



Universidade do Algarve

Faculdade de Ciências e Tecnologia

# The impact of sensory marketing in pharmaceutical industry

**MOHAMAD TAREK SAID**

Dissertação para obtenção de grau de mestre em Ciências Farmacêuticas

Trabalho realizado sob a orientação:

**Professor Doutor Pedro Ricardo Martins Lopes da Fonte**

2023



**UAlg FCT**

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*“Most of the important things in this world have been accomplished by people who have kept on trying when there seemed to be no hope at all.”*

**Dale Carnegie**

## **Acknowledgments**

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## **Abstract**

People can perceive their surroundings, including market or shopping environment through sight, hearing, touch, smell, and taste. Often, senses play a key role in the selection and preference of a specific product. Thus, sensory marketing is crucial, because it is defined as a process engaging customer sense to influence their behavior, memories, emotion, choice, perception, and therefore consumption. The pharmaceutical industry is huge, with a market value of 2.8 trillion dollars worldwide. The pharmaceutical marketing has increased in the last 20 years with spends of nearly 30 billion dollars. Sensory marketing strategies are assumed in the pharmaceutical field, by pharmaceutical industry to differentiate themselves from other competitors by applying distinguishing sensory features (color, smell, name, taste, texture) to the products. It can also be used by community pharmacists to create a pleasant buying environment. These strategies are not only used for marketing reasons since they may have a potential role in improving patients health and avoiding medical confusion and errors. The main aim of this dissertation is to focus on the fundamentals of consumers behavior, neuromarketing and sensory marketing, understanding how these advanced approaches leverage insight from neuroscientific studies to influence consumer behavior. Also, it focuses on the importance of stimulating the sensory system to evoke emotion and memories and understand how pharmaceutical companies can incorporate sensory elements into their product, packaging, and marketing campaigns to enhance customers trust and loyalty. Furthermore, it will be discussed how dosage forms can influence patients adherence to treatment and improve the therapeutic outcome.

**Keywords:** Consumer behavior; Sensory marketing; Pharmaceutical industry; Dosage form; Medication error.

## **Resumo**

As pessoas podem perceber o que as rodeia, incluindo o mercado ou o ambiente de compras, através da visão, audição, tato, olfato e paladar. Muitas vezes, os sentidos desempenham um papel fundamental na seleção e preferência de um produto específico. Assim, o marketing sensorial é crucial, porque é definido como um processo que envolve os sentidos do cliente para influenciar o seu comportamento, memórias, emoções, escolhas, percepções e, por conseguinte, o consumo. A indústria farmacêutica é enorme, com um valor de mercado de 2,8 trilhões de dólares em todo o mundo. O marketing farmacêutico aumentou nos últimos 20 anos, com gastos de quase 30 mil milhões de dólares. As estratégias de marketing sensorial são assumidas no domínio farmacêutico pela indústria farmacêutica para se diferenciar dos outros concorrentes, aplicando características sensoriais distintivas (cor, cheiro, nome, sabor, textura). Os produtos e podem também ser utilizadas pelos farmacêuticos comunitários para criar um ambiente de compra agradável. Estas estratégias não são utilizadas apenas por razões de marketing, uma vez que podem ter um papel potencial na melhoria da saúde dos pacientes e na prevenção de confusões e erros médicos. Esta dissertação centra-se nos fundamentos do comportamento do consumidor, do neuromarketing e do marketing sensorial, compreendendo como estas abordagens avançadas tiram partido de estudos neurocientíficos para influenciar o comportamento do consumidor. Além disso, centra-se na importância de estimular o sistema sensorial para evocar emoções e memórias, assim compreender como as empresas farmacêuticas podem incorporar elementos sensoriais nos seus produtos, embalagens e campanhas de marketing para aumentar a confiança e a lealdade dos clientes. Também, discute como as formas de dosagem podem influenciar a adesão dos doentes ao tratamento e melhorar o resultado terapêutico.

**Palavras-chave:** Comportamento do consumidor; Marketing sensorial; Indústria farmacêutica; Formas de dosagem; Erro de mediação.

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## **List of abbreviations and acronyms**

**OTC** – Over the counter

**EEG** – Electroencephalography

**MEG** – Magnetoencephalography

**FMRI** – Functional magnetic resonance image

**TMS** – Transcranial magnetic stimulation

**PET**– Positron emission tomography

**SST**– Steady state topography

**GPCRs** – G-protein-coupled receptors

**FDA** – Food and drug administration

**PVC** – Polyvinyl chloride

**PCDPD** – Patient centric pharmaceutical drug product design

## 1. Introduction

Consumers usually try to collect enough information and usually think carefully before taking any purchase decision. But with a lot of comparable products on the market, why do consumers take quite different purchase decisions? The big question is: is the consumer the absolute owner of the purchasing decision? Do the companies follow a strategy to influence our purchasing decisions? Do they intentionally target our senses with this strategy? The distinctive color of some brands, the music that is played on Television commercials or in stores, the smell of products, all do not exist randomly or by coincidence (1).

Marketing is the process that companies follow to present its product or service to the consumers. Companies are always trying to develop innovative marketing strategies to attract consumers attention to their products. However, this remains a big challenge, due to the big variation of the products in the market which increases the competition between companies. Companies need to search and develop innovative marketing strategies to differentiate themselves from others and to attract the most part of consumers. They have been focusing on consumers subconscious mind by studying consumers behavior, and their buying decision to discover what do consumers really look for to satisfy their needs. To achieve this knowledge, companies usually use neuroscience, to understand consumers minds, and know what does affect their behavior and purchase decision toward a product (2).

The pharmaceutical industry is one of the world largest industries, with a market value of about 2.8 trillion dollars worldwide (3). Only the over the counter (OTC) market exceeded 162 billion-dollar (4). Europe pharmaceutical market share is 23% of global pharmaceutical market, the total European pharmaceutical value at ex-factory increased from 89.4 billion-euro in 2000 to 208,949 billion euros in 2017. Where Portugal pharmaceutical market value was 3,560 billion-euro (5). Such numbers could not be achieved without marketing for sure, so pharmaceutical companies have a long history of using and developing marketing strategies to differentiate themselves from competitors, in which the market has comparable products.

Traditionally, pharmaceutical marketing has relied on information and rational appeals, focusing on clinical efficacy, safety, and scientific evidence(6). However, as consumer expectations evolve, there is a growing recognition that emotional and sensory aspects play a vital role in shaping brand

perception and fostering brand loyalty. The pharmaceutical industry has started to embrace sensory marketing to engage with customers on a deeper level, triggering emotional response and building lasting connections, enhancing consumers trust with the brand. This marketing strategies focus on turning the products to a whole sensory experience that meet consumers needs (2).

This dissertation will focus into the theoretical framework of marketing and pharmaceutical marketing , consumer behavior, neuroscience, neuromarketing and sensory marketing concepts, by understanding how do human mind work and how do sensory cues can influence the consumers behavior. Then it will move on to study the human senses, and the impact of sensory marketing in the pharmaceutical industry , showing how pharmaceutical companies can integrated sensory stimuli to their pharmaceutical products to enhance consumer experience and brand perception. Furthermore, an overview about products preference, and the relationship between product, packaging design and drugs dosage form with patients preferences and will discuss how multisensory design for pharmaceutical products and their packaging can help reduce medication errors and optimize patients treatment.

## **2. Marketing and pharmaceutical industry**

Marketing is defined as the activity that a company takes to promote the purchase of a product or service (7,8), and since the 1950s, it has been considered as the process that any company needs to perform to present their product or service to the consumer (8). The most common marketing model is called mass marketing. This model aims to reach the widest audience possible, by appealing the entire market rather than one targeted group, to achieve a higher number of sales and maximum brand exposure. Herein, it is believed that general advertising is what is needed to get to the market, where the consumer is treated as a viewer only, and the company has a short-term exchange with them (9). This model has been widely used because it is simple, but currently, there are more offers in the market and the competition between companies is bigger, which makes this model not enough (10).

Marketers have realized that it is not enough to focus only on the product or service, but also on consumers and the relationship with them (1). Companies then started to shift towards a new relational strategy, considering relationship marketing. This model ended the idea that consumers are

only viewers, by involving them in the process, which creates buyer and sellers interaction and long-term relationship. However, the relationship model did was not enough and did not give much success (9). Therefore, the sensory marketing model has surged, which is the model that puts the human sense and mind at the center of companies focus. This model aims to influence consumer decisions by focusing on engaging their five senses, where the product is present as an experience that involves their sensory system, creating emotional connection with the consumers (1). With the high number of information and comparable products from different brands that are exposed in the market, consumers can prefer some brand upon the other, like for example, some prefer reference medicines over generics, as in the case of antibiotics or pain killers. Marketers started to wonder about the reason behind these preferences and found that consumers are not buying considering only the therapeutic value but are also influenced by product sensorial experience (11).

The evolution of marketing in the pharmaceutical industry has significantly changed over the years. Pharmaceutical marketing is big business, and it continues to grow at a rapid rate. In fact, the marketing spend in pharmaceutical sector has increased by 70% in the past 20 years and now totals about 30 billion-dollars. Traditional marketing strategies in pharmaceutical industry have revolved around vigorous product marketing of the prescription drugs, the strategy usually target the physician and the pharmacists, where patients need were not the main goal. Traditional marketing channels for pharmaceutical drugs usually take two paths. The first marketing channel is direct to consumer which includes tv advertising. This channel has marked a total spending of 6 billion dollars in 2016 with 663000 Tv advertisement. The second marketing channel is direct to provider, payer. Where pharmaceutical companies approach physicians, and pharmacists directly to sell them prescription drugs and offers them free samples. This marketing channel has marked a total spending of 20 billion-dollars where 13 billion-dollars were spent on free samples only(6).

