# Neuroemotions and Behavior in the Purchase Process

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## Abstracts

Emotions are the fundamental pillar of neuromarketing, the perception of hedonic, utilitarian value, the emotions experienced by customers during the buying process and the effect the behavior of each stage is seen from the brain structures of the mind. The sample selected for the study was 354 real customers of supermarkets in the city of Riobamba and the sample of 8 participants with the use of eye tracking glasses in the store tour during this process. The results, in three stages of the process system (inputs, processes and results) with the emotions involved in each stage. Stage I are: uncertainty, joy, anger/anger/anxiety, happiness, curiosity. The emotions in stages II and III are joy, surprise, satisfaction, security, and confidence and the emotions felt in the Evaluation Stage are satisfaction, exhaustion, demotivation, joy, and anger/anger/anxiety. There are hormones and neurotransmitters that are involved with emotions at different stages of the buying process. The right brain hemispheres are activated in negative emotions, left in positive emotions in all stages of the buying process. Brain structures are also activated at each stage of the buying process. The results of the Eye tracking in the comparative analysis analyzed Meditation, Attention and Blinking in the stages of the purchase process. It is concluded that repurchase and recommendation intentions are determined by positive emotions which, in turn, are determined by the hedonic and utilitarian value of the product and services that reduce negative emotions.

**Keywords**: emotions, neuroemotions, emotional perception, decision making, stages of the purchase process, eye tracking.

## Introduction

Studying the mind and the brain has become a great challenge for science, several disciplines have been tackling this subject in recent years, such as philosophy, psychology and neurosciences. However, there are still the following questions: where is consciousness, what produces happiness in our brain, how do we remember, why do we remember more what causes us pain, why do we think that way, why do we think differently when faced with the same fact or situation, why do we choose a certain brand, product or service, how do we capture someone's attention, how do we store information in our memory, and what produces emotion in us?

Knowing our brain and the human mind is still a real challenge, in this context, marketing and neuroscience seeks to read the customer's mind, know their desires, how they make decisions

when buying products and services, why they say they want a product and buy another, what motivates them to buy, in order to design appropriate marketing strategies for customers and that are successful for the company. Studies of the biology and physiology of the brain show the results of the Blue Brain project (Markram, (2006), considered an important project in the world, by the researcher Henry Markram of the École Polytechnique de Lausanne (Switzerland), who for 15 years has created a simulation of the neurons of the brain (Markram, 2006).

Currently, biometric equipment provides direct information about the state of users in an environment, it is possible to use biometric sensor technology available on the market to measure emotional states and the stress level of a person in real time. While going through the shopping process biometric variables change in our body such as beats per minute, tension, breathing rate, brain waves, muscle tension, temperature, skin conductivity and pupil dilation where sensors can measure these variables.

The objective of the research is to identify the emotions present in the decision-making process through the mixture of emotions, neuroscience, marketing and the buying process. The article is organized in four parts: the first part presents a brief introduction to neuroscience, decision making, and the use of biometric equipment; the second part shows the results of the research with the application of the research instruments, survey and biometric eyes tracking equipment; the third part is the discussion that explains the results obtained from different perspectives of neuroscience and other authors, and finally the fourth part, addresses the conclusions that allow to make its contribution based on the results of the research with reflections, and to serve as a reference for further research.

Neuroscience.

It is the science that studies the structure, chemical function, pharmacology, and pathology of the nervous system, and how the different elements of the nervous system interact in behavior. Neuroscience from neurophysiological, neurochemical, neuropsychological or neuropsychiatric studies show that, in the embryonic development of the human being, it is identified that the nervous system begins to be constituted during the third week of life inside the maternal uterus.

The biological study of the brain is multidisciplinary, ranging from the molecular to the behavioral and cognitive, passing through the cellular level (individual neurons), the assemblies and small networks of neurons (such as the cortical columns) and the large assemblies (of visual perception) including the systems of the cerebral cortex or the cerebellum (Squire, 2008).

Buying behavior.

The customer's purchasing process comprises a set of consistent steps, with eventual backward returns of certain doubts, until reaching the final decision, which is reflected in the purchase. The phases of this process are: identifying, recognizing or awakening needs; gathering and processing information; formulating the decision, making the choice and then evaluating the consequences (Dubois & Rovira, 1998). The buying process is influenced by a series of internal and external circumstances, aspects or factors (Khan, 2001). The final phase includes a behavior after the purchase, it can be said that in this process there is a decision-making system: inputs, processes and results (outputs) (Schiffman & Kanuk, 2009).

Shifman et at. present a synthesis of the consumer behavior model from four points of view: (i) The economic point of view, where the consumer makes rational decisions, known as the "economic man" theory, which is strongly criticized by researchers; (ii) The passive point of view, which describes the consumer as submissive to the promotional campaigns of companies, and defines customers as irrational buyers; (iii) The cognitive point of view, which describes the consumer as a thinking problem solver, this model focuses on the processes by which they seek and evaluate information to make their decisions; (iv) The cognitive point of view, which describes the consumer as a thinking problem solver, this model focuses on the processes by which they seek and evaluate information to make their decisions. (iii) The cognitive point of view, which describes the consumer as a thinking problem solver; this model focuses on the processes through which they seek and evaluate information to make their decisions. (iv) The emotional or impulsive point of view, which states that purchases are made on an emotional basis, assigning less importance to cognitive information and giving greater importance to their mood and feelings of the moment.

Currently, new models, classifications and proposals have been incorporated that attempt to approach the subject in a holistic manner, incorporating new elements and variables in the researches Callejo, (2005); Khan, (2001). However, the elements incorporated are still deficient to understand human behavior in decision making. Solomon, (2017).

Emotion and marketing.

The buying process is a set of actions and relationships that constitute a real mystery, which has become an interesting challenge for those engaged in researching the internal and external factors of the customer buying process. The internal factors include emotions as an impact component in marketing purposes; and, the external factors include the motivations of reference groups and marketing campaigns.

Goleman, (1995) in his work emotional intelligence, shows the great power of emotions over the thinking mind and the frequent conflict that is generated between feelings and reason. He argues that emotional intelligence is a way of interacting with the emotional world and encompasses skills such as impulse control, self-awareness, motivation, enthusiasm, empathy and mental agility, among others.

A contribution to research on emotions is by Mitsuo Nagamachi, which is called Kansei, a Japanese term that means psychological sensation in the image of a product. Kansei engineering refers to the translation of the psychological sensations of consumers on a product that considers elements of perception in the design; it is also known as "sensory engineering" or "emotional usability". This technique consists of determining the sensory attributes that elicit certain subjective responses from people and then designing a product using the attributes to obtain the desired responses International Kansei Design Institute, (2007).

From different fields of science it is said that "emotion" is a key variable in the life of the human being Lyons, (1980). Emotion is understood as the result of an evaluation of the extent to which objectives are met (Ortony, Clore, & Collins, 1988). But it is also a concept used to describe the effect produced by significant physiological changes and their subsequent subjective interpretation. Emotion is studied from different approaches, from neuroscience its interest is in

the knowledge of brain mechanisms, hormones and neurotransmitters involved in emotion; in evolutionary psychology it focuses on identifying the emotional changes that occur throughout a person's life; on the other hand, cognitive psychology emphasizes the importance of the relationship between emotion and cognition; in clinical psychology it is interested in the relationship between psychological disorders and types of emotional experience Fernandez, (1995). From the evolutionary point of view, the limbic system and the amygdala are present in the emotional processes, the prefrontal lobes and the cerebral cortex regulate the higher processes of reasoning and planning of voluntary action. Vergara, (2006).

The dictionary of the Royal Spanish Academy RAE, (2022), points out that the word emotion comes from the Latin emotio, -ōnis and has two meanings, the first refers to "the intense and transient alteration of mood, pleasant or painful, which is accompanied by a certain somatic commotion"; the second expresses that emotion is "the interest, generally expectant, with which one participates in something that is happening".

