (orange store × blue store) and two products (chocolate × soap). The products varied in color, and were evaluated in isolation and embedded in the store context, through image manipulation. Findings suggest an interaction between store and product color significantly affecting both product attractiveness and purchase intention. Importantly, we found that the product category might modulate the complementary color-effect, in terms of attractiveness and purchase intention.

Keywords: *Color; retail environment; packaging; purchase intention; attractiveness.*

2. Introduction

Packaging could be the main connection between a product and the customer, communicating the qualities and benefits of the product (Giovannetti, 1995). Packaging exerts a significant impact in the moment of buying, since 70 percent of purchase decisions are made inside the store environment, even when consumers had intended to buy products from a

shopping list (Mohebbi, 2014). In an attempt to stand out, brands have been developing new packaging ideas, so that they might contribute to brand recognition. However, products do not stand out by themselves, since they are embedded in the environment that surrounds them. As brands are a means of communication, spaces also communicate with the consumer, affecting their attitude and behavior. Therefore, some authors have addressed the interaction between products and space characteristics on consumer behavior, namely: (i) the impact of ambient odors and retail density, on the perception of product quality (Michon et al., 2005); (ii) the effect of ambient and social cues on pleasure and arousal (Baker, Grewal, & Levy, 1992); and (iii) the effect of emotional responses evoked by store environment on the time and money spent in the store (Donovan, Rossiter, Marcolyn, & Nesdale, 1994).

Despite the existence of research focused on color perception related to physics, linguistics, physiology, and synesthesia (Elliot & Maier, 2014), this very research highlights the lack of studies on psychological aspects related to color. Furthermore, context-driven color research is still scarce. Here, we aim to reduce this research gap by investigating how color combinations affect product attractiveness and purchase intention. So far, research has focused on product or store environment, be it digital or physical (Bagchi & Cheema, 2012; Elliot & Maier, 2014). However, we suggest that it is not possible to decouple a product from its environmental context, and thus it is vital to analyze the interaction between product color and the dominant color of the environment where it is inserted.

Color is a component of both product and retail environment, playing a verified effect in the buying process: for example, blue stores are rated as more relaxing, less crowded and more reliable (Alberts & van der Geest 2011; Yüksel, 2009), and package color novelty increases purchase intention (Garber, Burke, & Jones, 2000). Prior research has demonstrated that colors of food packaging can affect consumer behavior (Mead & Richerson, 2018). For example, food in red-colored packaging is perceived as sweeter than food in blue-colored packaging (Huang & Lu, 2015). The product category itself might also influence the packaging color, due to cognitive associations (Spence et al., 2014). Accordingly, functional products (e.g., car tires) are associated to the blue color, and sensory or social products (e.g., chocolates) to the red color (Bottomley & Doyle, 2006).

In line with the above, marketers covet to know the most influential factors affecting the consumers' attitude toward a product. We suggest that, based on the color-marketing theoretical models (Aslam, 2006; Manav, 2013), the attitude toward a product might be determined by the interaction between several factors. Here we chose to tackle: (i) the color of the retail environment; (ii) the color of the product; and (iii) the product category. A store

setting is a complex scene. Here we aim to verify if the store environment has such a significant influence that it overrides the expected behavior related to a specific product and packaging color. Or if it is the influence of the product (and its specificities, e.g., color of packaging) that prevails.

This research focuses on the relation between product and retail environment. Considering that color is one of the most determining stimuli in visual perception (Babin et al., 2003), here we chose to explore the relation between packaging color and contextual color. Specifically, we were interested in investigating the role of complementary colors (product \times store environment) in consumer behavior. The attractiveness and purchase intention of two different category products (chocolate and soap) were measured in different situations obtained by the manipulation of the color of the product as well as of the store environment. We predicted that product and retail environment would interact affecting the products' perceived attractiveness and purchase intention.

3. Theoretical Background

3.1. The symbolic associations of color.

Color is a valuable marketing tool and its simbology is applied to achieve brand strategy (Seo & Scammon, 2017). There is an intended relationship between color and brand personality, even though color perception has individual emotional associations (Heller, 2012). For example, when someone looks at a yellow package, emotional associations are activated, which will cognitively affect the meaning of the visualized color (Elliot & Maier, 2014). This meaning depends on each individual person, their life history, their personality, and their past experiences. It also depends on the context – that is, it will be cognitively different to look at a yellow package knowing from the outset that it is a milk chocolate, and to look at a yellow package knowing that it is a bleach pack (see, for a review, Elliot & Maier, 2014; Labrecque et al., 2013; Shevell & Kingdom, 2008; Wauters, Brengman, & Mahama, 2014). Thus, the symbolic association of each color might vary depending on the context. For example, favorite personal colors are not the same for objects, such as clothes or for painted walls (Jonauskaite et al., 2016).

Even considering these specificities, several studies have explored the emotional and symbolic associations of stand-alone colors (i.e. isolated from a context), showing that color meaning is valid and can be generalized for most people (Ampuero & Vila, 2006). In general, when considering stand-alone colors, the colors yellow, pink and white are associated with sincerity; red and orange are associated with excitation; blue is associated with competence;

purple and black are associated with sophistication; brown is associated with robustness (Heller, 2012; Labrecque & Milne, 2102). However, the context where the colors are applied (e.g., type of product, environment, cultural setting) also determines their symbolic meaning (Bakker, Voordt, Vink, Boon, & Bazley, 2013). Accordingly, the norms concerning color in branding should be carefully revised.

3.1.1. Complementary colors.

Color is inseparable from the brand itself, acquiring a symbolic meaning in the mind of potential consumers (Hoek & Gendall, 2010). This combination leads to empathy and familiarity with the brand. Color also indicates the positioning of the product: if it is directed to the upper class it might communicate elegance and aesthetics, using colder and darker colors in the packages – black is mostly for this purpose (Ampuero & Vila, 2006). In contrast, less differentiated products may use brighter colors in their packaging, such as white (Aslam, 2006).

When considering the influence of specific relations between colors in human behavior (e.g., warm-cool, complementarity, chromatic-achromatic), the literature is scarce (Pridmore, 2011). Previous psychological and physiological literature on color states that the perception of complementary colors produces a high contrast and visibility due to the hue cancellation phenomenon (Schwartz & Krantz, 2014). This is the reason why orange is the color used in life rafts, to contrast against blue water (Mahnke, 1996). Itten (2001) stated that when two complementary colors are used in the proper proportions, they generate a balanced and harmonious effect. Consequently, each of the colors is perceived with maximum vividness, meaning that, for instance, green is greener if preceded by red, and vice-versa (Conway, 2002). Furthermore, the choice of complementary colors seems to be associated to emotional responses, being connected to unconscious processes where one might actively seek to choose this type of color combination, to attain a balanced mood (Martinez et al., 2018). The same authors reinforced that complementary colors choices are related to psychological processes, such as the feedback top-down mechanisms. Top-down processing might exert important influences on visual perception itself (Gilbert & Li, 2013). It is based on a hierarchical organization starting from complex brain processes, which influences lower-level sensorial perceptions (Gilbert & Sigman, 2007). Bearing in mind the influence of complementary colors in the emotional impact of visual perception, we sought to understand the impact of complementary colors between product and retail environment.