With advancements in technology, changes in regulations, and shifts in consumer behavior, pharmaceutical companies had to adapt their marketing strategies to remain competitive and effectively reach the consumers. The personalized marketing helps pharmaceutical companies to personalize their customer, by leveraging patient data such as medical history and treatment preference, giving the chance for pharmaceutical companies to tailor their messages to a specific audience (7,8).Pharmaceutical companies also started realizing the importance of sensory marketing in creating a deeper connection with consumers, which made them start to integrate these marketing strategies

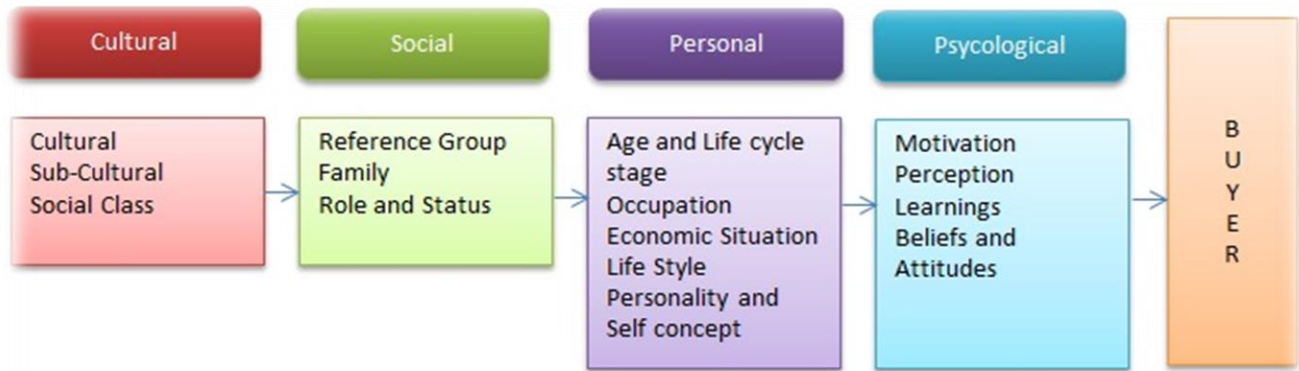
into their product and campaigns. The integration of sensory marketing in the pharmaceutical industry reflects the evolution of marketing and the adaptation to the changing in consumer behavior where consumers look to buy the whole experience not only the product, whether because this experience create a positive emotional bond or its just give them better felling and satisfy their needs.

### **3. Consumer behavior toward pharmaceutical products**

Consumer behavior in marketing can be described as the study of human behavior during the purchase process of a product or service which meet their needs (12). Understanding consumer behavior is good for marketers. Consumer behavior is a complex system that marketers try to understand to be able to discover why do consumers chose a certain product over others. By understanding and answering this, marketers and companies can be a step ahead of other competitors, increasing the probability of a brand or product to be chosen. Therefore, data about consumers allows companies to define the market and identify threats and opportunities (2).

Understanding consumer behavior in the pharmaceutical market is especially important to pharmaceutical companies to meet consumers needs and improve patient treatment. By considering the factors that influence consumer behavior pharmaceutical companies can develop strategies, provide accurate information, and enhance the overall consumer experience. There are some factors affecting consumer behaviors before buying pharmaceutical products such as, information about product, brand loyalty and price, but also packaging and dosage form are usually factors that could potently influence consumers behavior (2).

Since consumers have different behavior which means not all consumers share the same interest, in other words consumer behavior is influenced by different factors, these factors are culture, social, personal, and psychological, as shown in Figure 1.

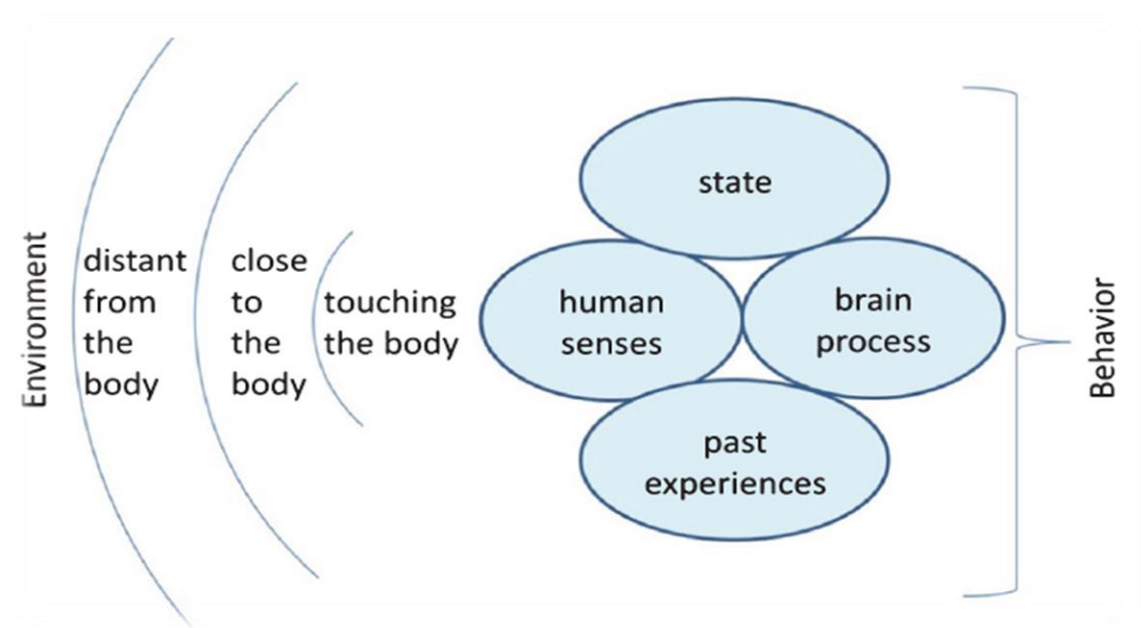


**Figure 1.** Factors influencing consumer behavior. *Reprinted with permission from: (2)*

Cultural factors include culture, knowledge, values, and behavior, consumers learn from close society members as family members. The subculture: is a group of people from the same social class who share the same values based on common life experiences. Social factors involve reference groups or opinion given to a group of people that exerts their influence on another group of people. The family and the person social position in the reference group (2).

Personal factors: include consumer age, lifestyle whether they follow a special lifestyle , economic state, occupation, self-concept, and personality. Psychological factors involve the motivation as the force that drives a consumer to seek their satisfaction, the prescription is the process consumers use to select and rate information, and finally the beliefs and attitudes (2). By considering these facts marketers will be able to understand consumers behavior better, to give the right offer that suits each consumer and satisfies their needs. Expecting consumers behavior is not easy especially that each consumer has different way of act, sometimes even the same consumer could have various acts and behave (13).

The human sensory system also plays a huge part when it comes to human behavior. The sensory system captures the information of the environment as shown in Figure 2. The figure shows the human sensor noticing the environment, the brain processing the input and the behavior. The process may commence as follows, these sense organs detect a stimulus in the environment , then a signal will be send to brain to be processed, during this processing between the sense and the brain, experience, and state (exited or relaxed ) , paly it role and all together will influence the behavior (14).



**Figure 2.** The process of behavior is stimulated by the environment . *Reprinted with permission from (14).*

### 3.1 The decision-making process

The decision-making process is the last step individuals make before taking a buying decision, this process is more applied in case of buying a new product. Kotler has identified the decision-making process as a five steps process as shown in Figure 3 (15).



**Figure 3.** The decision-making process as five steps purchasing process. *Reprinted with permission from (16).*

Recognition of need occurs when consumers become aware of a problem to solve or a need to satisfy. Such needs can be stimulated by a conversation or even by an advertisement. Information search occurs after consumers identify their needs, so they attempt to collect information about their target, with the help of various sources, whether personal or using other platforms. Evaluation of alternative is when consumers collect enough information, so they start to compare between all the opportunities they have available, and normally the decision is based on logical information, but sometimes the choice is based on emotional inputs. Purchase decision is the moment when consumers decide to make a purchase. This decision can be influenced by some factors such as an opinion or advice from someone trusted by the consumer, or unexpected occasions such as a price discount. Post purchase evaluation is the reaction consumers have after using the product or service. If the consumer needs are satisfied a good relationship will be built between consumer and brand, if the opposite happened, will cost the company a consumer loss and bad publicity.

Consumers usually spend money, for two reasons which are purchase or investment. Herein, two systems will do the judgment and take the final decision, the first system controlled by emotions and memories, while second system its more objective required more mental concentration, in most of the people system one is the dominator (17).

Noteworthy is the fact that consumer behavior towards pharmaceutical products varies across individuals as each consumer prefer a brand or dosage form , health conditions as its chronic situation or not , and cultural contexts as it depends on the information collect from other consumers. To meet consumer needs effectively while ensuring the safe and responsible use of such products, it is crucial to understand these factors and personalize marketing efforts, product information, and healthcare services according to them.

### **3.2. Neuroscience and neuromarketing**

Understanding consumers minds is overly complicated. Trillions of dollars are spent each year on studies about the human brain, and more than 400 billion dollars are invested in advertising campaigns (18). Pharmaceutical companies are one of the biggest ones that invest in advertising to increase their sales and promote new products (18). Each year they invest millions in creating and developing products, but unfortunately, a lot of products fail to bring consumer attention and make no impact on consumer memory. These fails are attributed to both marketers which stick to using the old marketing methods that is only focused on selling products, without paying attention on consumers needs. which make them ignore field as neuroscience that help to understand consumers needs and behavior(19,20). By refusing to use neuroscience they were losing a particularly important chance to understand and predict consumer minds and behavior (19).

Neuroscience is an area that aims to understand human behavior and reaction in relation to specific environments and situations by observing their process of decision making (1). The concept involves from the study of a single cell to the study of various brain areas and complex brain interactions. Neuroscience allows to understand the brain that control, emotion, reactions, and decisions, by using neurobiological methods and techniques that follow neural activity that reflects a main feature of the cognitive and behavioral process of the human brain, especially the one related to memory and attention (21). The use of neuroscience methods in marketing does not have a long