The term emotion involves two components at the neurophysiological level, one component is manifested in the physiological state of the body and the other component expresses the conscious feeling Iversen, Kupfermann, & Randel, (2000). Research in neuroscience shows that anatomically, the amygdala is the brain structure capable of assigning emotional meaning to environmental stimuli and activates a series of motor, autonomic and endocrine reactions in the central nervous system, which constitute emotional expression Simon, (1997). Undoubtedly, the anatomical structure, related to emotion is the amygdala LeDoux, (1992), is a nervous structure the size of an almond, which is located in the temporal lobe in each cerebral hemisphere, and makes several connections in different areas of the brain. Its function is to assign emotional meaning to environmental stimuli, with the information it receives from the sensory organs, it continues to the amygdala through the cerebral cortex; then it reaches the thalamus and from there, through the lemniscal pathway it reaches the primary sensory cortex. Thus, the information that reaches the amygdala finds the conditions to "make a judgment" about the stimulus (Simón, et al., 1997).

Thus, the pathway by which the information reaches the amygdala is called thalamo-cortico-amygdalar; but there is also a short pathway called extralemniscal, which directly connects the thalamus with the amygdala LeDoux, (1995); Romanski & LeDoux, (1992). In the case of rapid responses, these are explained by their inherited character, can be considered innate, and are called "primary emotions". The set of emotions that each organism acquires throughout its life is called "secondary emotions" Damasio, (1995).

To study emotions, one proposal is to organize them into three groups: (i) the study of emotional experiences, (ii) their objective physiological recording, and (iii) the study of expressive behavior Gonzalez, (2006), which can be approached from an evolutionary, psychophysiological and neuroscientific perspective Fernandez, Dufey, & Mourgues, (2007).

The evolutionary approach has facilitated the identification of the basic emotions that compose human expressions, exploring their universality, expression and recognition in different cultures Ekman, (1993). Neuroscience integrates the anatomy and physiology of the central nervous system for a psychological understanding of emotional behavior, emotion recognition and

expression Phillips, Drevets, Rauch, & Lane, (2003). Advances in science allow us to understand the location and functioning of brain areas involved in the experience, recognition and expression of emotions Gallardo, 2006; Silva, (2003). Emotions constitute a subject of study and knowledge that are just beginning to be glimpsed with greater precision; however, there is still no consensus agreement on the amount of emotions expressed and not expressed by human beings, a challenge that researchers face in this new century (Lewis, Haviland-Jones, & Barrett, 2008).

There is no doubt that emotions play a fundamental role in the purchase decision process, daily purchases mark an emotional state, they are more evident in complex purchases with high customer involvement, being these more perceptible Hillenbrand, (2007); Bagozzi, Gopinath, & Nyer, (1999); Hill, (2008); Johnson & Stewart, (2005); Lindstrom & Underhill, (2008).

The pioneers in experimental neuroscience were economists, who proposed the term to be created in the disciplinary field of "neuroeconomics" Lee, Broderick, & Chamberlain, (2006), with the aim of understanding the decision process of economic agents using cognitive psychology and neuroscience approaches. Thus, "neuroeconomics" appears in the most respectable academic circles. One of the most widely accepted definitions of neuroeconomics states that "it is an interdisciplinary field that applies new neuroimaging techniques to identify neural substrates associated with economic decisions" Zak, (2004).

The above definition could easily be extrapolated to a marketing context, stating that "Neuromarketing is an interdisciplinary field that applies new neuroimaging techniques to identify neural substrates involved in consumer decisions and behavior". Thus, a new tool designed to objectively guide consumers' cognitive and intentional capabilities in the face of marketing offers. However, the nature of this reductionist approach advocates a different definition, which can be expressed as follows: "Neuromarketing is the study of mental processes, explicit and implicit, and consumer behavior in various contexts, both in marketing activities for evaluation, decision making, storage or consumption, based on the paradigms and knowledge of neuroscience Droulers & Roullet, (2007).

Neuromarketing consists of the application of neuroscience research techniques to traditional marketing research Monge, (2009). The techniques that can be used in neuromarketing are of wide variety, such as Electroencephalography EEG, Functional Magnetic Resonance Imaging (fMRI); Magnetoencephalogram MEG (originally, Magneto-Encephalographic) or Positron Emission Tomography PET (Positron Emission Tomography); among the most recognized Droulers, et al. (2007); Monge, et al. (2009), which are summarized in Table 1.

Table 1. Comparison of biometric equipment.

| Equipment characteristics | EEG | EYES TRACKING | fMRI | MEG | PET |
|---|---|---|---|---|---|
| What does it measure? | Electrical fluctuations in brain activity | Movimiento de los ojos, pupilas. | Eye movement, pupils. | Magnetic fluctuations | Changes in metabolism |
| Participant risk | Non-invasive | No invasiva | Non-invasive | Non-invasive | Invasive/ |
| Temporal resolution | Very good | Muy buena | Very good | Very good | anxiety/ |
| Spatial resollution | Limited | Limitada | Limited | Limited | claustrophobic |

| | | | | | |
|---|---|---|---|---|---|
| Cost | Good quality/price ratio | Buena relación calidad/precio | Good quality/price ratio | Expensive | Limited |
| Uses | Medical and Marketing. | Marketing. | Marketing. | Medical and Marketing. | Good |

Source: Monge, (2009)

There are also other physiological indicators that can measure emotions in response to a specific stimulus, such as expressions. In neuromarketing, involuntary facial micro-expressions, eye movement and galvanic skin response are measured. The equipment used are electromyography, eye-tracking systems and skin conductance measurement systems, such as polygraphs Monge, et al. (2009).

The studies carried out so far have shown a good correlation between the results obtained by conventional research techniques, such as questionnaires or focus groups, and also the results of new research techniques using biometric equipment. Currently, many companies use neuromarketing techniques in their market research, such as Coca-Cola, Levi-Strauss, Ford, Delta Airlines, DaimlerChrysler, among others. Likewise, in the academy, there are graduate thesis works with the application of the new Neuromarketing techniques.

Research shows the importance of emotions in marketing and their relationship to consumer behavior studies. Advertisers use emotions to increase attention in advertisements that are designed to elicit emotional exposure and emotional reactions such as fear, joy, amusement, and other emotions Droulers, et al., (2007). There is still difficulty in measuring verbal and nonverbal, explicit or implicit emotional reactions; however, research shows in brain imaging the areas that are activated is the limbic system (especially the cerebral amygdala and the orbitofrontal cortex) in the management of emotions, and there is a greater involvement of the right hemisphere in the management of negative emotions.

In market research marketing researchers must calibrate expressive verbal scales in terms of objective measures, and apply the use of biometric brain imaging equipment to get closer to the reality of the experience in buying behavior Derbaix & Poncin, (2005); Marcus, MacKuen, Wolak, & Keele, (2006). Research on the role of emotions in marketing strategy is "The Role of Emotions in Marketing" Bagozzi, et al., (1999), starts from the premise that emotions play a fundamental role in people's lives and behavior; therefore, emotions should be included in the design of marketing strategies Ruiz & Arranz, (2003).

TOBII Eye tracking glasses

The eye tracking device was designed by Tobii Pro Company in order to help companies and professionals to obtain information about human behavior. Eye tracking is a device that evaluates the physiological indicators used to measure human behavior, through the neural systems involved in the gaze, the visual path or eye movement, the participant is in front of the screen staring and the Tobii Eye trancking Tobii captures eye movement data at 30 Hz or 60 Hz. The Eye Trancking Tobii glasses device facilitated the use in the tour of the physical stores, the Eye Tracking is not a technique of neuroscience itself facilitates the collection of information with biometric data to understand the unconscious mind of the people to whom the experimental study

is applied. Eyes Tracking studies are based on the "mind-eye" hypothesis: if the subject is looking at something, it is because he is interested in it. The average reaction time of the human being is 0.25 seconds in front of a visual stimulus with variations in time depending on the image or video of the test.