3.1.2. Color and consumer behavior.

Products are physically available to the consumer, through the most varied commercial spaces. Even if a product is specifically produced to stand out from others, the context in which it is inserted is crucial for its evaluation: the position inside the store, the lighting conditions, the height of the shelf, the odor, the music (Bellizzi & Hite, 1992; Hidayetoglu, Yildirim, & Akalin, 2012; Michon et al., 2005). Several other factors might influence consumer behavior in a store setting. Not only color, but also size, illustrations, shape, material and product information on the packaging might determine the buying process (Ampuero & Vila, 2006; Silayoi & Speece, 2007; Labrecque & Milne, 2012; Yan et al., 2014).

The consumers' decision-making process is largely determined by aesthetics, namely design and color (Kauppinen-Räsänen, 2014). Particularly, Mohebbi (2014) stated that eye-catching graphic designs and color will produce a lasting effect on purchase intention. Therefore, impulsive buying could also be activated when red is applied in an online context (Bagchi & Cheema, 2012), and blue environments induce more expensive purchases (Bellizzi & Hite, 1992). But the influence of color on consumer behavior might be affected by other factors, such as light conditions. Babin et al. (2003) stated that lighting effect acts as a mediator in color influence, since it changes substantially the purchase intention when interiors are orange or blue.

Following previous research about the influence of color in consumer behavior (Elliot & Maier, 2014; Gnambs, Appel, & Oeberst, 2015; Gopikrishna & Kumar, 2015; Jonauskaite et al., 2016; Labrecque et al., 2013), our study examines how color perception influences product evaluation, namely, attractiveness and purchase intention. Symbolic color associations also depend on the products' positioning strategy (Ampuero & Vila, 2006) and product category (Bakker et al., 2013). For example, high price products are associated to dark colors and not to yellow, red or orange colors. Considering other specific colors, blue is considered the preferred color among people, but it is not the ideal match for edible products packaging (Valdez & Mehrabian, 1994). Red and orange colors are the most suitable colors to associate to sensory products, such as chocolates and perfumes, but are unsuitable for functional products (Bottomley & Doyle, 2006).

Hence, we consider that the decision-making process in the acquisition of a product cannot be dissociated from: (i) the product itself; and (ii) the environmental context. Due to the complexity involved in color symbolism and perception, we have tested the same setting in two different product categories: a food product (chocolate) and a non-food product (soap).

Thus, we suggest that the emotional weight of stand-alone products might differ from that of context-embedded products. Moreover, we posit the following hypotheses:

H1a: When products have complementary colors to those applied in the store, purchase intention increases.

H1b: When products have complementary colors to those applied in the store, product attractiveness increases.

H2: The preferred color for chocolate differs from the preferred color for soap.

4. Method

4.1. Participants.

Four hundred and forty-two participants were recruited through Prolific Academic™ and Qualtrics™ online platforms in exchange for a nominal fee. Six participants were excluded as they did not complete the questionnaire, which resulted in a final sample of 436 participants (245 females). Participants were aged between 17 and 64 years old ($M = 32.5$, $SD = 10.03$). Fifty-five (12.6%) participants were undergraduates with High School Degrees, 197(45.2%) had Bachelor Degrees, 141 (32.3%) had a Master Degree, 23 (5.3%) had a PhD, and 20 (4.6%) had other type of education. The participants represented 40 different nationalities, the majority of which were Portuguese –142 (32.6%) – and British – 126 (28.9%).

4.2. Measures.

The questionnaire had three blocks: (i) a short demographic questionnaire; (ii) questions evaluating the product - graphically merged in the retail scenario- in terms of attractiveness and purchase intention; and (iii) color preferences, in terms of sensory appeal, for stand-alone chocolate and soap (without a background image). The second block was subdivided into two parts, one for the orange store, and the other for the blue store. Each part was randomly presented and preceded by a brief explanation about the store that the participants were about to see («Imagine that you are walking through a shopping area. Then you come across a store that resembles the one below. You decide to enter this store. Please concentrate and imagine that you are shopping inside this store»). After this introduction, an image of a retail store was shown, as a background to each product, so that the color combination could be perceived as a whole. Two types of products – a chocolate and a soap – were considered for participant evaluation in terms of attractiveness («How would you rate

this package in terms of attractiveness?») and purchase intention («How likely would you purchase this product?»). The evaluation of both products was made by means of a 7-point Likert-type scale rating product attractiveness (ranging from 1 = Very unattractive to 7 = Very attractive) (Yan et al., 2014). Participants were also requested to indicate, on a 7-point Likert-type scale, the intention to purchase the products (ranging from 1 = Very unlikely to 7 = Very likely) (Lutz, MacKenzie, & Belch, 1983). There were four colored options for each product (orange, blue, red and beige). The choice of product colors was based in the following reasoning: (i) blue and orange – to test the complementary colors effect between product and store; (ii) red – to test a color that is associated to sensory products category in an edible product and non-edible product; and (iii) beige – to test the effect of a neutral color in both colored retail environments. Figure 11 shows the images included in second block.