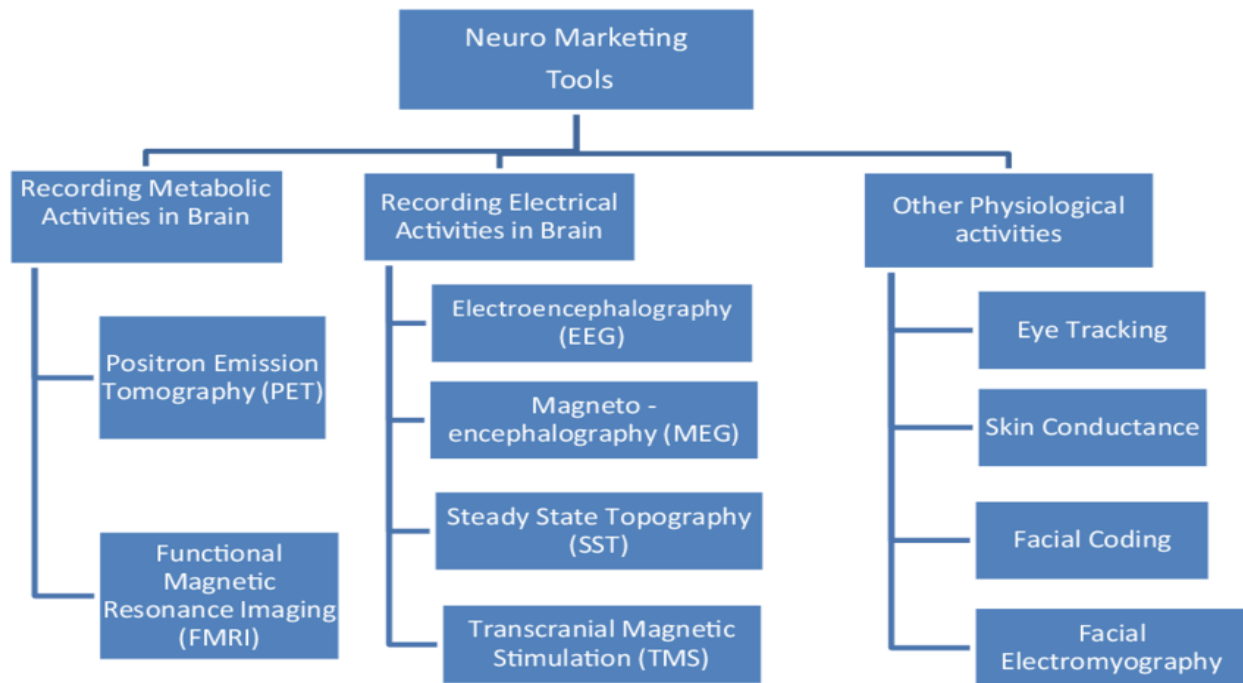
history compared to the other traditional methods. Thus, the combination of neuroscience and marketing has generated a new field that is called “neuromarketing,” which gives attention to consumer behavior from a brain perspective by applying neuroscience techniques (22). In 2002 Nobel prize winner Ole Smidts has defined neuromarketing for the first time as “the study of cerebral mechanism to understand consumer behavior to advanced marketing strategy” (18,23). Lately, multiple definitions of neuromarketing have been developed as some researchers defined it “a field that focuses on the marketing implication from understanding the interaction of cognition and emotion in human behavior based on neuroscientific methods” (20). Basically, neuromarketing studies the responses of the brain to marketing communication (22).

Neuromarketing studies are very interdisciplinary, since it relates to knowledge from marketing, management, psychology, and different medical fields specifically (neurology, psychiatry, radiology). Neuromarketing in university research has increased and gained more attention in the last few years. For example, in Spain, one fourth of all Spanish universities are conducting research in the neuromarketing field, which makes it one of the most developing disciplines (24,25). In 2008, Hubert and Kenning reported more than 800,000 Google hits for the term ‘neuromarketing’ (21), and in 2012, the same search yielded over 1.4 million hits, underlining the continuing interest in this topic (20). Marketers should not consider neuromarketing as a threat or replacement to the traditional method but as a complementary method to improve marketing by combining both techniques and getting the best solutions and results (26).

### **3.3. Neuromarketing techniques and advertising**

Neuromarketing has offered a chance to observe both conscious and unconscious mental processes. This opportunity is possible using many techniques that measure neural activity and understand brain reactions, when exposed to different stimuli (22).

Neuromarketing techniques are methods that are used to help marketers to discover emotions, and reactions of the consumer (22). There are three types of neuromarketing techniques divided according to brain activity as shown in Figure 4. They are techniques that record the metabolic activity of the brain, techniques that record other physiological activity, and other techniques that record the electrical activity of the brain (27)



**Figure 4.** Classification of neuromarketing tools based on brain activity. *Reprinted with permission from (27)*

There are three methods that are considered safe for research purposes, which are: electroencephalography (EEG), magnetoencephalography (MEG) and functional magnetic resonance image (fMRI) (19).

The EEG method detects the change in the electrical currents of brain waves. It is the most used in neuromarketing, due to the ability to capture information at an amazingly fast speed about 1millisecond. This method allows researchers to measure if the stimulus degree , the chance of stimulus being memorized , besides its not expensive method and portable (19).

The MEG is the method that analyzes and registers changes in a magnetic field that have been induced by the electrical activity of the brain. MEG gives a better temporal resolution and spatial resolution than EEG, but it is an expensive and non-portable method (19). The fMRI method measures brain activity based on blood flow, or it measures the amount of oxygen received in a different brain area, and it can study emotional response and deep brain structure, with 10 times better spatial resolution than MEG but with a lower temporal resolution, besides its very expensive and nonportable with a lot of equipment (19).

Besides the methods mentioned before there are others that are also used such as SST (steady state topography), which record brain activity used in neuromarketing tests on television advertisements (18).

Pupilometers: which is a device used on individuals to measure the dilation of pupil in response to a visual stimulus helps to measure consumers attention to stimulus .

Eye tracking: focus on where the eyes are looking and focusing on helps to indicate which stimuli grab consumer attention more(18).

Skin conductance: measures the changes in the electrical properties of the skin in relation to moisture helping to measure consumers reaction to environment (22).

After years of using and trying different techniques, neuromarketers found that there is a subdivide that helps in taking decisions. The thinking brain (conscious mind), it is the rational brain in charge of logical thinking. The emotional brain (subconscious mind) is responsible for feeling and emotional processes. The old brain (reptilian mind) controls the essential functions such as heart beating, breathing, which is considered more primitive and a memory mind, playing an important and crucial role in process of taking decisions. They participate on decision making process while watching advertisements or being in shopping seeing, touching, and trying products, so they participate in the buying process. In the case of pharmaceutical products, it has been discussed which of them play the key role in decision making. Most investigators have agreed and claimed that the emotional brain plays the biggest role in decision making, as they believed patients create emotional bond with the products. Many pharmaceutical companies have realized the importance of neuromarketing in promote different products, so they even started to try and evaluate neuromarketing methods to find out which the most effective way that brings consumer attention in order to select the best advertisements, where they record the brain activity of a group of consumers. Then, they are asked some fundamental question like, which commercial are more attractive and why, and which is the most memorable part of the commercial and what do consumer remember more about the commercial, whether if it is the name, the music, or the color. This allows the pharmaceutical companies to identify what grab consumer attention, to choose the best commercial, and reduce the costs. Marketers aim to influence the customer who is watching the advertisement by targeting both reptilian and emotional brains.

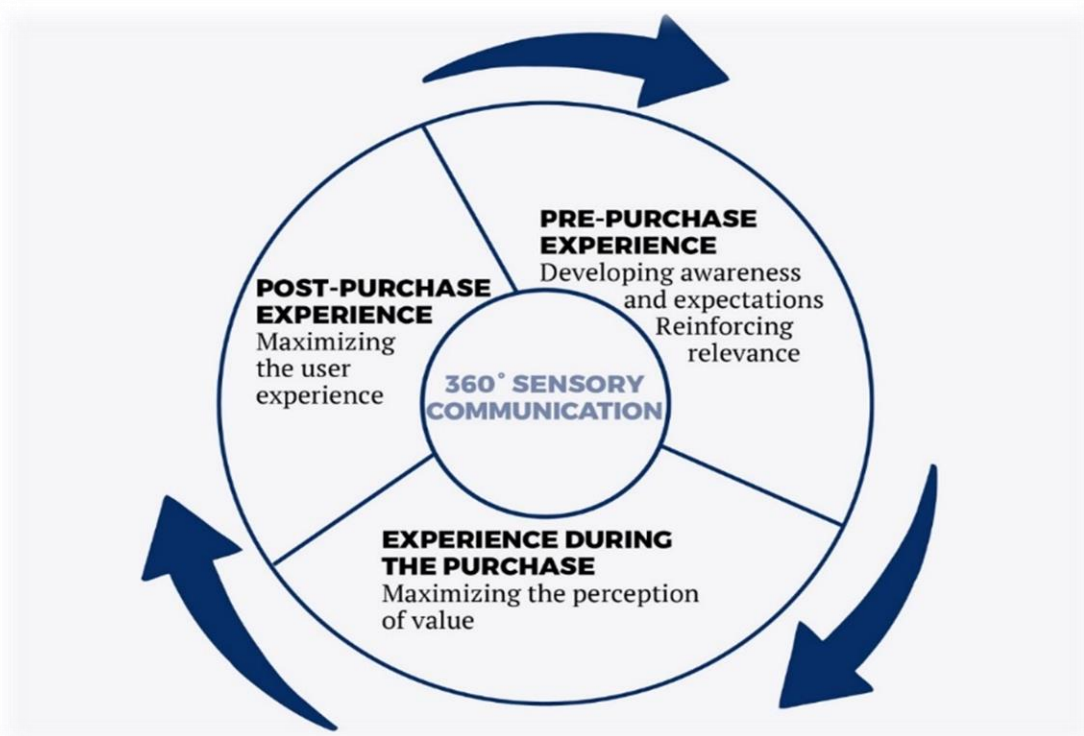
Advertising should be clear and easy to understand, by following some strategies, such as: (self-centered) by focusing only on consumer more than anything else and not even the product. It should be all about the consumers and their own benefits. For instance, it needs to deliver a positive message, that taking pharmaceutical products is going to help them to get longer and healthful life. Advertising should also play an emotional response, as human brains are attracted easily by emotional factors, for example, adding to the commercial babies, animals (dogs, cats), and nice sounds will make the advertisement more emotional and desirable to watch. The human brain is visual, a nice colorful photo or a video is worth a thousand words sometimes, as over 50 percent of the brain is devoted to processing visual images, and 80 percent of learning is visually based (18). Using contrasts using the words before/after, with/without, could help consumers to fix more information about the product. The ways to grab consumer attention are a lot for each product and the respective commercial, selecting the right tools that are going to influence the commercial, and considering different age, culture, and education is a key factor (28).

#### **4. Sensory marketing**

The five human senses have been ignored for a long time in marketing for not knowing the significant role they play in the purchase process, so nowadays interest in integrating human sense with marketing is getting bigger (29). The first sign of sensory marketing can be seen as the companies start to change their marketing strategy from focusing on selling only to pay more attention to product form. Sensory marketing is defined as a process for engaging customer senses to influence their behavior, memories, emotion, choice, perception, and therefore buying decision (30). The emergence of sensory marketing can be attributed to two key factors. Firstly, scientific research, particularly in the field of neuroscience, has influenced the marketing industry. Neuroscience provides valuable insights into the cognitive and emotional processes that impact perception, behavior, and emotions. Secondly the evolution of global markets has led to increased competition among companies.

As it is known that the buying decisions are driven more by emotions rather than rationality, companies are compelled to seek out innovative strategies to differentiate themselves and stay competitive against other companies (31). These led to the development of three principal areas of activity. The first one is the “360° sensory marketing” which focuses on the creation of consumer

experience pre and post purchase , by giving information about the product before buying , then giving the chance for consumer to live experiences, finally giving follow back to consumer after buying the product, as it is show on Figure 5. The second area aims to harness all the five senses in a combined manner guiding the whole sensory experience toward a single target by involving all sense in one experience . The third one consists of using the sense to consolidate the brand with a sensory signature whether a distinguish color or smell or packages form .