According to Rovira (2016) states that the most used metrics are the following:

1. Individual's Total Time of Attention Indicator (Average Fixation Duration). - measures the total time of attention

2. Time to First Fixation in the area of attention (Time to First Fixation) indicator. - shows an element that has captured the users' attention; lower values infer that the user's attention has been captured more quickly.

3. Total Fixation Duration indicator (Total Fixation Duration) - is the time that users have been looking at the analyzed element. This can mean increased interest (positive effect) or difficulty in understanding (negative effect).

Eye tracking, the technique of eye tracking, the analysis terms attention, meditation and blinking refer to aspects related to the results obtained during the tracking of eye movements.

Attention: is the ability to consciously focus the mind on a specific stimulus or task. Eye tracking, used to measure the level of attention a person pays to a particular visual stimulus, indicates how long and which areas of the stimulus capture the subject's attention. It determines which elements of an advertisement or product capture visual attention.

Meditation: refers to a mental training practice that seeks to achieve a state of mindfulness and tranquility. Meditation affects visual attention and fixation patterns, and studies suggest that meditation can improve the stability and quality of visual attention.

Blinking: is a natural physiological process in which the eyelids close and open in order to moisten and protect the eyes. Eye tracking does not record data during blinking, so no information can be obtained about the direction of the subject's gaze at that moment. For this reason, it is said that the more blinking, the less attention.

As a conclusion, the device allowed to obtain measurable data through the visual path that the participants in the physical store, with access to information with which you can deduce the involvement of the participant in the buying process.

Emotional state.

Studying emotions allows the understanding of human action, because they are uncontrollable elements that exempt human perception, however, they confer that there are judgments that can justify certain emotions, in order to manage and explain their desires and beliefs. González, (2009).

Emotions encompass different complex phenomena that lead to an evaluative judgment, intentional, sensation, physiological changes, human expression and tendencies to action; in this sense, if a person is in a situation of danger, the subject will feel the emotion of fear Esquivel, (2015).

People have one or several emotions in the same situation, that is, it is assumed that a human being can direct his behavior to a positive or negative evaluation that can condition his behavior; however, fear can provoke a reaction of fleeing, which is a basic reaction of the human being, or can have another reaction in the same circumstance, it is here where there is the uncertainty of the circumstances that incites to generate a specific action. Lange, (2001); Molina, (2013).

Functions of emotions.

Psychophysiological actions are adapted to the stimuli of each person's perception, considering that emotions are universal, however, there are different emotional functions that are: adaptive, social and motivational that allow identifying emotional awareness Vázquez, Basile, & López, (2021). The functions of emotions are detailed below:


Figure 1. Emotion functions

Source: Sanarai, (2023).

Adaptive emotions allow us to approach or move away for coexistence and prepare us for action, social emotions communicate our emotional state, and motivational emotions drive us to action.

Classification of emotions

Basic emotions

The main areas of the brain that are involved in basic emotions are the prefrontal cortex and the limbic system, together with other systems allow experiences conditioned to emotions, an example of this is the amygdala, which is essential in the perception of fear and disgust, and also in taste-type functions (Phelps and LeDoux, (2005); Suzuki, (2010) the characteristics of basic emotions are innate and universal and are not affected by sociocultural influences (Sander and Scherer, (2009).

There are six basic emotions, which are: fear, anger, surprise, joy, sadness and disgust Ekman, (2017); Cossin (2017); a study focused on facial expressions proposes four, which are: sadness, joy, disgust/anger and surprise/fear, after verification of the movement of the main facial muscles Jack, (2014). Neuropsychological studies assert that there are feelings that are often confused, fear/surprise and disgust/anger, due to a certain particularity of features Calvo and Nummenmaa, (2016). The basic emotions are detailed below:

- Fear: negative type feeling that tries to respond a reaction when a danger is presented, this also arises in relation to something unpleasant or unknown.

- Anger: emotional state that can be measured in scales of intensity, it goes from a simple or mild irritation to a possible intense anger, which is accompanied by high blood pressure and heart rate.

- Surprise: reaction expressed when the subject is confronted with something unknown or unexpected, or in expectation of a reward.

- Joy: positive emotion, favorable feeling that usually manifests itself with satisfaction, the physical response is laughter or a smile.

- Sadness: feeling of depression and antonym of joy, response of discouragement or disappointment.

- Aversion: repugnance or rejection of a person, product, situation or place.

Social or secondary emotions.

Social emotions are those related to experiences with other subjects, in different social contexts, such as falling in love, jealousy, envy and empathy. These complex emotional experiences can interact in some basic emotions, in envy is present sadness and anger, in falling in love is linked to fear and joy, finally, empathy brings with it a series of emotions with someone close, which are considered secondary emotions, although this conceptualization arises when talking about emotional experiences, but does not fail to perceive the elementary emotions, such as the basic ones; an obvious example of emotions and their relationship, arises when falling in love that affects jealousy that leads to a breakup, the same causes another type of emotions Dettano, (2019); Montañés & Iñiguez, (2002). The following are secondary emotions:

Security: it is a perception of confidence and the absence of risk.

Exhaustion: synonymous with fatigue, it is related to lack of motivation and energy, it is linked to apathy and drowsiness.

Satisfaction: state of well-being produced by brain optimization directed by feedback, e.g., satisfying appetite, obtaining a merit or doing an activity properly, buying something we like, and being able to pay for something.

Distress: negative emotional state that is related to the perception of danger or by impression.

Table 2. Primary and secondary emotions.

| No. | Primary emotions | Secondary emotions |
|---|---|---|
| 1 | Fear | Security |
| 2 | Anger | Exhaustion |
| 3 | Surprise | Satisfaction |
| 4 | Joy | Anguish |
| 4 | Sadness | Guilt |
| 6 | Adversion/rejection | Jealousy |
| | Primary emotions | Shame |
| | | Pride |

| | | |
|---|---|---|
| | | Pleasure |

Source: Etxebarria, (2003).

Table 3. Brain areas involved with anger/anger/anxiety/sadness.

| Each person may experience and express anger differently, the involvement of brain areas may vary in each individual. | |
|---|---|
| Amygdala | is an emotional regulator and is associated with the fight or flight response. |
| Ventromedial prefrontal cortex (VPC) | It is associated with the experience and expression of anger. |
| Anterior cingulate cortex (ACC) | It is involved in decision making and emotion regulation. |
| Frontal lobe | Dysfunction in the VPC is associated with difficulties in controlling anger and rage. |

Source: Mejía, de Yahya, Méndez-Díaz, & Mendoza-Fernández, (2009); Ostrosky, & Vélez, (2013); Torres, Córdoba, Cerón, Amézquita, & Bastidas, (2015). Rivera, & Flórez, (2017), Vallejo, Tapia, Zabala, (2023).

Table 4. Brain areas involved with uncertainty.

| It is an emotional and cognitive state that has multiple dimensions, for example: uncertainty about the future, lack of information, ambiguity or fear of being wrong in uncertain situations. | |
|---|---|
| Dorsolateral prefrontal cortex (DLPFC). | this area of the brain is involved in executive processing, decision making and planning. It is activated in evaluation processes and uncertainty management. |
| Anterior cingulate cortex (ACC): | is involved in emotional regulation, attention and conflict resolution. It is activated in uncertain situations and plays a role in cognitive and emotional processing associated with uncertainty. |
| Caudate nucleus | this brain area is involved in decision making and anticipation of rewards. It is activated in uncertain situations and acts differently depending on the circumstances, assesses possible outcomes and associated risks. |
| Amygdala | is involved in uncertainty and emotional processing. It is activated by uncertain and threatening stimuli, which triggers emotional responses associated with uncertainty, such as anxiety, fear, dread, anger and rage. |
| Hippocampus | It intervenes in the processes of memory, learning and is also involved in the process of uncertainty. It evaluates and contextualizes uncertain information and generates predictions and expectations based on experience. |
| Nucleus accumbens | is part of the reward system. It is associated with the experience of pleasure and response to emotionally positive stimuli, is related to situations of uncertainty and possible rewards. |

Source: Mejía, de Yahya, Méndez-Díaz, & Mendoza-Fernández, (2009); Ostrosky, & Vélez, (2013); Torres, Córdoba, Cerón, Amézquita, & Bastidas, (2015). Rivera, & Flórez, (2017), Vallejo, Tapia, Zabala, (2023).