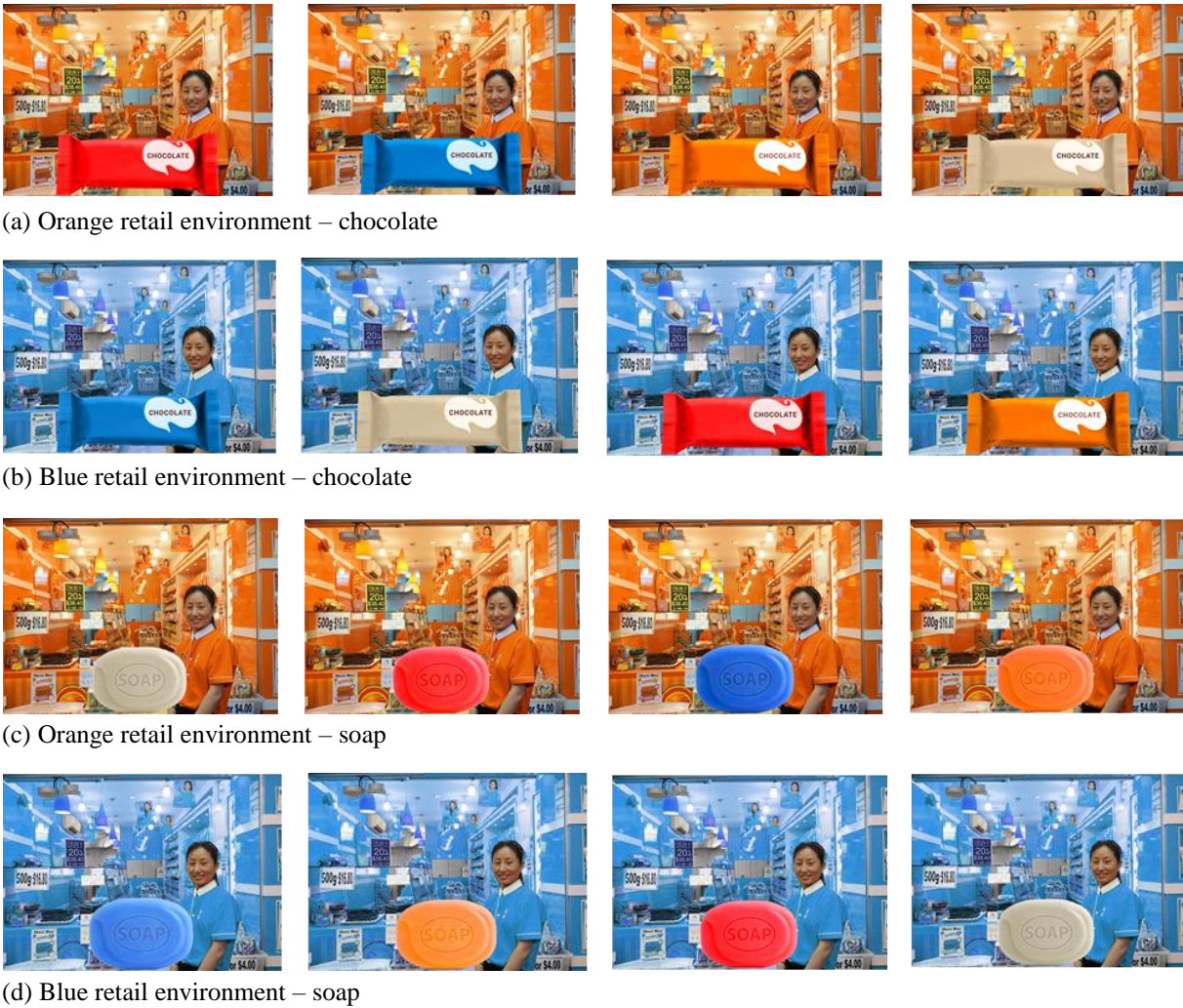
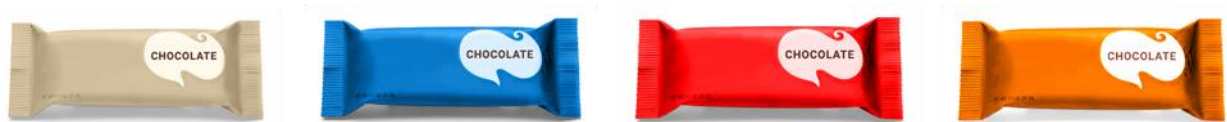


Figure 11
 Images representing the color manipulation for retail environment and products. The colors were randomly presented to participants.

The third block was composed by two sensory questions: one for the chocolate («Which of the following chocolates do you feel would be the most tasty?»); and, the other for the soap («Which of the following soaps do you feel would smell better?»). The products were presented in a stand-alone situation, and not embedded in a contextual color. The four colored options for each product (orange, blue, red and beige) were graphically manipulated and randomly presented. Each participant was allowed to pick only one preferred color. Figure 12 shows the available options for the third block.



Options for the sensory question – soap



Options for the sensory question – chocolate

Figure 12

Images representing the available options for each product, for sensory questions. The colors were randomly presented to participants.

The procedures were in accordance with the ethical standards of the 2008 Declaration of Helsinki. This study was conducted within the guidelines of the American Psychological Association (6th Edition) and approved by the local university ethics committee.

5. Results

5.1. Product graphically merged in the retail scenario.

First, we analyzed the data from the product graphically merged in the retail scenario, with a 2 (retail environment color: orange × blue) × 2 (product category: chocolate × soap) × 4 (product color: orange × red × blue × beige) repeated measures MANOVA, since we had two dependent variables and MANOVA allows verifying if within-subjects factors have an effect on the full set of response variables. The dependent variables were: (i) attractiveness; and (ii) the purchase intention.

After computing the MANOVA for testing main effects, separate univariate ANOVAs were performed for each dependent variable when analyses revealed statistically significant

differences. Multivariate tests showed there were no statistically significant differences for the retail environment color (Pillai's trace $V = .010$; Aprox $F(2, 434) = 2.22$, $\eta^2_{partial} = .010$, $p = .110$) and for product category (Pillai's trace $V = .006$; Aprox $F(2, 434) = 1.27$, $\eta^2_{partial} = .006$, $p = .281$). Nevertheless, the scores were significantly different considering product color (Pillai's trace $V = .037$; Aprox $F(6, 2610) = 8.19$, $\eta^2_{partial} = .018$, $p < .001$) and the interactions between the factors (Retail environment* Product category: Pillai's trace $V = .026$; Aprox $F(2, 434) = 5.82$, $\eta^2_{partial} = .026$, $p = .003$; Retail environment* Product color: Pillai's trace $V = .028$; Aprox $F(6, 2610) = 6.15$, $\eta^2_{partial} = .014$, $p < .001$; Product category*product color: Pillai's trace $V = .039$; Aprox $F(6, 2610) = 8.57$, $\eta^2_{partial} = .019$, $p < .001$; Retail environment* Product category* Product color: Pillai's trace $V = .077$; Aprox $F(6, 2610) = 17.53$, $\eta^2_{partial} = .039$, $p < .001$).

Next, results from univariate ANOVAs are exposed for each response variable.