**Figure 5.** Steps of the 360° sensory marketing to identify and follow every point of contact between companies and consumer, before buying, during the purchase, and after purchasing. *Reprinted with permission from (31)*

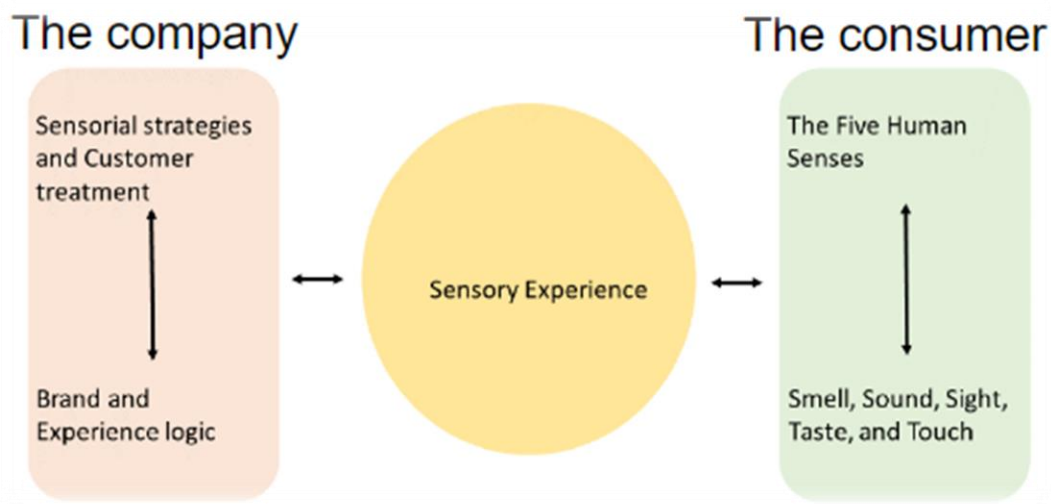
Sensory marketing has become an indispensable method because it is a combination of what modern society expects from a company, and what a company can do to create a sensory experience that satisfies and give consumers what they look for. It has become a tool to strengthen the connection between a company or brand and consumer. Some sensory researchers attempt to study the influence of sensory stimulus on products. For example, some marketers attempt to study the effect of touch and claimed that influences consumer attitudes and impulse buying behavior

(32,33). In another study, it was claimed that the ambient scent increased consumer viewing time making them able to recognize unfamiliar brands (34).

Sensory marketing has found its way into various industries, including pharmaceuticals. In the pharmaceutical industry, sensory marketing techniques are used to enhance the overall brand experience, by adding sensory elements to the pharmaceutical product and packaging will increase consumer memorability and lead to higher brand recognition, and better therapeutic process.

#### 4.1 Sensory experiences experimented by consumers

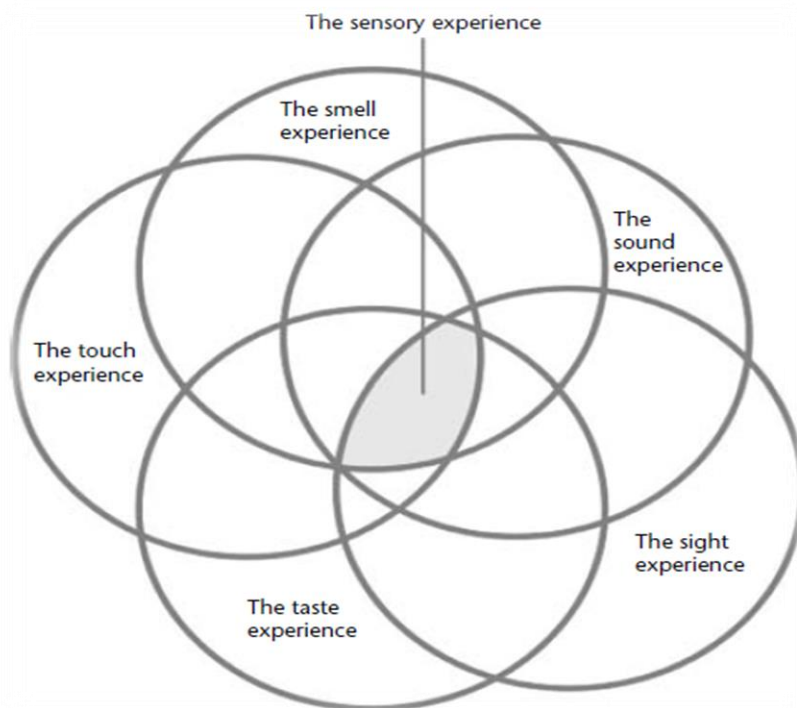
Creating the right sort of sensory experience has turned a priority for companies as they believed that stratifying and memorable experience can create a better connection and live longer with consumer, where they try to establish a sensory experience that involve the five senses, the main goal of these experience is to build an emotional bond with the customers and making an imprint on customer memory toward the service or product. A sensory experience could be defined as an interaction between the consumers five sense and the sensory stimulus provided by company, as shown on Figure 6 (1).



**Figure 6.** Sensory experience is presented as an interaction between consumer senses and what the company offers . Reprinted with permission from (1)

The aim of these experiences is to establish a bond with consumers by engaging both the rational and emotional aspects of the brain, where the subconscious mind (emotional mind) reliefs in automatic decision making and behavior based on memories and past experiences (31). More sensory stimulation means more communication and better experience, which increases the chance to influence consumers shopping by driving their attention to the products target. This offers a big opportunity for marketers to take advantage to ensure the success of the product in long term, an also increase the patients treatment by giving a better buying experience, turning the brand or the product enjoyable and faithful in consumer mind (1,35).

Kotler has identified a consumer buying experience as a process of “adding value for customer buying products and services through customer participation and connection, by managing all aspects of the encounter” (36). To secure a successful consumer experience, all five senses should be involved as shown on Figure 7, where the sensory experience is a result of the combination of all senses experiences vison , touch , smell , hear and taste (1).



**Figure 7.** Sensory experience is a result of the combination of all five senses experience. *Reprinted with permission from (1)*

A memorable experience would be experienced by the consumer which it is an especially important pillar for a successful service and product (37). The use of the five senses allows companies to create a more meaningful relation and connection between customers and products, or services, researchers confirmed from what consumers have been buying that they are looking to buy an emotional experience not product/service by its own, The goal of creating sensory experience for the pharmaceutical companies is not only to establish a brand name and differ themselves from other companies, but also to create an emotional link with patients, which reflect for positive feeling from the patients toward the pharmaceuticals, encouraging them to continue their treatment with more acceptance and less risks, by giving the patients a trustable and at the same time desirable experience while using pharmaceutical products.

Products and services are normally presented to customers in selling environments such as stores, community pharmacies and others. Designing a sensory environment will generate an emotional effect in the consumer, giving them a better experience with the buying environment and making their buying process more enjoyable. Kotler had identified the four main sensory terms which construct the buying atmosphere sight, sound, scent, and touch, as presented in Table 1. The fifth sense taste does not apply directly to atmosphere, because atmosphere is seen, heard , smelled, and felt but not tasted (38).

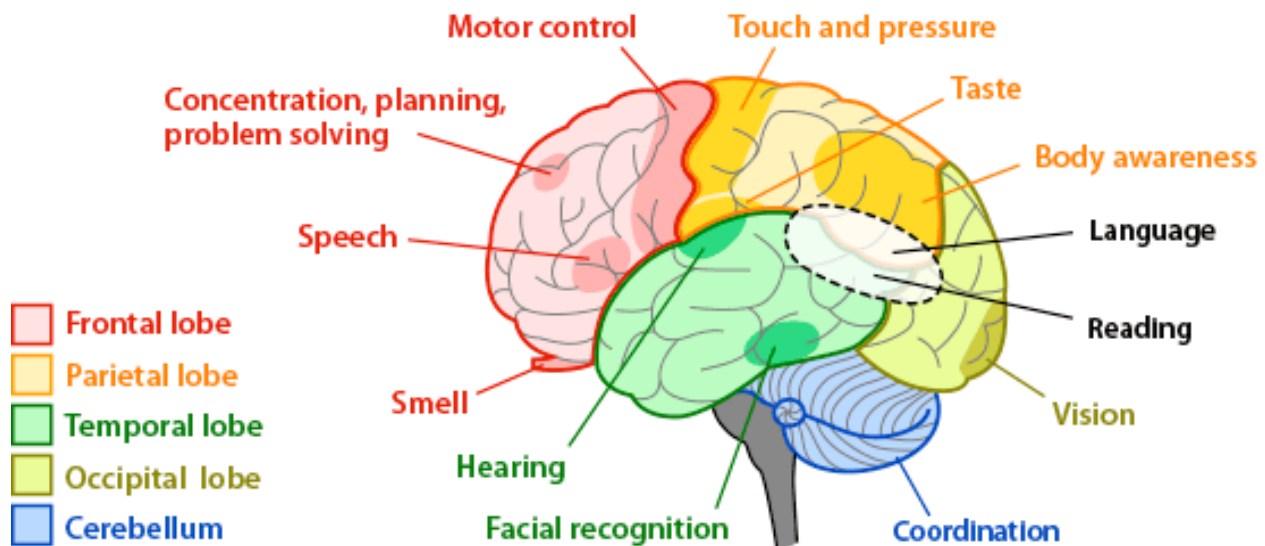
**Table 1.** Senses and aspects contributing to a sensory buying atmosphere. *Adapted with permission from (38)*

<b>Senses</b>	<b>Sensory stimulus</b>
Visual	Color Brightness Size Shape
Auditory	Volume Tone
Olfactory	Scent Freshness
Tactile	Softness Smoothness

This sensory environment strategies could also be applied on community pharmacy where patients pick up their medication and they are exposed to other healthcare products and services provided by community pharmacy such as (blood presser test, blood glucose test, and more), creating a pleasant atmosphere that engage patients senses inside the pharmacy. This helps patients to be more relaxed, especially during healthcare service, as most of the patient get anxious before doing these tests. A desirable atmosphere also helps the pharmacists to deal with patients as many patients feel nervous and confused while they are receiving their medicines. Pharmacists can help and calm down the patients, by giving them a better explanation about the medications and better pharmacotherapy monitoring. Adding some sensory features to the environment, such as a pleasant smell, calm background music, nice illumination ,and product organization in appealing ways helps the consumers find what they want. This creates a more welcoming and customer focused environment, which increases consumer satisfaction and loyalty. Furthermore, it allows pharmacists to give better services and recommendations for patients.