Table 5. Brain areas involved with joy.

| Joy involves the activation of several areas of the brain involved in emotional regulation, the generation of positive emotions and the processing of rewards. The experience of joy is multifaceted. | |
|---|---|
| Medial and ventromedial prefrontal cortex (MPFC and VMFC) | this area is involved in emotional regulation, decision making and reward evaluation. It is activated when related to the experience of joy and in the processing of positive emotions. |
| Nucleus accumbens | This brain area is part of the reward system and is related to the experience of pleasure and the response to emotionally positive stimuli. It is activated when associated with the experience of joy and the anticipation of rewards. |
| Anterior cingulate cortex | is involved in emotional regulation and response to emotional stimuli. It is activated with the experience of positive emotions and joy. |
| Amygdala | this brain structure plays an important role in emotional processing and evaluation of emotional valence. It is activated by the experience of positive emotions and joy. |
| Ventral tegmental area (VTA) | this area of the brain produces dopamine, a neurotransmitter involved in the reward system. It is activated by the release of dopamine in experiences of pleasure, positive emotions and joy. |

Source: Mejía, de Yahya, Méndez-Díaz, & Mendoza-Fernández, (2009); Ostrosky, & Vélez, (2013); Torres, Córdoba, Cerón, Amézquita, & Bastidas, (2015). Rivera, & Flórez, (2017), Vallejo, Tapia, Zabala, (2023).

Table 6. Brain areas involved with curiosity/surprise.

| is an intrinsic motivation that drives the desire to seek and acquire something new or unknown. It activates several areas of the brain involved in the experience of curiosity and surprise to unexpected stimuli, and depends on the intensity of the curiosity experienced. | |
|---|---|
| Nucleus accumbens | this brain region is part of the reward system, motivation and reward seeking. It is activated in the curiosity and pleasure associated with the discovery of new information and surprise at rewarding or unexpected stimuli. |
| Dorsolateral prefrontal cortex (Dorsolateral prefrontal cortex (DLPFC)) | is involved with executive activities, planning and decision making. It is activated with the processing of uncertain information and the impulse to search for answers. It is also activated when a person encounters stimuli that challenge his or her expectations or when an update of previous information is required. |
| Anterior cingulate cortex (ACC): | is linked to emotional regulation and response to novel stimuli and conflict detection. It is activated with the experience of curiosity, surprise and positive emotional response to novelty and learning, and is also associated with uncertainty, novel stimuli and when there is a discrepancy between what is expected and what actually happens. |
| Hippocampus | is related to the formation and consolidation of memory. It is activated during the experience of curiosity and surprise which facilitates learning and retention of new and unexpected information. |
| Posterior cingulate cortex (PCC) | is oriented towards attention to novel stimuli. It is activated by the experience of curiosity and orientation toward exploration of novel information. |
| Amygdala | key brain structure in emotional processing and evaluation of the emotional valence of stimuli. It is activated in response to unexpected or emotionally relevant stimuli, the experience of surprise. |

Source: Mejía, de Yahya, Méndez-Díaz, & Mendoza-Fernández, (2009); Ostrosky, & Vélez, (2013); Torres, Córdoba, Cerón, Amézquita, & Bastidas, (2015). Rivera, & Flórez, (2017), Vallejo, Tapia, Zabala, (2023).

Table 7. Brain areas involved with satisfaction.

| The experience of satisfaction involves the activation of several areas of the brain that are related to emotional regulation, reward processing and evaluation of success. | |
|---|---|
| Nucleus accumbens | is part of the brain's reward system, it is key in the experience of pleasure and response to rewarding stimuli, it is related to the experience of satisfaction, when a goal is achieved or a prize is obtained as purchase stimuli or an award for merit. |
| Medial prefrontal cortex | this area evaluates rewards and generates positive emotions that are associated with the experience of satisfaction and accomplishment. |
| Anterior cingulate cortex (ACC): | is involved in emotional regulation and response to emotional and novel stimuli. It is associated with the experience of satisfaction, in the context of personal achievement, purchases, rewarding experiences, and the successful completion of a task. It is also associated with uncertainty. |
| Insular cortex | integrates the emotional and somatic signals of the body, is related to the subjective experience of satisfaction, as well as to the evaluation of the quality of an experience or outcome. |
| Hippocampus | is part of the process of memory consolidation and evaluation of past events and experiences, which are associated with satisfaction and evoking positive and rewarding memories. It is also associated with learning, curiosity and retention of new information. |

| | |
|---|---|
| Posterior cingulate cortex (PCC) | is oriented to attention to novel stimuli. It is activated by the experience of curiosity and orientation toward exploration of new information. |

Source: Mejía, de Yahya, Méndez-Díaz, & Mendoza-Fernández, (2009); Ostrosky, & Vélez, (2013); Torres, Córdoba, Cerón, Amézquita, & Bastidas, (2015). Rivera, & Flórez, (2017), Vallejo, Tapia, Zabala, (2023).

Areas of the brain involved in the choice of a product or service.

| The choice of a product or service involves the activation of several areas of the brain that are involved in decision making, reward processing and option evaluation. | |
|---|---|
| Nucleus accumbens | is part of the brain's reward system is part of the response system to rewarding stimuli. Activation of the nucleus accumbens has been associated with anticipation and evaluation of rewards associated with product or service choices. To curiosity, pleasure and discovery of new things. |
| Ventromedial prefrontal cortex (VMPC) | This brain region is involved in reward evaluation and decision making. It is activated when we evaluate and compare options that are available, it is also related to the generation of preferences and choices. |
| Anterior cingulate cortex (ACC): | is involved in the evaluation of emotional relevance and conflict detection. It is activated when there is a subjective evaluation of available options, and in decisions based on emotionally relevant information. It is also active with the experience of curiosity and positive emotional response to novelty and learning, as well as associated with uncertainty. |
| Dorsolateral prefrontal cortex (DLPFC). | is involved in executive processing and planning. It is active in the evaluation and comparison of options, and in rational cognitive control, in decision making based on available information. |
| Insula | integrates somatic and emotional cues, in decision making based on internal sensations. It is active in the subjective evaluation of options and the emotional experience associated with the choice of products or services. |

Source: Mejía, de Yahya, Méndez-Díaz, & Mendoza-Fernández, (2009); Ostrosky, & Vélez, (2013); Torres, Córdoba, Cerón, Amézquita, & Bastidas, (2015). Rivera, & Flórez, (2017), Vallejo, Tapia, Zabala, (2023).

Brain areas work together and communicate with each other to evaluate options and generate preferences. In addition, the choice of products or services may be influenced by individual, contextual and cultural factors, resulting in variations in brain activation and choice preferences.

## METHODOLOGY.

Ethical considerations of the research: the study was conducted with the approval of the participants with guaranteed anonymity.

Participants: the inclusion criterion for the survey was applied with the participation of shoppers regardless of age, gender, or social status in the supermarkets: Gran Aki, Mall del centro, Giralda Plaza, Paseo Shopping and Multiplaza in the city of Riobamba, province of Chimborazo.

Tools: as part of the study, a survey was elaborated that included topics of interest of the study variables: emotions and decision making. The objective was to analyze emotions and the purchase decision process in order to identify the brain areas involved in the stages of the decision making process.

The survey was elaborated in person, with demographic questions: age, gender, public or private employee, average income, and behavioral questions of reasons for buying in the place, emotions felt in the stages of the purchase process.