5.1.1. Attractiveness.

Regarding the retail environment color, results were close to a marginally significant level on perceived product attractiveness ($F(1,435) = 3.611$, $\eta^2_{partial} = .008$, $p = .058$). Concerning the product category there was no significant effect ($F(1, 435) = 1.241$, $\eta^2_{partial} = .003$, $p = .266$). Respecting the product color, the degrees of freedom were corrected (Greenhouse-Geisser procedure) due to sphericity violation ($\epsilon = .837$) and the analysis revealed significant differences in product attractiveness ($F(2.510,1091.877) = 7.025$, $\eta^2_{partial} = .016$, $p < .001$). Also, we found interaction effects between retail environment color and product category ($F(1,435) = 7.775$, $\eta^2_{partial} = .018$, $p = .006$), as well as among other interactions: retail environment color \times product color; product category \times product color; and, the triple interaction retail environment color \times product category \times product color, where sphericity was not assumed ($\epsilon = .680$, $\epsilon = .884$, $\epsilon = .973$, respectively). We found an interaction between retail environment color and product color with an adjusted $F(2.041,887.684) = 6.475$, $\eta^2_{partial} = .015$, $p = .001$. Also, we obtained an interaction between product category and product color with an adjusted $F(2.652,1153.716) = 12.024$, $\eta^2_{partial} = .027$, $p < .001$. Finally, the results revealed a triple interaction between retail environment color, product category and product color, with an adjusted $F(2.920,1270.153) = 30.575$, $\eta^2_{partial} = .066$, $p < .001$.

It is worth mentioning that the partial η^2 relative to product color and to each interaction indicates the existence of a weak association between the independent variable and the dependent variable, except for the triple interaction, where $\eta^2_{partial}$ indicates a medium association. On the other hand, given that all interactions were significant, the interpretation

of the main effects cannot be independent of the other factors. In this sense, the significant result of the interaction between retail environment color and product category will not be considered relevant, as it revealed a weak η^2_{partial} score and there were no main effects for these factors.

Regarding the color of the product, and to make an adequate interpretation of the results, the factorial design was decomposed into four single-factor designs to analyze the simple effects of this factor when the retail environment color and the product category remain constant. Hence, the effect of product color was analyzed under four conditions: (i) orange store and chocolate; (ii) orange store and soap; (iii) blue store and chocolate; and (iv) blue store and soap.

5.1.2. Purchase intention.

The results for purchase intention were similar to those obtained to attractiveness. Firstly, the analyses revealed no statistical differences considering the retail environment color ($F(1,435) = .867, \eta^2_{\text{partial}} = .002, p = .352$) as well as considering the product category ($F(1,435) = 2.457, \eta^2_{\text{partial}} = .006, p = .118$). Regarding the product color, the degrees of freedom were corrected (Greenhouse-Geisser procedure) due to sphericity violation ($\epsilon = .849$) and the analysis showed significant differences in purchase intention ($F(2.548, 1108.478) = 5.190, \eta^2_{\text{partial}} = .012, p = .001$). Also, we found interaction effects between retail environment color and product category ($F(1,435) = 11.500, \eta^2_{\text{partial}} = .026, p = .001$), as well as among other interactions: retail environment color \times product color; product category \times product color; and, the triple interaction retail environment color \times product category \times product color, where sphericity was not assumed ($\epsilon = .722, \epsilon = .891, \epsilon = .979$, respectively). The interaction between retail environment color and product color had an adjusted $F(2.165, 941.703) = 11.351, \eta^2_{\text{partial}} = .025, p < .001$. The interaction between product category and product color also followed adjustment ($F(2.674, 1163.017) = 16.383, \eta^2_{\text{partial}} = .036, p < .001$). And a triple interaction was found between retail environment color, product category and product color, with an adjusted $F(2.936, 1277.133) = 313, \eta^2_{\text{partial}} = .067, p < .001$. Again, only η^2_{partial} related to the three factors interaction showed a medium association between the factors and the purchase intention.

We followed the same procedure here as for perceived product attractiveness. Therefore, the factorial design was decomposed into four single-factor designs to analyze the simple effects of this factor when the retail environment color and the product category remain constant. Hence, the effect of product color was analyzed under four conditions: (i)

orange store and chocolate; (ii) orange store and soap; (iii) blue store and chocolate; and (iv) blue store and soap. The results are presented in Table 5.

Table 5

Synthesis of the analyzed data through repeated measures ANOVA. Significant effects are presented.

| Single-Factor Designs | | | One-way ANOVA with repeated measures and related samples t-test with Bonferroni correction | |
|-----------------------|------------------|--------------------------|--|--|
| Retail environment | Product category | Product color | Attractiveness | Purchase intention |
| Orange store | Chocolate | Red; Blue; Beige; Orange | Sphericity was not assumed ($\epsilon=.952$) Adjusted $F(2.856,1242.444)= 10.146$, $\eta^2_{\text{partial}}= .023$, $p< .001$ Orange vs. Red ($p< .001$; $d'=.22$; $M=6.16$ vs. $M= 5.74$) Orange vs. Beige ($p< .001$; $d'=.14$; $M= 6.16$ vs. $M= 5.63$) Blue vs. Beige ($p= .025$; $d'=.23$; $M= 5.95$ vs. $M= 5.63$) | Sphericity was not assumed ($\epsilon=.979$) Adjusted $F(2.936,1277.369)= 9.816$, $\eta^2_{\text{partial}}= .022$, $p< .001$ Beige vs. Red ($p= .032$; $d'=.26$; $M=6.12$ vs. $M= 5.74$) Beige vs. Orange ($p= .046$; $d'=.18$; $M= 6.12$ vs. $M= 5.80$) |
| | Soap | Red; Blue; Beige; Orange | Sphericity was not assumed ($\epsilon=.920$) Adjusted $F(2.761,1201.073)= 7.264$, $\eta^2_{\text{partial}}= .016$, $p< .001$ Orange vs. Red ($p= .001$; $d'=.18$; $M=6.13$ vs. $M= 5.77$) Orange vs. Blue ($p< .001$; $d'=.22$; $M= 6.13$ vs. $M= 5.60$) | Sphericity was not assumed ($\epsilon=.923$) Adjusted $F(2.769,1204.583)= 11.948$, $\eta^2_{\text{partial}}= .027$, $p< .001$ Beige vs. Red ($p= .045$; $d'=.13$; $M=5.94$ vs. $M= 5.61$) Beige vs. Blue ($p< .001$; $d'=.21$; $M= 5.94$ vs. $M= 5.41$) Orange vs. Red ($p< .001$; $d'=.20$; $M= 6.02$ vs. $M= 5.61$) Orange vs. Blue ($p< .001$; $d'=.25$; $M= 6.02$ vs. $M= 5.41$) |
| Blue store | Chocolate | Red; Blue; Beige; Orange | Sphericity was not assumed ($\epsilon=.888$) Adjusted $F(2.665,1159.225)= 24.610$, $\eta^2_{\text{partial}}= .054$, $p< .001$ Red vs. Blue ($p< .001$; $d'=.29$; $M= 6.29$ vs. $M= 5.56$) Red vs. Beige ($p< .001$; $d'=.32$; $M= 6.29$ vs. $M= 5.52$) Red vs. Orange ($p= .023$; $d'=.14$; $M= 6.29$ vs. $M= 6.06$) Orange vs. Blue ($p< .001$; $d'=.22$; $M= 6.06$ vs. $M=5.56$) Orange vs. Beige ($p< .001$; $d'=.25$; $M= 6.06$ vs. $M= 5.52$) | Sphericity was not assumed ($\epsilon=.923$) Adjusted $F(2.770,1205.011)= 22.888$, $\eta^2_{\text{partial}}= .050$, $p< .001$ Red vs. Blue ($p< .001$; $d'=.29$; $M= 6.14$ vs. $M= 5.42$) Red vs. Beige ($p< .001$; $d'=.32$; $M= 6.14$ vs. $M= 5.37$) Red vs. Orange ($p= .002$; $d'=.17$; $M= 6.14$ vs. $M= 5.83$) Orange vs. Blue ($p= .001$; $d'=.18$; $M= 5.83$ vs. $M=5.42$) Orange vs. Beige ($p< .001$; $d'=.21$; $M= 5.83$ vs. $M= 5.37$) |
| | Soap | Red; Blue; Beige; Orange | Sphericity was not assumed ($\epsilon=.866$) Adjusted $F(2.597,1129.766)= 1.034$, $\eta^2_{\text{partial}}= .002$, $p= .370$ There are no statistically significant differences. | Sphericity was not assumed ($\epsilon=.879$) Adjusted $F(2.638,1147.419)= 4.078$, $\eta^2_{\text{partial}}= .009$, $p= .010$ Beige vs. Red ($p= .032$; $d'=.13$; $M=6.12$ vs. $M= 5.74$) Beige vs. Orange ($p= .046$; $d'=.13$; $M= 6.12$ vs. $M= 5.80$) |