## 5. Human senses

The human senses are a fundamental aspect of human existence the information to understand and interact with the environment around, the play a crucial in human daily lives in various aspects as awareness, safety, communication, pleasure, and emotions (14,39). Each one of the five senses is related to a specific part of the brain called lobe, as shown on Figure 8. The frontal lobe controls the smelling sense but also controls body movement, speech, concentration, and problem solving. The parietal lobe control sense of touch and taste together with body awareness. The temporal lobe is responsible for hearing, emotion, and memory. The occipital lobe governs the vision. Also, there are two more lobes which are the cerebellum control body balance and coordination, and the limbic lobe, which is responsible for emotions, despite that these lobes are specific sensory function, but the brain is highly interconnected and sensory processing involves multiple brain region working together. The different lobes are responsible for processing and interpreting sensory information, and they work together to create a perfect sensory experience (40).



**Figure 8.** Brain lobes and related senses. *Reprinted with permission from (41)*

Each of the five senses has its function and property which give access for different experiences. The sense of vision plays a key role when it comes to collecting information through illumination,

colors, choosing the right colors for products and their packaging while influencing consumer perception toward the product. The sense of hearing comes right after vision in terms of collecting information, selecting a good advertisement that provides enough information will help consumers to learn more about the product. The sense of olfaction and the sense of taste plays a key role in memory. Selecting a desirable smell and adorable taste helps to create a positive memory with the product. The sense of touching plays a key role in collecting information by touching and feeling the objects around them, choosing the right materials will influence consumers decision toward the product, by following these strategies pharmaceutical industry will be able to create a product that can influence consumer positively toward their product (29).

### **5.1 Human sensors**

Each human sensor acts as a transducer that is made up of two components which are the receptor part and the transformer part. The first one captures all kinds of stimulus that grab attention and consequently produces some act and behavior. The stimulus should be in the right quantity to affect the receptor (42)

The second part converts and reproduces this reaction to create a signal that is sent along the nervous pathway system. This part is way more complicated than the first one due to the number of sensors given and distributed to the receptive area. The touching sense is a good example to explain this, since the many tactile sensors that exist on the tip of the finger can reproduce many sensory experiences like pain, hot, cold. The first action in the process is done through the receptor cell which is linked to the first order afferent neurons which collect information, and act as a switching point that receive all kind of sensors inputs. These inputs will be consequently moved to the second order afferent neuron and received by a sensory receptor to stimulate the brain and create an action.

The sensory system uses special sensory receptors called G-protein-coupled receptors (GPCRs), and Ion channels, to detect small molecules and mechanical movements. Both receptors play a part in sensory transduction pathways by initiating or adjusting stimulus evoked responses. GPCRs and ion channel, are detectors of taste, when GPRCs play the biggest part in vision and olfactory, and ion channel predominate in hearing and somatosensory, as demonstrated in Table 2. Sensory receptors that are responsible for vision, hearing, taste, smell, and equilibrium are mostly located on the head, while the receptor that detect touch, heat, cold, pressure, and pain, are mostly found in

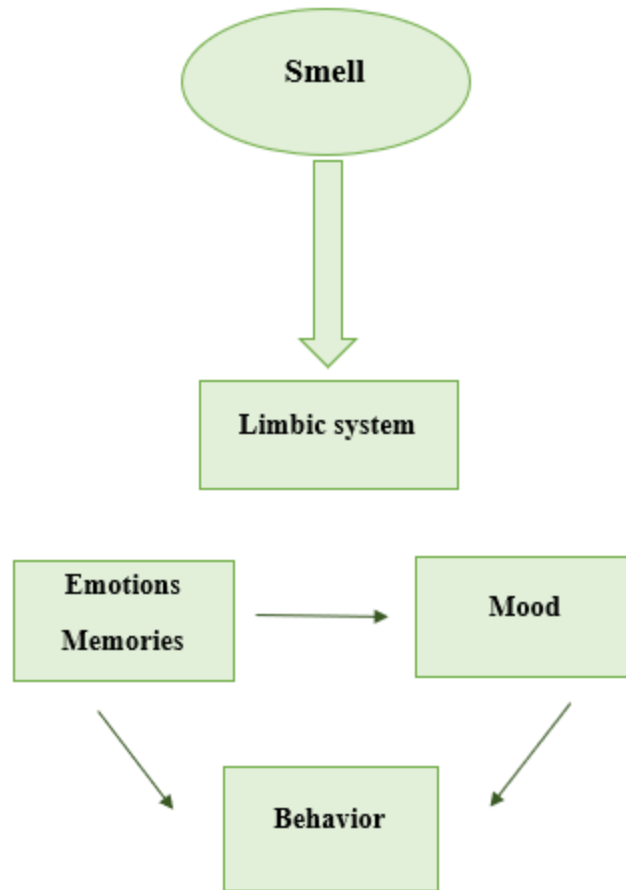
the skin which is called the somatosensory (43). The human brain and the sensory system use adapting mechanism to avoid overwhelm and keep attention by filtering every signal letting only the strongest one or the most important to pass through (42,43).

**Table 2.** Senses and respective sensory receptors. *Adapted with permission from (43)*

<b>Sensory modality</b>	<b>Main receptors</b>
<b>Vision</b>	GPCRs
<b>Smelling</b>	GPCRs
<b>Hearing</b>	Ion channel
<b>Taste (sweet and bitter)</b>	GPCRs
<b>Taste (sour)</b>	Ion channel

## 5.2 Odor

The smell sense plays a major part in stimulating human emotions and memories. It is the most direct sense, since the sensory receptors transfer information directly to the limbic system, the emotion part, which explains why humans react faster to odor in comparison to other sensory inputs (Figure 9) (1). About 75% of human emotions are connected and based on smell (44). smell can change consumers mood, a smell of nature such as (the sea, forest, roses) give a freshness and calming feeling (45). The human nose can distinguish and memorize more than 10,000 scents, which makes smell the strongest sense in evoking and creating memories. Consumers associate most of their memories with specific smells, as a study showed that 80% of men and 90% of women associate their memories and experience with a particular smell, like homemade bread, candy, or any other scents people used to smell when they were young, sometimes it is enough to trigger childhood memories (44).



**Figure 9.** Effect of odor on consumer behavior. *Reprinted with permission from (46).*

Smell has enormous influence on memory, marketers paid more attention to adding scents to products or stores because they believed it could be the most remarkable factor in consumer sensory experience. Scents can be used in marketing, to create a brand and product identity, differentiate, and even for advertising (1). Applying scent to a product or to a store will influence consumer spending time and purchases behavior. It will create a memory in consumers minds, whether about the store, the product, and even the service given. Consequently, consumers will associate this scent with this product or store and rebuy the product again because it generates memories and emotions(47).

Fragrances ingredients are substances extracted from natural origin, or synthetically made. These ingredients are added to products to give a pleasant smell, or to mask an unpleasant odor (48). The use of fragrance is widely applied and plays a key role in create identity of personal care products

such as (shampoo, skincare, and deodorants) (45). Consumers are not only searching for just functional products nowadays, but they also looking for a product with a pleasant smell, which can identify them and satisfy their emotions (47).

The addition of scents can also be used by the pharmaceutical industry to improve medicine and patients therapeutic process. There are a few types of medicines such as nasal solutions, creams, medicines for treatment of the throat, and breath spray. The smell in these types of medicines requires more attention in comparison to other pharmaceutical products because it is a key factor of medicine acceptable level. Scents of sea give a feeling of clearness and relief is usually used for nasal solutions, while sweet scents as honey which give a sense of comfort are used for throat treatment. Fresh scents as menthol are commonly used in breath sprays, and usually fruity and sweet scents are used for creams and skin care products (48).

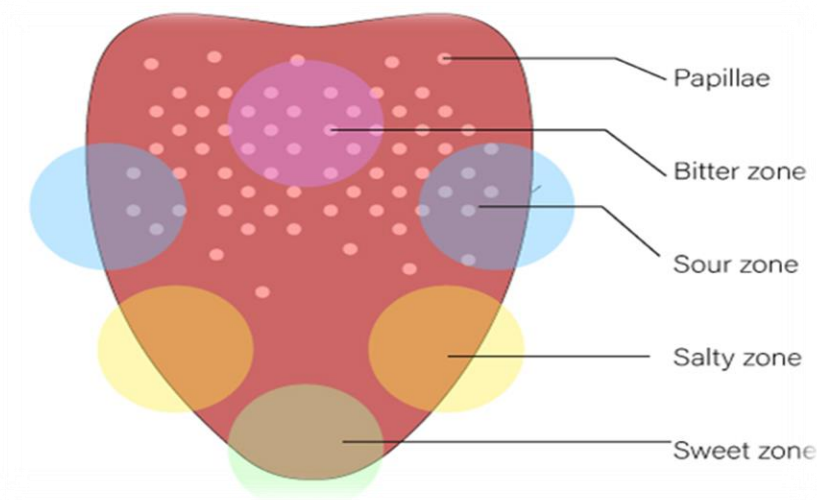
The addition of sweet aromas and fragrances in medicines for children is quite important to increase their acceptance and create a good memory in their mind (48). Sweet scents such as vanilla and lavender are recommended in children products. These scents can promote a relaxing feeling (49). The scents can have an impact on the therapeutic process, since some evidence showed a positive placebo effect in relation of cough medicines which most of it had an herbal scents. They believed that these scents would bring positive memory and emotions, and consequently influences the placebo effect of the medicine (50). Another study showed the influence of ambient odor in reducing patients anxiety. It was claimed that the smell of orange released in the healthcare centers including in the community pharmacy, helped to reduce patients anxiety (51).

Using scents in marketing is a highly effective tool, to influence consumer emotions and create memories and experience (1). But it can also lead to creating bad memoirs and experiences, in case of not selecting the right fragrance, can lead to provoke allergies in some consumers, as in case of some fragrances as (rosemary and peppermint) are likely to cause allergies, which can affect the product and the company negatively (52).

### **5.3 Taste**

The sense of taste plays an important role in every human life ,on the physical, survival , emotional level. Eating and drinking are associated with happiness and good memories .The taste is detected

and identified by taste receptors known as taste buds, humans have around 10,000 taste buds located on the tongue, there is four types of flavor that taste buds can detected which are sweet, sour, bitter, salty, each flavor is detected in different tongue area, sweet on the tip on the tongue, sour on the side of the tongue, bitter on the back of the tongue, salty on the whole edge of the tongue (1) as it is shown in Figure 10.



**Figure 10** .The four tastes and their location on the tongue. *Reprinted with permission from (53)*

Taste buds get weaker by age, and by getting old it will be harder to recognize flavor, while babies and young children have the strongest taste capacity (54). Together with the sense of smell they represent the only chemical senses where taste experience is strongly influenced by smell. Most of taste perceptions are smell perceptions, since the nervous system uses the sense of smell to distinguish different tastes, if the sense of smell is decreased by a stuffy nose for instance, perception of taste is usually reduced as well (44). Besides smell, taste can be influenced by other senses, such as vision, hearing, and touch. It was observed the interaction between vision and taste, showed that colors can influence taste perception (55). The experiment showed that participants blind to the color of a fruit drink, can only identify 20% of the flavor, whereas they were able to identify 100% when they saw the drink color (56). In the case of some consumers, touching is especially important to evaluate the quality of the product, as a study have shown that, the taste of the same water was evaluated in a different way when it was given in two different types of glass (57).