Procedure: The survey was applied at the entrance of the supermarkets mentioned above, from January to March 2023. The participants answered the survey voluntarily and anonymously, and once the data collection was completed, the descriptive statistical analysis was performed. The questions related to the six stages of the purchase decision process and the emotions generated at each stage were multiple choice questions. Then, through the review of bibliographic sources, the hormones and neurotransmitters and brain areas involved in the purchase process were identified. It was applied to a sample of 354 supermarket customers.

In the experimental phase, the Tobii Eye Tracking Glasses biometric equipment was applied to a sample of eight participants to determine attention, meditation and blinking, in the stages of the purchase process that comprise the process system: input, process and result. The average of the ratings determined the level of emotion of the participants in the buying process, the results corroborate the traditional survey with the results of the biometric equipment. The limitation of the study was the very small sample and the application time, because the average time of stay of each participant in the supermarket is one hour, in eight participants with two eyes tracking glasses available and were four hours of data collection. It is a qualitative and quantitative study, descriptive in nature, with descriptive statistics analysis, which allowed the identification of the emotions present in the stages of the purchase process.

Experimental phase.

Objective: to determine the emotions present in the purchase decision process in the participants of the sample that carry out the purchase process in a supermarket.

Biometric equipment used:

To understand the emotions in the shopping behavior and the brain reaction to external stimuli, two Tobii Eye Tracking Glasses 2 50/100HZ (Wireless) equipment were used for the physical walk through the supermarket.

Procedure:

The equipment was used at the entrance of the participants to a supermarket that was selected in a random sample, in order to identify attention, meditation and blinking, the behavior of the brain in the stages of the decision-making process. The participant's travel time in the supermarket is one hour with the use of the Eye Tracking glasses, with the purpose of obtaining relevant data.allowed to identify the emotions present in the stages of the purchasing process.

How to use the equipment: Eye trancking glasses.

1. Place the headband of the Eyes Tranking on the participant.

2. Turn on the equipment and enter the Tobii Pro Lab system, and proceed to link with the software installed on the phone via bluetooth.

Synchronize the view with the software, calibrating the equipment correctly (tracking the view as indicated by the controller).

4. The participant must walk through the physical store in approximately one hour.

5. Once the participant has completed the tour of the physical store, the study data is extracted.

6. The results of the evaluations are averaged and analyzed.

**RESULTS.**

In the execution of the survey carried out in the supermarkets of the city of Riobamba, to determine the emotions felt during the stages of the purchase process were:

Table 9: What emotions do you feel in the following stages of the purchase process? Identifying, recognizing and searching for information, prior to acquiring products or services.

| Stages: Identifying, recognizing and seeking information | Respondents | % |
|---|---|---|
| Uncertainty/doubt | 130 | 37 % |
| Joy | 100 | 28 % |
| Anger/anger/anxiety/sadness | 82 | 23 % |
| Distress | 31 | 9 % |
| Curiosity | 11 | 3 % |
| TOTAL | 354 | 100 % |

Source: Market research conducted in January - March 2023.

Table 9 shows the results of the survey of supermarket customers in the city of Riobamba, on the emotions they feel in the stages of the purchase process: identify, recognize and seek information, prior to acquiring their products or services. Thirty-seven percent feel uncertainty, 28% joy, 23% anger/anger/anxiety, 9% joy, 3% curiosity.

Table 10: What emotions do you feel in the following stages of the purchasing process? process (decision) and result (choice), prior to purchasing your products or services?

| Stages: process (decision) -result (choice) | Respondents | % |
|---|---|---|
| Joy | 129 | 36% |
| Surprise | 87 | 25% |
| Satisfaction | 79 | 22% |
| Security | 26 | 7% |
| Confidence | 33 | 9% |
| TOTAL | 354 | 100% |

Source: Market research conducted in January - March 2023.

Table 10 shows the results of the survey of supermarket customers in the city of Riobamba, in the emotions they feel in the stages of the purchase process: process (decision) and result (choice), prior to acquiring their products or services. Thirty-six percent feel joy at the moment of making the purchase decision and choice, 25% surprise, 23% satisfaction, 7% security, and 9% confidence.

Table 11: What emotions do you feel after purchasing your products or services?

| Stage: evaluation | Respondents | % |
|---|---|---|
| Satisfaction | 112 | 32% |
| Exhaustion | 37 | 10% |
| Demotivation | 38 | 11% |
| Joy | 78 | 22% |
| Anger/anger/anxiety/sadness | 89 | 25% |
| TOTAL | 354 | 100 % |

Source: Market research conducted in January - March 2023.

Table 11 shows the results of the survey of supermarket customers in the city of Riobamba, in the emotions they feel in the product evaluation stage after purchase, 32% feel satisfaction, 10% exhaustion, 11% demotivation, 22% joy and 25% anger/anger/anxiety.

Table 12. Summary of the stages of the purchase process.

| System Stages of the buying process. | Questions Emotions Areas of the brain | System Stages of the buying process. | Questions Emotions Areas of the brain | System Stages of the buying process. |
|---|---|---|---|---|
| Inputs | Identify needs/problems | What emotions do you feel in this stage I, II and III: identifying, recognizing and gathering information in the process of buying your products or services? | Uncertainty/doubt.<br>Anger/anger/anxiety/sadness<br>Joy<br>Fear<br>Anguish<br>Curiosity | Hormones and neurotransmitters:<br>Uncertainty/doubt: dopamine, serotonin and endorphins.<br>Anger/anger/anxiety/sadness: cortisol.<br>Joy: dopamine, serotonin and endorphins.<br>Fear: cortisol, adrenaline, endorphins.<br>Distress: cortisol, gaba.<br>Curiosity: adrenaline, dopamine, endorphins. |
| | Recognize or awaken the need. | | | Brain hemispheres: right in negative emotions, left in positive emotions |

| | | | | |
|---|---|---|---|---|
| | Collect or search for information | | | Brain structures.<br>Uncertainty/doubt: dorsolateral prefrontal cortex (DLPFC), anterior cingulate cortex (ACC), caudate nucleus, amygdala, hippocampus, nucleus accumbens.<br>Anger/anger/anxiety/sadness: amygdala, ventromedial prefrontal cortex (VMPC), anterior cingulate cortex (ACC), frontal lobe.<br>Joy: medial and ventromedial prefrontal cortex (MPFC and VMFC), nucleus accumbens, anterior cingulate cortex, amygdala, ventral tegmental area (VTA).<br>Curiosity/surprise: Nucleus accumbens, Dorsolateral prefrontal cortex (DLPFC), Anterior cingulate cortex (ACC), Hippocampus, Posterior cingulate cortex (PCC) Amygdala. |
| Process | Formulate the decision | What emotions do you feel in this stage IV: formulating the decision of the purchase process of your products or services? | Joy, Surprise, | Hormones and neurotransmitters:<br>Joy: dopamine, serotonin, endorphins.<br>Surprise: adrenaline, endorphins and cortisol. |
| | | | | Brain hemispheres: right in negative emotions, left in positive emotions. |
| | | | | Brain structures:<br>Joy: medial and ventromedial prefrontal cortex (MPFC and VMFC), Nucleus accumbens, Anterior cingulate cortex, Amygdala and Ventral tegmental area (VTA).<br>Curiosity/surprise: Nucleus accumbens, Dorsolateral prefrontal cortex (DLPFC), Anterior cingulate cortex (ACC), Hippocampus, Posterior cingulate cortex (PCC) Amygdala. |
| Results | Choice | What emotions do you feel in this stage V: choosing the purchase process of your products or services? | Satisfaction, Security, Confidence | Hormones and neurotransmitters:<br>Satisfaction/security/confidence: dopamine, serotonin and endorphins. |
| | | | | Brain hemispheres: right in negative emotions, left in positive emotions. |
| | | | | Brain structures.<br>Satisfaction: medial prefrontal cortex, nucleus accumbens, anterior cingulate cortex, insular cortex, hippocampus.<br>Choice processing: ventromedial prefrontal cortex (VMPC), nucleus accumbens, anterior cingulate cortex |

| | | | | |
|---|---|---|---|---|
| | | | | (ACC), dorsolateral prefrontal cortex (DLPFC), insula. |
| Post-purchase | Evaluation | What emotions do you feel in this stage VI: evaluation of the purchase process of your products or services? | Satisfaction, Rejection (aversion) Exhaustion (demotivation) Joy Distress, Sadness/anger | Hormones and neurotransmitters: Satisfaction/joy: dopamine, serotonin and endorphins. Rejection/exhaustion/demotivation/ distress/sadness: cortisol, decreased gaba. |
| | | | | Brain hemispheres: right in negative emotions, left in positive emotions. Brain structures. |
| | | | | Brain structures. Satisfaction: medial prefrontal cortex, nucleus accumbens, anterior cingulate cortex, insular cortex, hippocampus. Disappointment/anger/anger/anxiety/sadness: amygdala, ventromedial prefrontal cortex (VPC), anterior cingulate cortex (ACC), frontal lobe. |

Results of biometric Eye Tracking equipment.