5.2. Sensory and individual evaluation for chocolate and soap.

In order to verify how participants behave when the product is shown individually (i.e., without retail background), they were asked to choose the tastiest chocolate and the soap with the best smell. The same four colors mentioned above, were applied: red, blue, beige, and orange.

A cross-tabulation was computed and Pearson χ^2 was calculated to investigate if the participants' color preferences for chocolate and soap were related or not. Figure 13 shows the preferred color choices for both chocolate and soap. Each participant stated her/his preference for each product, thus causing a sample size duplication.

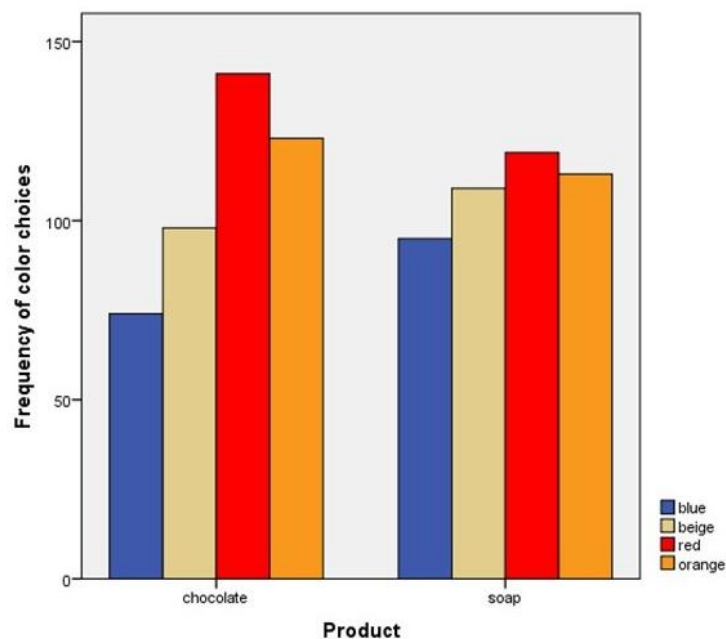


Figure 13

Color choices for both chocolate and soap, considering the sensory and individual evaluation.

Statistically significant differences were found, $\chi^2(9) = 25.003$, $p = .003$. In fact, only 27% of the participants who considered the blue chocolate as the tastiest one chose the blue soap for smell. In addition, 25% participants who chose the blue chocolate preferred a beige soap, 16.2% selected the orange soap, and 31.1% selected the red soap. More agreement was identified among people who preferred the beige chocolate, as 40.8% also chose the beige soap while 14.3% indicated the blue soap and the same percentages of people referred the orange or the red soaps. In the group who mentioned the red chocolate was the tastiest, 29.1% of the participants said the red soap had the best smell and only 19.1% thought the beige soap

was the option. Percentages of participants who chose the blue soap or the orange one, were similar (24.8% and 27%, respectively). More agreement was verified among the participants who preferred the orange chocolate, where 33.3% preferred the orange soap. Again, there was a minority of people who have chosen the beige soap (18.7%). Also, 26.8% in that group preferred the red soap and 21.1% chose the blue soap.

6. Discussion

We aimed to investigate the effect that dominant retail environment colors might produce on product attractiveness and purchase intention. Previous literature did not focus on the interaction between retail environment color and product color. Our results confirm the prediction that there is an interaction between the color of a store and product color. Furthermore, we also found that the product category itself contributes for the significant triple interaction: retail environment \times product color \times product category. Indeed, the analyzed data showed that neither the color of the store alone nor the type of product alone has any significant effect on attractiveness and purchase intention. Both dependent variables showed a similar pattern considering the product choice, when retail environment was considered. As we henceforth discuss, these results may be due to the interaction of the following factors: (i) the symbolic color association for edible and non-edible products; (ii) the complementary colors effect; and (iii) the individual color preferences.

We found the most relevant effect in the blue store, but only for chocolate, where red and orange colors were the preferred choices. These preferences tend to be the same in attractiveness and purchase intention. Specifically, in the blue store, the red chocolate was the most attractive and had the highest score for purchase intention relatively to blue and beige colors. In this context, we concluded that the complementary color contrast – or almost complementary, in the case of red color in contrast to blue – positively influences attractiveness and purchase intention of the chocolate. For the other product – soap – attractiveness and purchase intention did not vary significantly depending on the product color. Considering the orange store, the orange color was the preferred one, for both products, in terms of attractiveness. For purchase intention, the results showed that the beige chocolate was the preferred one relatively to red. For the soap, orange was preferred when compared to the blue soap. We concluded that, for this context – orange store –, the color contrast is not so relevant, since the prevailed choices were beige (i.e. neutral color) and orange (the same color as the retail environment). Thus, our results partially validate H1a and H1b, since both hypotheses are valid only for the chocolate in the blue retail environment.