Surprisingly, sound also plays an effect on taste. A research study was performed to study the effect of sound on taste, where they record participants while eating chips and ask them later to hear themselves in a headphone. It appeared that the louder the sound of the bite, the fresher the chips were in consumers mind (58). All the senses cooperate with taste to give people the wished sensory experience.

Taste is an important parameter for patients also to guarantee their compliance. A lot of patients have difficulty or even sometimes refuse to take their medicines and food bulking agents, due to the bitter taste (54). Usually, it occurs some adherence problem when it comes to oral antibiotics, and the reason for this problem is mostly the bitter taste (59). Pharmaceutical industry has been using some techniques to mask the bitter taste of their product, to improve product and patients compliance to treatments (60). Palatability of medicines is a particularly important fact to achieve patients compliance and acceptance, especially for pediatric products. To improve the taste of the product, pharmaceutical industry use masking techniques like adding sweetening and flavor agents (61). Sweet taste is the most preferred taste for most people whether children or adults (62). The use of sweet taste has a long history with pharmaceutical products, as honey is widely used for cough treatment in children and adults (63,64). That could explain the fact that most cough medicines have a honey taste or other sweet taste where actually sweetness has a more than pleasant taste effect (65,66). Sweet taste shows a positive placebo effect on cough treatment besides the analgesic effect (67). Sweetening agents are added to oral pharmaceutical formulations, in pediatric formulations, to mask the unpleasant taste of medicines, and increase treatment acceptance it could be of natural origin like sucrose, sorbitol which is also used as a non-calorific for diabetes patients, or from artificial origin like saccharin (68). The sweetness degree of artificial agents is much higher than natural ones. For instance, saccharin is 500 times sweeter than sucrose, unlike nature sweetening agents, artificial agents are not metabolized in the body (69,70).

Flavor agents are also widely used in pharmaceutical formulations, since flavoring is incredibly significant in pharmacy, even patients start to create an association between some type of product with a certain flavor, such as citrus flavors and flu and antihistamine drugs (68). Flavor preferences can be also influenced by age. Children prefer fruit and sweet flavors, some adults prefer the acidic taste, while many elderly people prefer mint taste. It has been proposed a guideline for some classes of drugs with suitable flavors as presented in Table 3. Where antibiotics sweet flavor is used,

to make it more acceptable . For antihistamine and flu drugs, citric taste is used because it is given sense of freshness. For barbiturates, a sweet taste is also used to give a relaxation sense provided by cinnamon. For electrolyte solutions both sweet and citric taste are used because it gives sense of freshness and energy (71)

**Table 3.** Some drug classes with preferred flavors. Adapted *with permission from* (71)

Drug class	Preferred flavor
<b>Antibiotic</b>	Cherry, banana, strawberry, vanilla, raspberry
<b>Antihistamine</b>	Apricot, orange, lime, cinnamon, honey, peach
<b>Barbiturates</b>	Cinnamon, banana, vanilla, strawberry
<b>Decongestants &amp; expectorants</b>	Anis, apricot, mint, pineapple, lemon, orange, butterscotch
<b>Electrolyte solution</b>	Grape, lemon, raspberry, cherry, grenadine

As children have a stronger sensory system, helps them to detect and discover the taste, smell, and craft a first impression and memory whether they like or dislike it (72). Medicines need to be as palatable as possible for them in taste, smell, and appearance (73). As the sweet taste is more preferred for children, volatile flavors like bubble gum, and fruity flavors, can help to induce children to take medicines (72). The sense of taste is incredibly significant for consumers perception of every consumable product. Consumers do not buy products that do not taste good, but they always search to buy products that satisfies their taste. Together with the other sense, taste participate in the consumer sensory experience, which will create a good or bad memory of the product (74).

#### 5.4. Sound and name fluency

Sound is the way people use to express themselves, they tell others who they are, what they stand for, and how they feel and express their opinion. People even use sounds and music to express their feelings (1). Life is a constant cacophony of auditory information, and each day every person is exposed to a substantial number of sounds, which make the ear an overdeveloped organ. From the jingle of the radio station to the traditional Microsoft tone that people hear when turn on computers (75). Sounds influence mood strongly, as it creates feelings and emotions, (44). Besides this sounds can trigger the memory, people are able to remember sounds from an earlier time in their life, and listening to childhood music is enough to trigger feelings and memories of the place it was played in (1). Therefore, sounds play a key role in product and retail environments and have been used in marketing for a long time to communicate with customers and give them awareness about companies and their products through Tv and Radio commercials. Many companies have created an identity and signature by using sounds, for example, Microsoft® and Nokia®, create a unique tone that people can recognize their companies by listening to that tone only (44).

The pharmaceutical industry has also used auditory marketing to promote itself and its products. The pharmaceutical company Bayer has made an advertisement where music and sounds were used to promote their product Alka-Seltzer®. The advertising goes like this: “*plop, plop, fizz, fizz, oh what a relief it is*“. The use of sounds was not only for advertising reasons, but also to make awareness about medication fast action. The commercial was ranked as number. 13 on the list of top 100 campaigns of the twenty century. Later the sound “plop fizz“, turned a sound identity for all Alka-Seltzer® products (45).

Sound symbolism and product names are other aspects that marketers pay much attention. Sound symbolism refers to the fact that certain sounds are associated with specific object properties (76). A lot of studies have demonstrated that the fit between product category and brand name can affect preference (77,78). The name of a medication is particularly important to ensure marketing success, but choosing a good name is not something simple at all. The medicine naming process starts several years before launching the product. Most of the time pharmaceutical companies pay agencies up to hundreds of thousands of dollars, to create a name for their products (79). There are some rules that pharmaceutical companies need to follow in the naming process. It cannot sound like another product to avoid medical misperception. It cannot make any medical or promotional

claim. The medicine name also should not contain any indication, exclusivity, superiority, and risk minimization. For example, the FDA rejected a name for an insulin medication called NovoRapid®, because it indicates that it is faster acting than other competitors, and the name was changed to NovoLog®.

The medicine name also cannot promise efficacy or guaranteed results. For example, hair regrowth company Rogaine, was not allowed to sell their product under the name Regain (80). But it can have a name that implies what it is does like (Levitra®) that comes from “levitate.” Also, it can indicate when it is used like (Lunesta®) came from “lune” that is moon in French.

Consumers usually count on the first several letters to distinguish similar names. That led marketers to use some letters that are easy to pronounce and avoid the hard ones. For example, letters P, T, D, K, Q, C, R give the name a strong sound, which makes it the most effective letters for marketing purposes. That explains the fact that the first two letters combination PR is common in medicines name, like (Prozac®) (81). The letters X, Y, and Z are widely used in medicines names because it is associated with efficacy, and it is a letter easy to remember (79). Over the time these two letters became associated with pharmaceutical companies and their products like the letter Z is associated with GlaxoSmithKline (Zyrtec®), and X with Pfizer (Xanax®) (82).

Letters like S, L, M, are soft letters, usually suited to lifestyle and women products, like birth control pills (Yasmine®, Alessa®, Seasonal®) (80,81), while letters like H, W, and J are avoided because it is difficult to pronounce or have a different sound in other languages (81). Producing a simple name is quite important, since complex names are perceived by patients to give side effects, which can influence patients buying decision and consequently the companies market share (83).

Meanwhile, some pharmaceutical companies have followed innovative marketing strategies to promote their product (especially erectile dysfunction medicines). By sponsoring a sports team like Pfizer when they sponsor a Viagra car on the NASCAR circuit and Levitra sponsors the New England Patriots professional football team. Where Eli Lilly’s used their product name Cialis to decorate a yacht in the America cup race, Eli Lilly also sponsored the competition. The main reason behind these marketing campaigns, besides promotion, is to send a message to consumer that these products represent force and strength (81). By choosing a medicine name, companies need to satisfy the public by creating a name that is easy to say and remember, but companies also need to have in count the physician who are going to prescribe, recommend, and sell the medicines.

Physicians prefer more scientific names that make a connection with chemical composition and the use of the drug. Companies have established a group of letters, called stems which are conventions used to indicate pharmacological related substance, the drug stems are consisted of syllables that came at the end (suffixes) or on the beginning (prefixes) of the name,(84). For example, the stem “coxib,” indicate drugs that belong to class COX-2 inhibitors such as Celecoxib ®. The “mab” is another stem that denotes monoclonal antibodies such as Infliximab ®. These stems help the physician to remember the drugs and what they are used for (85).

Choosing a suitable name for a pharmaceutical product is quite important as choosing the right color (73). Pharmaceutical companies attempt to find a name that is memorable, sound attractive, easy to pronounce in different languages and is not offensive in another cultures (80). But with a lot of registered names in the market already, it has become a big challenge to produce a name that is distinctive and memorable, safe, and not already in trademark or sounds like other medicines that already existed (84).

### **5.5 The texture and design of dosage forms and packaging**

Touch is the sense where stimuli make direct contact with the human body (skin), which people can discover ambient, temperature, and objects that surround them (86). Touch creates a sense of form, as, it allows people to know that a knife is sharp, or a stone is hard without the need to touch it every time, but by memory that has already been established since the first experience (29). After vision, the sense of touch is the second dominant sense in perceiving products and their quality and decide whether consumer like the product or not before buying it (86). This makes it a tool of transmission process for emotions, feelings, and information, increasing in this way the physical and psychological interaction between firms and consumers leading to better sensorial experience (1).

Patients are in daily contact with medicines, mostly with oral formulations, namely tablets, since it is more common and preferred among patients, also to the fact that it is cheaper to the manufacturers (87). The design of tablets could present many problems that can affect patients therapeutic process, and one of these problems is dysphagia (88). Especially old people suffer from dysphagia, or they found tablets hard to swallow (89), due to some properties as shape, size, or even surface

texture, which can affect swallowability (88). Pharmaceutical industry can work to solve this problem, by work on products design (shape, size, texture) to make easier to swallow and more acceptable (90).

The shape and design of a product can help and influence consumer perception toward product (73). Alongside the fact that dosage forms shape, form, and size, play a role in drug release rate (91,92), and it can also influence patients therapeutic process (93). Angular shaped tablets excite more energetic effect in the body with longer performance in relation to the curved tablets, which introduce more calming effects with less performance (94).