Inputs:

The biometric eye tracking equipment was applied in the stages of the purchase process in 8 participants, the indicators were attention, meditation and blinking, the results were:

Table 12. Attention, meditation and blinking.

| N=Participants | attention | meditation | Blink Strength |
|---|---|---|---|
| Participant 1 | 46,61 | 61,86 | 50,20 |
| Participant 2 | 40,93 | 52,49 | 75,07 |
| Participant 3 | 61,31 | 74,15 | 50,32 |
| Participant 4 | 39,61 | 40,86 | 52,32 |
| Participant 5 | 29,03 | 43,39 | 45,80 |
| Participant 6 | 36,48 | 32,62 | 57,79 |
| Participant 7 | 41,66 | 84,19 | 46,32 |
| Participant 8 | 65,20 | 55,58 | 49,69 |
| AVERAGE AVERAGES | 45,10 | 55,64 | 53,44 |

Table 12 shows the average in the degree of attention, meditation and the frequency of blinking that customers, the results in meditation 55.64, attention 45.10, and in blinking 53.44. The following are considered in the input system in the purchasing process

Attention: greater focus of the mind before the stimuli; in meditation: greater tranquility and reflection, improves the quality of visual attention and greater blinking means less concentration and attention.

Process - Output (purchase).

Table 13. Attention, meditation and blinking.

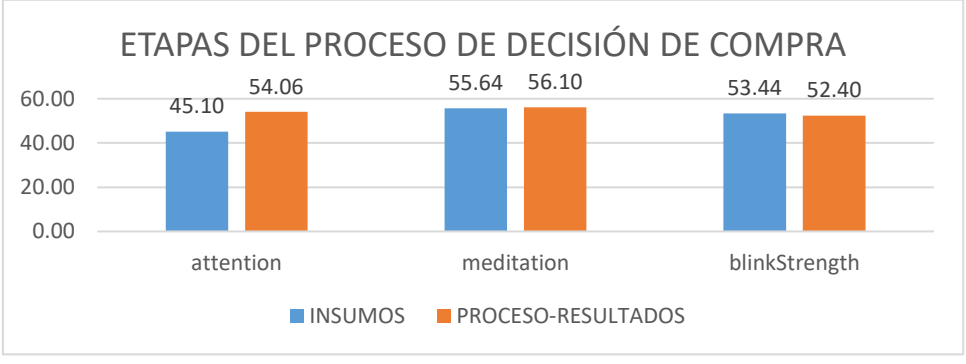
| N=Participants | attention | meditation | blinkStrength |
|---|---|---|---|
| Participant 1 | 59,36 | 47,25 | 48,64 |

| | | | |
|---|---|---|---|
| Participant 2 | 44,97 | 45,02 | 41,45 |
| Participant 3 | 69,92 | 56,68 | 51,64 |
| Participant 4 | 44,12 | 75,93 | 48,89 |
| Participant 5 | 52,55 | 56,54 | 52,97 |
| Participant 6 | 54,64 | 55,68 | 49,84 |
| Participant 7 | 54,49 | 58,83 | 57,83 |
| Participant 8 | 52,42 | 52,90 | 67,94 |
| AVERAGE AVERAGES | 54,05 | 56,10 | 52,41 |

Table 13 shows the average in the degree of attention, meditation and frequency of blinking that customer, the results are higher than 50 points, in blinking 52.41, in attention 54.05 and in meditation 56.10. They are considered in the system of the purchase process and the results or outputs there is greater meditation, attention and less blinking (greater Concentration.

The blinking is recorded by eye tracking is an indicator to measure the attention, because when something attracts the attention less blinking, and blink more when there is less attention. Attention is an indicator that the ad or video is capturing the attention of the audience and is effectively communicating the information. Carter, & Luke, (2020); Huang, Yang & Nakano, (2023), Rivas, & Esteban, (2004).

It means that once the person formulates the decision and chooses to fix their gaze on the chosen product, there is greater concentration and satisfaction with the chosen product.




Graph 2: Comparative analysis of attention, meditation and blinking in the stages of the purchase process.

It is concluded in the comparative analysis that, the level of Meditation has an emotional impact in percentages are almost equal, in the Element Input, and 56.10% in the Element Process - Result 56.10%. In the level of attention in the system the Input Element is 45.10% and, in the Process, - Result Element 54.06%, being higher in the system the Process and Results Element; that is, there is more attention in the purchase process in formulating the purchase and in the choice. The number of times the person blinks is measured inversely, the higher the number of blinks the lower the level of concentration, 53.44 % is higher in the Input Element and lower in

the Processes and Results Element, in the inverse analysis would be that, there is less blinking which means greater concentration in the purchasing processes.

Tabla 14. Resultados Eye Tracking.

| No. | Sistema | Etapas del proceso de compra. | Resultados Eye Tracking |
|---|---|---|---|
| 1 | Insumos | Identificar necesidades/problemas | Atención: menor atención.<br>Meditación: mayor meditación<br>Mayor Parpadeo: menor concentración |
| 2 | | Reconocer o despertar la necesidad | |
| 3 | | Recopilar o buscar información | |
| 4 | Proceso | Formular la decisión | Atención: mayor atención.<br>Meditación: mayor meditación<br>Menor Parpadeo: mayor concentración |
| 4 | Resultado o salida | Elección | Atención: mayor atención.<br>Meditación: mayor meditación<br>Menor Parpadeo: mayor concentración |
| 6 | Post venta | Evaluación | No evaluado |

Limitations of eye tracking: it shows the WHAT, but not the WHY. It also does not show whether what is observed has a positive or negative valence. It shows where our gaze is focused (foveal vision), but not the peripheral (parafoveal vision).

**DISCUSSION.**

Companies manage the experience in the use of the product or service, through the traditional variables of the market mix, nowadays the act of purchase is also managed with emotions, and the gratifying experiences of consumption and value of the brand or product. Some marketing theorists define emotion as: "a feeling produced by the subconscious when faced with the opportunity to satisfy a basic need that drives the body to act to achieve it" Madduck & Fulton, (1996) (p.124). Other authors define emotion as "An immediate response of the organism that informs it of the degree of favorability of a stimulus or situation" Wukmir, (1967) (p.167) According to Kotler & Armstrong (2012) customers make many purchase decisions every day, and these decisions are the focal point in marketing activities. Large companies research consumers' buying decisions in detail, with the goal of answering questions about what, where, how and how much they buy, and when and why they buy." Consumer behavior is the study of how individuals, groups, and organizations make decisions to acquire, use, and discard goods, services, ideas, or experiences, to satisfy their needs and wants. Understanding consumer behavior is fundamental for companies so that they can adjust marketing strategies to attract and retain customers. Cohen, (2006), Peter, Olson, Blanco, Correa, López & Domette (2006); Rivas & Esteban, (2004).