In line with the literature about product categories, red and orange are the most appealing colors for sensory products (Ampuero & Vila, 2006). Specifically, the products where senses need to be used (e.g., smell, taste, hearing). We chose two sensory products (chocolate and soap), but different in their categories (edible for chocolate and non-edible for soap). We concluded that, in fact, orange and red were the most preferred colors for attractiveness and purchase intention, generally, and considering both retail scenarios. However, bearing in mind the already mentioned triple effect, the chocolate evaluation in the blue store had the strongest effect. We propose that this specific result is related to the contrast induced by complementary colors. The blue background from the blue store (second block of the online questionnaire) might produce such a contrast on the package, that red and orange chocolates turn the preferred choice – the complementary color of blue is orange, and red is adjacent to orange. The referred contrast effect was not valid for the soap. As Bottomley and Doyle (2006) concluded, the products related to cleaning and hygiene are mostly associated to cool colors, namely blue. As a sensory product, the soap has also a cleaning and hygienic association that might prevail, in this context.

Thus, we conclude that a symbolic and unconscious association might happen between this specific product category as a concept (i.e., cleaning and hygiene products) and cool colors. Accordingly, if it would be possible to construct a general symbolic association between product category and specific colors, we could argue that the soap might be related to blue and the chocolate to orange or red. Therefore, the red and orange options for soap did not confirm the complementary colors effect in the blue store, due to the unconscious association between the product category and the blue color. Thus, the product category might moderate the complementary colors effect in terms of attractiveness and purchase intention. This conclusion might be more consistent for attractiveness – considering the soap and the blue store –, since it was the only case in which there were no significant results for the product choices.

Considering the stand-alone color choices for sensory questions (i.e., without the store as a background), we concluded that there was a higher agreement for the preference of beige color. Generally, only a third part of the participants chose the same color for both products, relatively to taste (chocolate) and smell (soap). These results do not reflect the preferred colors associated to smell or taste, for each product. Accordingly, the red soap was the preferred one referring to smell, and the red chocolate was the preferred one referring to taste (followed by orange). Blue was the least chosen color for both products. As we have seen above, these overall preferences differ from that of context-embedded products, thus

validating our initial prediction. When sensory and individual evaluation were considered, both products were preferred in the red color, countering H2. However, for the context-embedded products H2 has been confirmed, due to the varied color choice among products. We thus conclude that the environmental color changes the individual color preference for chocolate and soap.

Color preferences are dependent upon the topic and personal characteristics (Bakker et al., 2013). To test color preferences related to a specific product category, we could hereafter extend our present investigation, also testing the Associative Learning theory (Amsteus, Al-Shaabani, Wallin, & Sjöqvist, 2015). Associative Learning is a principle in which ideas and experiences reinforce each other, being mentally linked to one another (Fodor, 1983). That is, our brains do not recall information in isolation, thus the information is grouped together into one associative memory. Following Amsteus et al. (2015) investigation, and in line with our findings, we could continue to explore the concept that universal associations with colors are different depending on the specific context where they are displayed.

However, our results should be interpreted cautiously. Although we found significant results to test our predictions, the effect sizes could be relatively small – which, anyway, is a frequent outcome for research in social sciences. This means other variables might play a role in the processes studied. Also, larger samples – such as the one used in this study – have increased probability of finding significant effects when such effects do not exist in the population. Therefore, we should be cautious in interpreting results with small effect size.

For future research, we suggest that other variables might be considered, such as arousability (Mehrabian, 1996) and impulsive shopper profile (Mortimer, Bougoure, & Fazal-e-Hasan, 2015), since they tend to affect consumer behavior (Porat & Tractinsky, 2012). High scores in arousability induce to more sensitive reactions (Kwallek, Soon, & Lewis, 2007), namely to colors and environment. Therefore, highly arousable people might have a more sensitive reaction to complementary colors effect.

This research is not without limitations. Firstly, the choice of products' colors was limited to four colors, although this was enough for validating our predictions. However, including more colored options, it would be possible to further investigate the interaction between retail environment and products. Secondly, the products category could be more diversified to test our predictions in a different context (e.g., fashion, restaurants).

To sum up, we verified that the complementary color contrast between the local where products are exposed, and the products themselves, contributes to enhance attractiveness and purchase intention depending on product category. These results confirm and extend prior

research that found spatial characteristics and color contrast to affect consumer behavior. Here we hope to shed new light and extend research on the color interaction effect in marketing, as a tool that will affect consumer behavior.

GENERAL DISCUSSION

The detailed discussion of our results can be found in the three studies included above (Chapter I, II and III). Thus, we will henceforward instate the collective results, and suggest other possible perspectives considering our findings and their theoretical and practical implications. We will firstly summarize the general propose of this investigation.

All over this dissertation we have explored the importance of complementary colors in organizational and consumer behavior. Through the development of three studies, we have emphasized the importance of psychological processes in color perception, the product category, the type of packaging, as well as the dominant environmental color. We have also discussed the interrelation of these concepts and how their interdependence could affect consumers' decision making. The main idea was to analyze how consumers react when complementary colors are used in both packaging and retail environment. Research in color perception concluded that there is a balanced sensation associated to complementary colors (Martinez et al., 2018; Schwartz & Krantz, 2016). Additionally, a maximum color contrast is produced when complementary colors are used together (Itten, 2001). We wanted to analyze if either the balanced sensation or the contrast effect would positively affect product attractiveness and purchase intention.

Our research hypotheses on the effect that complementary colors might produce, were addressed through different methodologies. Bearing in mind that there is always a psychological process intrinsic to color choices (Kurt & Osueke, 2014), we firstly investigated the connection between color and mood states (Chapter I). Hence, we used an experimental within-subject repeated measures design. Through a longitudinal study where participants came to a laboratory room individually, it was possible to accurately assess their color choices and relate them to the tested mood conditions. In the second and third studies (Chapter II and Chapter III, respectively) we chose to deepen our knowledge on complementary colors and its possible use in marketing and retail settings through questionnaires and observation methods. The studied colors were graphically manipulated to induce the visualization of the intended products or retail environment.

To test our research hypotheses, we investigated: (i) the relation between the balanced perceptual sensation afforded by complementary colors and affects – Study 1; (ii) if orange color increases purchase intention and attractiveness of a specific type of packaging – Study 2, and; (iii) the influence of retail environment dominant color in consumer behavior, in terms of attractiveness and purchase intention – Study 3.

We first investigated the psychological association between complementary colors and mood states (Chapter I). To summarize, the main results of this first study that led to our conclusions, were:

- (1) Complementary colors were mostly chosen when an unbalanced mood was induced;
- (2) Cool colors were mostly chosen when sadness was induced – blue and purple;
- (3) Warm colors were mostly chosen when happiness was induced – orange and yellow;
- (4) Non-complementary colors were mostly chosen when sadness was induced.