The unfamiliar shape of the angular give impressions of surprise and interest (95), but it is also associated with a negative feeling, such as fear, anger, anxiety, and irritation, while emotions such as joy, pleasure, and relief are associated with curved tablets (94). It was previously observed that angular shape is less preferred in comparison with curved shape medicines (96,97). The shape of tablets could give various impressions to consumers whether on, swallowing difficulty or effectiveness. Angular or diamond shaped tablets were expected to be more difficult to swallow, but more effective, whereas curved shaped were expected, easier to swallow but less alerting and effective (98).

The size of tablets was reported to be the main problem due to swallowing difficulty as expected. Large size pills (tablets and capsules) are strongly disliked among patients, as a study showed that some patients preferred to take several medium tablets than taking a single big tablet because they found it really hard to swallow. The same study also found that small tablets with a size of 5 mm or less were less preferred among patients, because they found it disposed to stick to gums, difficult to sense or it gives the patients an uncertain sensation of whether it is still or not in the oropharynx. The same study suggested the dimension for tablets, would be between 6 to 13 mm in length, referred that is the medium size tablets (90).

Texture is a particularly crucial element when it comes to product acceptance. Texture acceptance is built based on several factors, such as cultural, physiological, and emotional, and these factors are most of the time based on experiences. Also, the age of consumers influences their behavior toward texture, since younger consumers seem to be more likely influenced by texture. Especially in relation to products that are consumed through the mouth. Slimy, gummy, viscous, and hard

texture, are strongly disliked among consumers due to the fear of choking. Babies and young children usually refuse to take food that has a hard texture, which made the food industry to have special attention to the baby food lines by making it softer and smoother (99).

In relation to tablets texture, coated tablets are the most common and more liked among patients in comparison of chewable tablets. Patients usually think it will stick to mouth recesses, so patients are more disposed to smooth coating tablets and find it easier to swallow, giving them a better sensation over uncoated tablets (90).

Topical drug formulation as pain relievers can be a perfect alternative of oral formulations, with properties of applying directly to the local which provides a transdermal drug delivery and reduce the side effects of drugs (100). Unfortunately, most of the time consumers ignore these kinds of pharmaceutical products due to its texture whether its sticky or greasy, making it difficult to spread, taking more time to be absorbed, and leaving some residue behind, so these kinds of texture does not satisfy consumers expectations (101).

Compared to the cosmetic industry pharmaceutical industry did not pay too much attention to how their topical products feel when it is applied, but they focused on efficacy (45). Recently, pharmaceutical companies have shown a big interest in developing the texture by improving the ingredients of their products to be more acceptable to consumers (102,103). The new topical products must be effective, but it is also needed to have appealing aesthetics to prove itself in the market, a better sensory property of a product like how it looks or feels can improve patients compliance and give the patients a better feeling (104). Adding some texture agents to products can help to change product aspect and appearance, making them more enjoyable to consumers. Texture agents are used in pharmaceuticals and cosmetics formulations, to improve or change their aspects such as thickness, viscosity, and stickiness (68). The addition of such agents can strongly contribute to patients compliance, so patients would have a better feeling applying the topical formulation. Texture agents exist in natural forms such as polysaccharide gums or they can be synthetically produced and can be mixed such as Glyceryl dibehenate /compritol 888 or used individually like coconut oil. Besides making the product more pleasant and acceptable, they can improve the product life and stability (105).

The packaging design (shape, texture, and weight ) affects the way people see and judge the product. Consumers most of the time attempt to touch and evaluate the packaging multiple time before

judging the product and buying it (106). Packaging as a definition it is a combination of different materials, that are sold with the product for various interests such as protection, transport, storage, marketing, and providing information for patients for use and identification (107). Most of the pharmaceutical companies in Europe use blisters made of PVC and foil to package medicines, unlike the USA which use bottles (108). The blister form had introduced more safety in consumers life by reducing the incidence of suicide by overdose (109), or by taking medicines by mistake or accident (110). Packaging is not only a tool to protect, and transmit drug information it could have more impact as a way that pharmaceutical companies use to communicate with consumers (111).

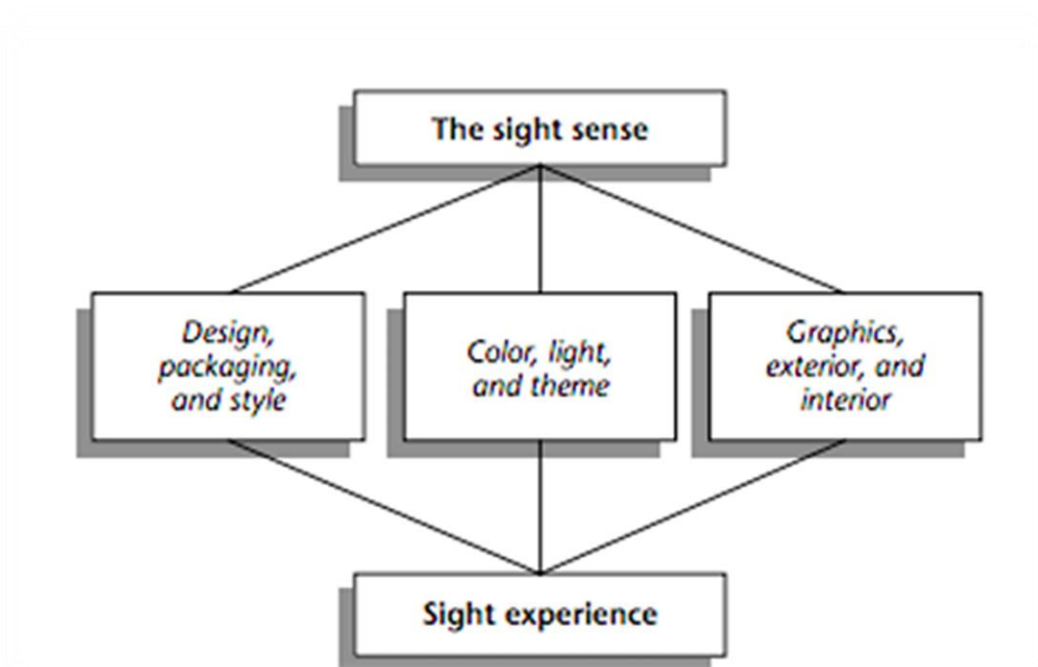
The shape of packages can also influence consumer perception toward the product since it can transmit different meanings. For example, angular shape indicates aggressiveness and contradiction while curved denote harmony and calm (112,113). Due to this information, an angular package can reflect to consumer an experience of stronger product compared to curved packages products (114). Package weight is another aspect that consumers use to evaluate products (106). Most patients expect the heavier drug packages to be more effective but more likely to present more serious side effects, and more expensive in comparison with lighter drug packages(115). A group of patients most of them old, preferred bigger size packages than small ones for reasons like it is easier to manage and distinguish from the other medicines packages (116). Study about packaging designs, have reviewed some pharmaceutical product packaging design including, eyedrop dispensers, blister packs, screw top containers and childproof containers, and others. Eyedrop bottles are preferred in comparison to individual use eyedrop containers, for the biggest surface area that bottle have, make it easier to handle and to use as patients claimed (117). Patients prefer to use the traditional screw top bottle opening system over the other opening system as the click-lock system, as they found it much easier to manage.

Patients were left to choose between the different designs of blister opening system, push-through design for tablets and slide system for suppositories were the most liked and preferred ones, because they found it more comfortable to use and easier to open in comparison with other blister design opening systems as peel-push and aluminum or plastic wrapping, which they found it harder to open (116). Numerous packages have been designed to satisfy patients needs like dose dispensing devices such as inhaler, or to remind patients of their medication and help them to avoid confusion (118), such as multidose dispensing system (119), calendar packaging (120), pill box and

bubble packages (121). Overall, packaging design is a particularly important perspective that the industry should pay attention to, it needs to get the consumers both functional and emotional satisfaction.

## 5.6 The relation between vision and colors

The sense of vision is considered the strongest sense when it comes to receiving information and recognizing a brand or a product. The connection between the eyes and the brain is very fast and 45ms it is enough for a person to identify the objects surrounding, which gives the fact that 80% of the information is obtained by it (46). The sensory strategy when it comes to vision focuses on light, color, shape, and packaging. Together this sense expression will participate in the process of creation of a successful sensory experience and brand identity, Figure 11 shows, the sense of sight can be influenced through, design, packaging, color, light, them, graphic, to create a vision experience (1).



**Figure 11.** Interaction of visual stimulus to create a vision experience. *Reprinted with permission from (1)*

Colors play an important part in every daily activity , which makes it more like signals and codes associated already with individuals subconscious. For instance, the red color while walking or driving means stop because it provides information for risk. Green gives the sensation of safety, and black and yellow could indicate danger or risk. Colors could transmit both impacts either positive or negative, based on consumer expectations, understanding, or experiences, they could generate different emotions and feelings, from energetic, aspiring, and warmth to gloomy, bored, and cold (122). Colors play a key element in marketing, understanding colors and what they represent is a big step toward a successful and memorable product. It affects consumer behavior by stimulating their emotion and mood, giving an advantage for companies to select the proper color for products and their packages (123). Colors can transmit different meanings and emotions to the consumer (123,124) as figure 12 demonstrates.



**Figure 12.** Colors and it reflects meaning to consumers.

When it comes to human behavior and reaction in relationship to colors, there are two different explanations which are, the reaction to colors could be innate or learned (123). The first one suggests that the brain produces emotional reactions depending on provided color, where the second one claims that experience creates reaction to color. Before choosing product color it should be in mind that colors can have associations from culture to culture (125). For instance, the color white

in East Asia means funerals and death (126), while in New Zealand and the USA means peace, purity, and happiness (127). Blue in East Asia is perceived as cold and evil, but as cleanliness in India (123), where blue indicates femininity in the Netherlands, but in the UK, indicates masculinity and is perceived as trustworthy and quality (127). Green in Malaysia denotes disease and risk (126), whereas in Japan and the USA green is a sign of happiness, adventure, and good taste (128). Red is known as the love color in most countries as China, USA, Argentina, and Denmark but it represents bad luck in Chad and Nigeria (128). Yellow means infidelity, and envy in, France (127), Germany, and Russia (125), whereas it indicates warmth in the USA (127), trustworthy and good taste in China (129). Black is related to fear, fury, death, envious in Mexico, Poland, Russia, Germany (125), stupidly and weakness in India (130), when it denotes power, authority, expensive, in USA, South Korea and Japan, high quality, and luxury in China (128). Companies should study and understand the market and the culture for a specific country before choosing the color of their product.

The color of any product is a vital part of the consumers experience since they are immediately attracted by the color. The sensation of color is the first attraction that simplifies the perception of the product and help consumers to identify and evaluate the products (131). Colors are an essential part of any product, package, logo, to influence consumer expectations toward the price and quality of the product (132). Using the right colors could be the cheapest tool to change product perceptions. For example, in the USA darker colors give expectations for expensive and high-quality products, whereas in the UK beige is associated with expensive, white is cheap, pink, and red are average, colors are the field where companies can create an identity and be different from the others on market (123).