Emotional marketing seeks a connection with the customer, making them feel valued, cared for, cared for, increasing their self-esteem and ego. With the aim of building loyalty, they become loyal customers, and generate a state of loyalty between the customer and the company, create a relationship and ties that go beyond a commercial exchange to strengthen the emotional relationship, positive feelings of customers towards the brand, and the company seek to meet the needs of consumers Robinette, Brand & Lenz, (2001). Thus, the new trend of emotional neuromarketing manages the value of the offer of a product or service through the creation of emotional experiences of communication and gratifying consumption for the buyer/users, throughout the purchase process and after it, where it seeks to activate brain structures that drive

the purchase button, and generate the rewards and gratifying satisfactions that the customer is looking for.

## CONCLUSIONS

Technological advances, neuroscience and marketing research are rewarding and encouraging, but there are still some challenges and barriers to overcome, such as the high cost of research, small study samples, the image of neuromarketing considered unethical, the lack of communication agreements among researchers and the absence of standards. These limitations were identified at the neuromarketing meeting "Neuro Connections - Global Neuromarketing", held in February 2009 in Krakow, Poland. The results of the survey conducted with customers of supermarkets in the city of Riobamba, in the emotions they feel in stage I of the buying process: identify, recognize and seek information, prior to purchasing their products or services are uncertainty, joy, anger/anger/anxiety, joy, curiosity. The emotions they feel in stage II and III of the purchase processes (decision) and result (choice), prior to acquiring their products or services are joy at the moment of making the purchase decision and choice, surprise, satisfaction, security, and confidence. The emotions they feel in the Product Evaluation Stage after the purchase are satisfaction, exhaustion, demotivation, joy and anger/anger/anxiety.

There are hormones and neurotransmitters involved with emotions at different stages of the buying process, in the Input Stage: there is uncertainty/doubt and involves dopamine, serotonin and endorphins; in Anger/anger/anxiety/sadness involves cortisol; in Joy involves dopamine, serotonin and endorphins; in Fear involves cortisol, adrenaline, endorphins; in Distress involves cortisol, gaba; in Curiosity involves adrenaline, dopamine, endorphins. In the Process Stage (decision formulation): Satisfaction/security/confidence involves dopamine, serotonin and endorphins. In the Results Stage (choice and purchase): Satisfaction/security/confidence involves dopamine, serotonin and endorphins. And finally, in the Evaluation Stage, Satisfaction/joy involves dopamine, serotonin and endorphins; in rejection/exhaustion/demotivation/distress/sadness, cortisol is involved and there is a decrease in gaba. Also, the right brain hemispheres are activated in negative emotions, left in positive emotions in all stages of the buying process.

Brain Structures in the Input Stage in Uncertainty/Doubt involve the Dorsolateral Prefrontal Cortex (DLPFC), Anterior Cingulate Cortex (ACC), Caudate Nucleus, Amygdala, Hippocampus, Nucleus accumbens. Anger/anger/anxiety/sadness involves the amygdala, ventromedial prefrontal cortex (VPR), anterior cingulate cortex (ACC), frontal lobe. Joy involves the medial and ventromedial prefrontal cortex (MPFC and VMFC), nucleus accumbens, anterior cingulate cortex, amygdala, ventral tegmental area (VTA). Curiosity/surprise involves the nucleus accumbens, dorsolateral prefrontal cortex (DLPFC), anterior cingulate cortex (ACC), hippocampus, posterior cingulate cortex (PCC), amygdala. The brain structures in the Process Stage - (Formulating the decision) are: in Joy the medial and ventromedial prefrontal cortex (MPFC and VMFC), nucleus accumbens, anterior cingulate cortex, amygdala and ventral tegmental area (VTA) are involved. Curiosity/surprise involves the nucleus accumbens, dorsolateral prefrontal cortex (DLPFC), anterior cingulate cortex (ACC), hippocampus, posterior cingulate cortex (PCC), amygdala. The brain structures in the Results Stage (choice and purchase) are: Satisfaction involves the medial prefrontal cortex, nucleus accumbens, anterior

cingulate cortex, insular cortex, hippocampus. The choice process involves the ventromedial prefrontal cortex (VMPC), nucleus accumbens, anterior cingulate cortex (ACC), dorsolateral prefrontal cortex (DLPFC), insula. The brain structures in the Evaluation Stage (after purchase) are: satisfaction involves the medial prefrontal cortex, nucleus accumbens, anterior cingulate cortex, insular cortex, hippocampus. In the Insafisfaction/anger/anger/anxiety/sadness: amygdala, ventromedial prefrontal cortex (VPC), anterior cingulate cortex (ACC), frontal lobe.

In the comparative analysis the level of Meditation has an emotional impact in percentages that are almost equal, in the level of attention in the system the Element processes is greater than inputs; that is to say, that there is greater attention in the purchase process in formulating the purchase and in the choice. The number of times the person blinks is measured inversely, the higher the number of blinks the lower the level of concentration, being lower in the Processes and Results Element, therefore there is less blinking which means greater concentration in the purchasing processes.

Neuroemotions allow to carry out advertising campaigns obtaining relevant data of the brain structures involved in the buying process, which will facilitate the use of more effective strategies for companies to make better decisions when investing in advertising, generating greater benefits, less probability of failure and thus unnecessary expenses.

Technology has evolved together with science, currently there are devices that help to evaluate and measure the behaviors of the human brain that allow us to know what customers think at the time of generating a purchase or what is the experience they have about a certain product or site. Neuroscientific technology has infinite resources that by means of EEG, eye tracking, fMRI and galvanic measurement can identify with greater accuracy what the human brain feels and thinks when faced with different stimuli through the senses. Post-purchase evaluations show that repurchase and recommendation intentions are determined by positive emotions which, in turn, are determined by hedonic value, and that utilitarian value reduces negative emotions. Eye tracking is a tool for understanding how the eyes and visual attention interact with visual stimuli, providing valuable information for interface design, advertising and other fields related to visual perception and decision making.

## WORKS CITED

Bagozzi, R., Gopinath, M., & Nyer, P. (1999). The role of emotions in marketing. Journal of the Academy of Marketing Science, 27(2), 184-206.

Callejo, J. (2005). Modelos de comportamiento del consumidor: apropósito de la motivación. Política y Sociedad (16), 93 - 110.

Carter, BT y Luke, SG (2020). Las mejores prácticas en la investigación del seguimiento ocular. Revista Internacional de Psicofisiología , 155 , 49-62.

Cohen, M. (2006). El comportamiento del consumidor: quienes son, por qué compran y cómo se puede anticipar cada uno de sus movimientos. Mexico: McGraw-Hill Interamericana.

Damasio, A. (1995). REVIEW (blacksquare): Toward a Neurobiology of Emotion and Feeling: Operational Concepts and Hypotheses. The Neuroscientist, 1(1), 19.

Derbaix, C., & Poncin, I. (2005). La mesure des réactions affectives en marketing: évaluation des principaux outils. Recherche et Applications en Marketing, 20(2), 55-75.

Droulers, O., & Roullet, B. (2007). Emergence du neuromarketing: apports et perspectives pour les praticiens. Décisions Marketing(46), 9 - 21.

Dubois, B., & Rovira, A. (1998). Comportamiento del consumidor: Prentice Hall.

Ekman, P. (1993). Facial Expression and Emotion. American Psychologist, 48, 384 - 392.

Ekman, P. (2017). El rostro de las emociones. RBA libros.