We predicted that complementary colors were associated to a balanced mood, following the literature about the topic (Mahnke, 1996; Schwartz & Krantz, 2016). However, our results showed that complementary colors were preferred in the unbalanced mood scenario. Additionally, the higher choice of non-complementary colors occurred when sadness was induced. We concluded that these results may be due to the following factors: (i) the existence of feed-forward top-down neural mechanisms (Gilbert & Sigman, 2007); (ii) the symbolic association between colors and emotions; and (iii) the individual meaning attributed to the analyzed emotional states. The feed-forward top-down mechanism could explain the process for color choice, in this specific case (i.e., when a mood state is induced through autobiographic recall, leading to a choice of a colored card which best describes the mood sensation). We suggested that one in an unbalanced mood state might unconsciously look for regaining a balanced condition – consequently, the choice of complementary colors occurred. We are adding that one might actively seek a color combination in order to attain the mood level that one is unconsciously seeking.

The symbolic association between colors and emotions is not separable from our findings. Research on color and emotions concluded that cool colors are associated to negative emotions, as opposed to warm colors which are associated to positive emotions (Dael et al., 2016). Considering that cool colors were mostly chosen in the non-complementary group of colors, we reinforced the fact that cool colors are associated to unbalanced condition. The individual meaning of each mood state could also affect the decision-making process inherent to color choice. The fact that concepts as sadness and happiness might be more commonly understood by people than the concepts of balanced and unbalanced emotions, is also conceivable. Hence, the results demonstrated that sadness had the most significant effect in terms of color choice (i.e., blue and purple), related to non-complementary colors. Also, warm colors (i.e., yellow and orange) were mostly chosen when

happiness was induced. We concluded that it might have been an easier recognition of sadness as a strong emotion, or that specific emotion was induced more effectively.

From the subset of results produced by the first study, and following the hypothesis that complementary color contrast would benefit product perception, we proceeded for the second study. We tested the color effect in terms of attractiveness and purchase intention. To summarize, the principal results of the second study that led to our conclusions, were:

- (1) Anthropomorphic packages were more attractive than the non-anthropomorphic one;
- (2) The green anthropomorphic package was the most attractive;
- (3) Neither anthropomorphism nor orange or vivid green color, increased purchase intention – when compared to the non-anthropomorphic package;
- (4) Parents – regardless of their children’s gender – demonstrated a similar intention to purchase both pink and blue anthropomorphized packages. Thus, sex-typed colors (blue vs. pink) and the consumers’ children’s gender are not associated, in pasta category.

In the first study, we have concluded that cool colors were chosen when sadness was induced, and that warm colors were chosen when happiness was induced. Adding these concepts to packaging, we decided to analyze anthropomorphism applied to a specific product on the market. We assumed that anthropomorphism, in our specific case, had a symbolic association to happiness (i.e., a happy face was smiling for us). Thus, warm colors might potentiate the positive effect of happiness, and that might reflect on consumers choice. For the hypothesis concerning the complementary color contrast, we considered the color contrast between the pasta inside the package (the transparent package material allowed to see the pasta, clearly), and the color of the anthropomorphized brand image outside the package. The main conclusions were that, generally, the anthropomorphized packages increase product attractiveness, but do not affect purchase intention – when compared to the same product using a non-anthropomorphic package. Additionally, the green anthropomorphic package was the preferred one, which might have revealed, firstly, a stronger identification with the brand color *Milaneza*. Secondly, the fact that the green anthropomorphic package produced an almost complementary color contrast between the pasta and the package (vivid green vs. orange-red), led to a higher color contrast perception, positively affecting the product attractiveness. However, we wanted to go further with this evidence about complementary colors effect, testing it in retail environment and products. Thus, our findings led us to the third study.

From the set of results produced by the first and second studies, we proceeded for the third study. Bearing in mind the preference for the vivid green package (second study), we decided to deepen the clue about the effect that complementary colors contrast might produce on consumer behavior. Following the literature that concluded that environmental characteristics (such as color) influence consumer decision making (Donovan et al., 1994), in the third study we tested the influence of a colored retail environment on product attractiveness and purchase intention. To summarize, the main results of the third study that led to our conclusions, were:

- (1) There was a significant triple interaction: retail environment color vs. product color vs. product category;
- (2) Neither the color of the store alone nor the type of product alone had any significant effect on attractiveness and purchase intention;
- (3) The most relevant effect was in the blue store, only for chocolate, where red and orange colors were the preferred choices for attractiveness and purchase intention;
- (4) For the orange store, both orange chocolate and soap were the most attractive; the beige chocolate was the preferred one for purchase intention; and the orange soap was the preferred one for purchase intention;
- (5) The individual product sensorial choices (i.e., without retail environment as a background) revealed that blue was the least chosen color for both products, and red was the preferred one referring to smell (soap) and taste (chocolate) – immediately followed by orange in the case of the chocolate.

The most important conclusion of the third study was that, indeed, there was a triple interaction resulting from retail environment color \times product color \times product category. Thus, we reinforced the idea that color should not be considered individually, but always in the context where it is inserted. Following the complementary color contrast effect relatively to pasta (Study 2) which led to an increase in product attractiveness, we could say that the same effect was replicated in the third study, comparatively to the chocolate in the blue store (orange and red colors are opposite to blue). It appears that emotional and symbolic associations might have occurred, in line with the conclusions from the first study, when complementary colors were chosen after the induction of the unbalanced mood state. The unconscious motivation for choosing a contrasting color for chocolate evoked by a blue store, might be the result of the enhancer effect caused by the store environment. In this case, the product category is relevant since the red or orange soap was not the preferred one. Hence, the symbolic association between orange and red colors to edible products (Valdez & Mehrabian,

1994) might be exalted due the blue color effect, as a complementary color contrast. The same is not applicable for the orange store. In fact, both orange chocolate and soap were the most attractive. In our first study, we concluded that when happiness was induced, warm colors were also chosen. If we could apply the same argument to this specific scenario (orange store evoked a positive sensation rather than a negative one) the results were a replication from the first study. In the orange store scenario, the product category did not seem to be relevant, since both soap and chocolate had the same pattern of choices in terms of attractiveness.

We concluded that the orange color applied in retail environments as a dominant color, did not evoke the need for a color contrast relatively to product choices, at least for chocolate and soap categories. On the contrary, the blue color applied in retail environments as a dominant color, evoked the need for a complementary color contrast in the case of the chocolate, increasing product attractiveness and purchase intention.