The pharmaceutical industry has a long history of using colors whether for dosage forms or packaging for a different reason as identity and marketing (73). The addition of color to pharmaceutical products, whether tablets, creams, oral liquid, and toothpaste, will make the product more attractive, appealing, and informative. A significant impact for some companies was made when they decide to use a unique color on their products and led to the creation of what is now known as “signature products” (45). Such as the famous example of Viagra® which its known as “the blue pill”( Figure 13), and the green package of Aspirin® (Figure 14).



**Figure 12.** Viagra blue pill. *Reprinted from* (133)



**Figure 13.** Aspirin green package. *Reprinted from* (134)

The appearance and packaging of medicines have a significant impact on their therapeutic success (111). According to experts the colorful presentation of medicines and their packaging, can help to improve the effectiveness of their therapy, by avoiding the possibility of confusion, and turning the medicines easy to recognize, reducing medication errors (135). Tablets colors can help patients with limited health education, weak memory, and limited cognitive abilities, to recognize their medication (136). A study was applied to antiepileptic tablets, which showed that changes in tablets colors decreased the adherence rate in patients, because the patient did not take the tablets, it was also suggested in the study that pharmacists should be warning patients when there are any changes in tablets appearance (shape or color) (137). Patients tend to associate medicine colors

with their effects, taste and even with some diseases (73), which make colors have a significant impact on the effectiveness of drugs (138).

Red, yellow, and orange, are usually associated with stimulation effects (136,139), while blue, green, and white are associated with tranquilizing and depressant effects (136). In a previous study on a group of patients with tuberculosis it was observed an increase on energy level for patients who were given a yellow placebo tablet (140). Another study about anxiety symptoms found a relation between green tablets and better health improvement (141). Yellow tablets showed a good result in relation to depressive symptoms (142). Blue tablets showed a sedative effect in comparison with both pink and orange tablets (142,143). Red is usually associated with heart disease (144), and yellow was linked as an anti-malaria drug in relation to yellow eyes of patients (145). A study was performed by Wan et al (98). To evaluate consumer expectations on taste (bitterness), effectiveness and headache symptom relief based on color, the colors were red, light red, blue, light blue, green, light green and white. As a result, red and green were expected to be the most bitter, and the less bitter were light blue and blue tablets, respectively. When it comes to effect both red and light red was expected as more effective followed by green and light green, while white expected to be the strongest on headache treatment while light green was expected as the less effective (98). Colors could transmit different meanings across cultures also in relation of medicine as a study demonstrated that Caucasian associated white color with an analgesic effect and black drugs with a stimulation effect, while to African Americans it was completely the opposite (146). Research by Tao et al. in (2016), evaluated the relationship between drug color (red, yellow, orange, green, blue, white, black) and expected therapeutic effect on five different populations, with results presented on Table 4 (147). A strong bond and association between colors and drug effect was demonstrated.

**Table 4.** Comparison of perceived therapeutic effect of colored medicines for five different population groups. *Adapted with permission from (147)*

Color	Population group				
	Chinese	Italian	White American	Black American	General American
<b>Red</b>	Stimulant	Stimulant	NA	NA	Stimulant
<b>Yellow</b>	Hallucinogenic	Stimulant	Stimulant	Hallucinogenic	Stimulant
<b>Orange</b>	Analgesic	Stimulant	Stimulant	Stimulant	NA
<b>Green</b>	Depressant	Depressant	Analgesic	Depressant	NA
<b>Blue</b>	Depressant	Depressant	Depressant	NA	Depressant
<b>White</b>	Depressant	Depressant	Analgesic	Stimulant	NA
<b>Black</b>	Hallucinogenic	NA	Stimulant	Analgesic	NA

**NA: Data not available.**

The color of packaging is important element also, as it gives consumers the shortest possible time to create memories and pay attention to the product, to the fact that around 80% of visual attention is given to color, while the rest is focused on the shape (148).

It can be confirmed that from all the packaging elements, color is the main element to communicate due to the fact of creating a visual stimulation and which is not the case with the other elements (149), and influence consumer behavior (150). As medicines are packaged in blisters, consumers keep them in their boxes most of the time. That led to the fact that packaging can also participate in consumers therapeutic perspective of medicines (111). As a study was done by Roulette and Droulers applied on 150 participants to test the effect of variation in drugs packaging colors on expected therapeutic effect, the colors (red, orange, brown, yellow, green, blue, grey) were adapted to a package of commercial analgesic, participants were asked to relate the colors to eight therapeutic classes: inflammation/fever (antipyretics), pain (analgesics), depression/anxiety (psychotropics/stimulant), insomnia (hypnotics/sleep pill), heart/blood pressure (cardiac), digestion (heartburn), skin, respiratory system. Results showed that brown, red, and grey packages were perceived as more dangerous diseases and more potent medicines in relation to yellow, and green

packages. Red and orange presented more precaution to use in relation to green, blue, and yellow, darker colors packages (red, brown, blue) were perceived to be more expensive, act more rapidly and effective, and more expected to show side effects, in comparison to light colors packages (yellow, orange, green and grey). No significant results about the association between packaging colors and therapeutics class unless, for results that were more significant which are, light colors packages were related to antipyretics. Both dark and light colors packages associated with heart disease (111). Colorful packaging can also help to avoid medication errors either at home or clinical level (151–153). For example, black cap packaging is required for concentrated potassium chloride to avoid posing the patients unintentionally, red color is used for medication with high precaution, hazard level as in Canada it is suggested to use with neuromuscular blocking agents (154). In the UK, for example, aerosols equipment that contains bronchodilator drugs usually have a blue color, while they are presented in brown inhalers when they contain steroids. These small details could be extremely helpful to avoid medical confusion (155). ClearRx is a successful example of a colorful medicine package, that helped a lot of patients to avoid medication errors in USA, it's a red bottle with label features that provide a large typeface can be used for inputs like patient name, medication name, and information such as dosage, warning symbols, it has also a special place for specific patient information, providing like this more security, the designer used colorful rubber rings that can be placed around bottle neck serve as a color code to identify each medicine holder from the family member, this simple and creative idea was created by designer Deborah Adler in 2005, the design was adapted and used by Target pharmacy's. A study showed that 85% of consumer preferred Clear Rx over the conventional format (156).

## **6. Multisensory design to enhance treatment of health problems**

Multisensory health products and their packaging are strategies pharmaceutical industries follow for marketing reasons to build an emotional bond with patients and minimize the cognitive dissonance toward medication. But also, to compete against many therapeutic problems, such as non-adherence to treatment and medication error or confusion. Non-adherence to treatment is a serious problem, so approximately 50% of the patients do not adhere to their medication (157,158). Only in the USA of all medication related hospital admission up to 69% of the cases are a result of poor

adherence to medication, with a cost of 100 billion dollars a year approximately (159). Poor sensory design and some characteristics of health product and their packages (were discussed earlier ) that do not satisfy consumers needs, is one of the main factors that led to compliance problems (118). Patients centric pharmaceutical drug product design (PCDPD) is defined as “ as the process of identifying the comprehensive needs of individuals or the target patients population and utilizing the identified needs to design pharmaceutical drug product that provides the best overall benefit to risk profile for that target patients population over the intended duration of treatment “ (160). PCDPD helps to identify patients preference and needs regarding treatment failures to design a product that can satisfy them, and guaranty like this their compliance. By understanding the reason behind patients non-adherence to treatment, it will be easier for pharmaceutical industries to add and remove some product characteristics to reach a multisensory product design that is going to satisfy patients needs and preferences, securing like that a better compliance to treatment (118).

A lot of medicines on the market can appear or sound similar (73). In the USA showed that more than 7,000 drug-related death occur and over 1.3 million people are affected each year, due to medication errors (85). A third of these cases are a result of similarity in drugs, name, packaging, and appearance. Namely, older people tend to be on multiple medicines at the same time (161).

The multisensory design of health products and their packages could help to avoid medicine confusion in both clinical areas, for example, choosing a certain color for pediatric medicines like pink or light blue or soft packaging material to distinguish it from others. Another possibility that can be used to avoid dose error is to select a different shape or texture, for different medication doses, curved shape or soft texture for lower doses , and a rough texture or angular shape for a higher dose. Packages with different open-lock systems that could give a unique way to open or make a unique sound, can be suited to differ dose or population categories (pediatric and adult). Adding odor agents to distinguish medicines doses or population category can be an extremely useful method considering the big effect of the smile on memory, but first pharmaceutical industry needs to ensure that adding an odor agent is not going to influence the drug composition. On a domestic level using packaging designs, such as tablet boxes, can be an extremely helpful tool for patients to remember to take their medication and avoid confusion it with other drugs. The role of health professionals, whether doctors and pharmacists are critical to educate the patients during product

prescription and dispensing and make sure that patients will have maximum benefits and the minimum risk.

## **7. Conclusion**

As it was demonstrated, consumers are widely targeted by stimuli that influence their subconscious mind, which is considered the determinant of buying decisions. Neuroscience field helps to understand consumer behavior through different techniques that analyze consumer brain reactions to different sensory stimuli. The application of sensory marketing to the pharmaceutical field can be particularly useful for both the industry and patient .

Selecting the right color that defines the product, choosing the suitable shape, and size for the products and their packaging that gives the consumers a good feeling, and selecting a pleasant smell that will change consumers mood and create a good memory , even the fluency of brand name and how it sounds, all these features will contribute to creating a good sensory experience, that satisfies consumers needs, and influences their perception toward a product. While at the same time sensory, strategies can help to avoid the medication errors that have been caused by the proliferation of lookalike, soundalike drugs in the market in recent years. Along with the huge role it can plays in solving some serious health problems, such as patient non-adherence to treatment and medication confusion at the domestic level. These sensory strategies could also be applied in community pharmacy, by adding some sensory features to the environment, such as a pleasant smell, calm background music, nice illumination will create a more welcoming and customer focused environment, which increase consumer satisfaction and loyalty. Furthermore, it allows pharmacists to give better services and recommendations for patients.

Sensory marketing is an important topic for pharmaceutical area, as it helps the companies in marketing competition and brand identity, and it also helps them to understand patients preference in terms of dosage forms, improving patients adherence to medication, alongside to the fact of avoiding medical confusion. Sensory marketing is a very big field, and there are a lot of challenges to be developing in the pharmaceutical area, when most of the pharmaceutical companies has focused on one sensory cue which is color, other sensory aspects should be more studied as well, as a

growing number of research now demonstrated the influence of multisensory design of pharmaceutical product and their packaging, on patients expectations regarding the efficacy. This field provide valuable insights for pharmaceutical companies who are looking to leverage sensory marketing to their advantage.

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