To summarize, we conclude that our studies provide strong support for the influence of complementary colors in consumer behavior, due to emotional and perceptual processes. Study 1 determines the evident psychological mechanisms associated to the choice of complementary colors. Study 2 reveals that both anthropomorphic packaging and color (vivid green color, in the tested scenario) are techniques that can be used to increase product attractiveness. Also, we hypothesized that the complementarity of colors between pasta and the package itself enhances the effect on attractiveness. With Study 3, we extend the findings concerning complementary colors and attractiveness, confirming that color is an underlying factor existing in the complex relationship between retail environment, packaging and product category.

1. Theoretical and practical implications.

Physiologists have linked the complementary colors effect to perceptual and physiological aspects (Conway, 2002). However, the behavioral consequences resulting from the application of this type of color harmony (i.e., the complementarity between colors is one of the various color harmonies), have not been integrated with consumer behavior or organizational behavior literature. Through color and space theories, we merge the color psychology literature with the management knowledge. Specifically, organizational and consumer behavior literature. Hence, we firstly examine how the symbolic meaning of color affects behavioral attributes in workspaces, such as performance, mood and wellbeing. Managers should be attentive to spatial quality since, as we have mentioned before, this is determinant to foster a healthy and productive organizational environment.

Secondly, our research also contributes to the literature by helping marketers to manage effectively the marketing outcomes related to brands and retail environment. In-store marketing could benefit with the knowledge of color: for example, logos, advertising and packaging could enhance consumers’ attention and brand memory, using the influence of color (Labrecque et al., 2013). An attractive package enhances consumer assessment and might increase brand attachment (Rauschnabel & Ahuvia, 2014). Exploring the effect that complementary colors might produce on attractiveness is crucial to define aesthetic aspects related to the product, but also related to the space around it. Similarly, considering that the context where the product is inserted is critical for the consumers’ evaluation, not only the surrounding space but also the product exhibitors should be thought in terms of color, to meet the brand strategy.

Color exists everywhere around us and we can use it as a tool. With this research work, we expect to underline the pertinence of the influence of color whether in the context of marketing or in other type of spaces. The concept of emotional balance associated to complementary colors, and the disclosure of inherent emotional processes as showed in Study 1, has a direct applicability into the diverse types of space (e.g., workspaces, clinics, schools, hospitals). Consequently, the knowledge about color might be used by managers, marketers, designers and architects to choose an appropriate color scheme for space, furniture, logos, websites, storefronts and packaging (Figure 14).

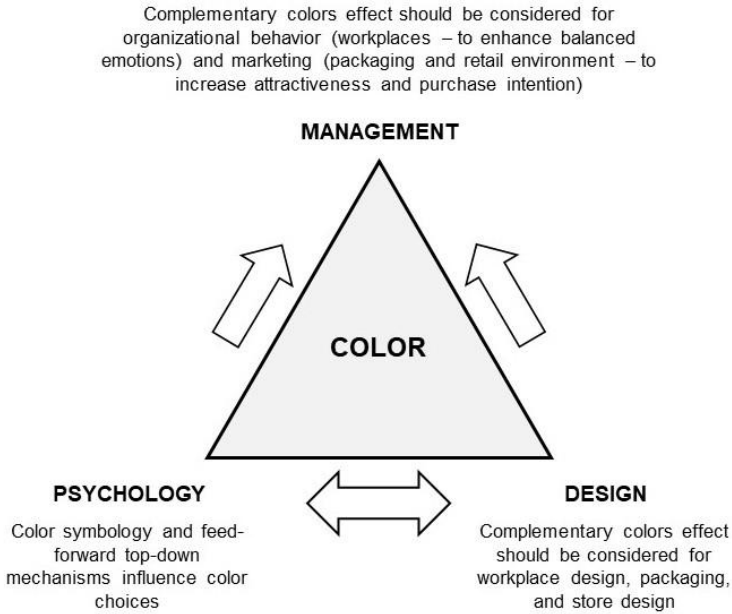


Figure 14
Implications between Psychology, Design and Management.

Nevertheless, there are no static and simplified rules for color. As we have seen, the applicability of color might differ by product category and the space attributes should be carefully observed. Brands should use color to help in their strategic development, as well as spatial considerations must be considered to create the most comfortable and healthy environment.

2. Limitations and future research.

Our investigation including three studies about color is not without limitations. Firstly, when talking about color, its three components (hue, brightness, saturation) naturally arise in our mind. In our studies, we did not test for the brightness and saturation variation, but we did only focus on hue. Secondly, although we have controlled the physical conditions from which participants were perceiving colors (Study 1) we did not control for computer screens and their standardization (Study 2 and Study 3). We suggest, for future research, that other colors might be tested in similar scenarios, to verify the complementary color contrast effect between other pairs of colors. Additionally, the conclusions obtained from each of the studies might be further developed through other experiments, in order to further test the hints that arise through our investigation, such as: (i) test if the blue color as a dominant color in retail environment, also evoke an increase of attractiveness and purchase intention in edible products with the color orange or red; (ii) test the same setting as the considered in the first study, adding other negative and positive mood states, in order to obtain more detailed conclusion about psychological processes and symbolic association to colors; and (iii) test the complementary color contrast in packaging, through different types of packages (e.g., transparent and non-transparent packages – food *vs.* graphics in packages –, exhibitors *vs.* packages).

3. Conclusion.

This thesis has necessarily been selective, given the extensive research and interrelated areas in the color field. Notwithstanding, we validated our prediction about the presumed effect of complementary colors, both emotionally and in retail settings. The herein information about color is an important validation since it constitutes one more step for the science world, proving that color is more than aesthetics. Thus, color has a recognized influence on one's cognition and behavior, with practical implications. However, research on color still has a long way to go due to its inherent perceptual and contextual complexity. We believe that by furthering our knowledge about color through scientific investigation,

pertinent insights will arise into the nature of perception and behavior, probably leading to thought-provoking findings.

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APPENDIX

Ishihara's Color Blindness Test (short online version with 8 plates) – Study 1

This on-line color vision test consists of 8 plates taken from the PIP 24 Plate Color Vision Test. Participants had 3 seconds to identify the number on each of the plates.

Script – Study 1

This script was presented in paper sheets, in person. Four conditions were tested (happiness, sadness, balanced mood, unbalanced mood), individually.

Observation grid – Study 2

The observation took place at Continente and at El Corte Inglés supermarkets.

Script – Study 2

This script was structured on Qualtrics™ platform. Participants were approached via email and in person.

Script – Study 3

This script was structured on Qualtrics™ and Prolific™ platforms. Participants were approached via email and through social networks (i.e. Facebook).