Esquivel, L. (2015). El libro de las emociones. Debolsillo.
Etxebarria, I. (2003). Las emociones autoconscientes: culpa, vergüenza y orgullo. EG Fernández-Abascal, MP Jiménez y MD Martín (Coor.). Motivación y emoción. La adaptación humana, 369-393.
Fernandez, A., Dufey, M., & Mourgues, C. (2007). Expresión y reconocimiento de emociones: un punto de encuentro entre evolución, psicofisiología y neurociencias. Revista Chilena de Neuropsicología (2), 8 - 20.
Fernández, A. E. G. (1995). Manual de motivación y emoción. Madrid: Editorial Centro de Estudios Ramón Areces.
Gallardo, R. V. (2006). Naturaleza del Estado de Ánimo. Revista Chilena de Neuropsicología, 1(1), 29.
Goleman, D. (1995). Emotional intelligence. New York: Bantam Books.
González, M. (2006). Aspectos Psicológicos y Neurales en el Aprendizaje del Reconocimiento de Emociones. Revista Chilena de Neuropsicología, 1(1), 21.
González Lagier, D. (2009). Emociones, responsabilidad y derecho. Marcial Pons.
Hill, D. (2008). Emotionomics : leveraging emotions for business success. London; Philadelphia: Kogan Page.
Hillenbrand, P. (2007, 24 al 26 de octubre). Emoción y decisión de compra: La universalidad de las expectativas emocionales entre géneros y grupos de edad al ejemplo de productos financieros. Paper presented at the XII Foro de Investigación. Congreso Internacional de Contaduría, Administración e Informática, Mexico D.F.
Huang, C., Yang, B. y Nakano, K. (2023). Impacto de la duración del monitoreo antes de la solicitud de adquisición en el tiempo de adquisición con información sobre los datos de seguimiento ocular. Análisis y prevención de accidentes , 185 , 107018.
International Kansei Design Institute (2007). What is Kansei Engineering? Extraido el 15 septiembre, 2009, de http://www.kanseidesign.com/kansei_e.html
Iversen, S., Kupfermann, I., & Randel, E. R. (2000). Emotional states and feelings. En E. R. Kandel, S. J. Harris & T. M. Jessell (Eds.), Principles of neural science (4 ed.). New Jersey: McGraw-Hill.
Johnson, R. A., & Stewart, W. D. (2005). A reappraisal of the role of emotion in consumer pehavior. En N. K. Malhotra (Ed.), Review of marketing research. Vol. 1. Armonk, N.Y.: M.E. Sharpe.
Khan, M. A. (2001). Consumer behaviour. New Delhi: New Age International.
Kotler, P & Armstrong (2012). Marketing. México: Pearson Lange, S. (2001). El libro de las emociones (Vol. 27). Edaf.
LeDoux, J. E. (1992). Emotion and the amygdala. En J. P. Aggleton (Ed.), The Amygdala : neurobiological aspects of emotion, memory, and mental dysfunction. New York: Wiley-Liss.
LeDoux, J. E. (1995). Emotion: Clues from the brain. Annual review of psychology, 46(1), 209-235.
Lee, N., Broderick, A., & Chamberlain, L. (2006). What is 'neuromarketing'? A discussion and agenda for future research. International Journal of Psychophysiology, 63(2), 199 - 204.
Lewis, M., Haviland-Jones, J. M., & Barrett, L. F. (2008). Handbook of emotions. New York: Guilford Press.
Lindstrom, M., & Underhill, P. (2008). Buyology Truth and Lies About Why We Buy. New York: Broadway Books.
Lyons, W. E. (1980). Emotion. Cambridge [Eng.]; New York: Cambridge University Press.
Maddock, RC y Fulton, RL (1996). Marketing para la mente: estrategias del cerebro derecho para publicidad y marketing . Grupo editorial Greenwood.
Otero, X., Santos-Estevez, M., Yousif, E., & Abadía, M. F. (2023). Images on stone in sharjah emirate and reverse engineering technologies. Rock Art Research: The Journal of the Australian Rock Art Research Association (AURA), 40(1), 45-56.
Nguyen Thanh Hai, & Nguyen Thuy Duong. (2024). An Improved Environmental Management Model for Assuring Energy and Economic Prosperity. Acta Innovations, 52, 9–18. https://doi.org/10.62441/ActaInnovations.52.2
Girish N. Desai, Jagadish H. Patil, Umesh B. Deshannavar, & Prasad G. Hegde. (2024). Production of Fuel Oil from Waste Low Density Polyethylene and its Blends on Engine Performance Characteristics . Metallurgical and Materials Engineering, 30(2), 57–70. https://doi.org/10.56801/MME1067
Shakhobiddin M. Turdimetov, Mokhinur M. Musurmanova, Maftuna D. Urazalieva, Zarina A. Khudayberdieva, Nasiba Y. Esanbayeva, & Dildora E Xo'jabekova. (2024). MORPHOLOGICAL FEATURES OF MIRZACHOL OASIS SOILS AND THEIR CHANGES. ACTA INNOVATIONS, 52, 1–8. https://doi.org/10.62441/ActaInnovations.52.1
Yuliya Lakew, & Ulrika Olausson. (2023). When We Don't Want to Know More: Information Sufficiency and the Case of Swedish Flood Risks. Journal of International Crisis and Risk Communication Research , 6(1), 65–90. Retrieved from https://jicrcr.com/index.php/jicrcr/article/view/73
Szykulski, J., Miazga, B., & Wanot, J. (2024). Rock Painting Within Southern Peru in The Context of Physicochemical Analysis of Pigments. Rock Art Research: The Journal of the Australian Rock Art Research Association (AURA), 41(1), 5-27.
Mashael Nasser Ayed Al-Dosari, & Mohamed Sayed Abdellatif. (2024). The Environmental Awareness Level Among Saudi Women And Its Relationship To Sustainable Thinking. Acta Innovations, 52, 28–42. https://doi.org/10.62441/ActaInnovations.52.4
Kehinde, S. I., Moses, C., Borishade, T., Busola, S. I., Adubor, N., Obembe, N., & Asemota, F. (2023). Evolution and innovation of hedge fund strategies: a systematic review of literature and framework for future research. Acta Innovations, 50,3, pp.29-40. https://doi.org/10.62441/ActaInnovations.52.4
Andreas Schwarz, Deanna D. Sellnow, Timothy D. Sellnow, & Lakelyn E. Taylor. (2024). Instructional Risk and Crisis Communication at Higher Education Institutions during COVID-19: Insights from Practitioners in the Global South and

North. Journal of International Crisis and Risk Communication Research , 7(1), 1–47. https://doi.org/10.56801/jicrcr.V7.i1.1
Sosa-Alonso, P. J. (2023). Image analysis and treatment for the detection of petroglyphs and their superimpositions: Rediscovering rock art in the Balos Ravine, Gran Canaria Island. Rock Art Research: The Journal of the Australian Rock Art Research Association (AURA), 40(2), 121-130.
Tyler G. Page, & David E. Clementson. (2023). The Power of Style: Sincerity's influence on Reputation. Journal of International Crisis and Risk Communication Research , 6(2), 4–29. Retrieved from https://jicrcr.com/index.php/jicrcr/article/view/98
Marcus, G., MacKuen, M., Wolak, J., & Keele, L. (2006). The Measure and Mismeasure of Emotion. En D. Redlawsk & R. Boynton (Eds.), Feeling Politics: Affect and Cognition in Political Information Processing. New York: Palgrave McMillan Publishing.
Markram, H. (2006). The blue brain project. Nature Reviews Neuroscience, 7(2), 153-160.
Mejía, D. I. L., de Yahya, A. V., Méndez-Díaz, M., & Mendoza-Fernández, V. (2009). El sistema límbico y las emociones: empatía en humanos y primates. Psicología iberoamericana, 17(2), 60-69.
Molina, C. (2013). Emociones expresadas, emociones superadas. Oniro.
Monge, S. (2009). Jornada. Paper presented at the Neuromarketing: Nuevas fronteras de la investigación de mercados. from hww.euskadinnova.net/home.aspx?tabid=226&idEvento=2721
Ortony, A., Clore, G. L., & Collins, A. (1988). The cognitive structure of emotions. Cambridge [England]; New York: Cambridge University Press.
Ostrosky, F., & Vélez, A. (2013). Neurobiología de las emociones. Revista Neuropsicología, Neuropsiquiatría y Neurociencias, 13(1), 1-13.
Peter, J. P., Olson, J. C., Blanco y Correa Magallanes, J. L., López Taymani, Y., & Domette Nicolesco, J. (2006). Comportamiento del consumidor y estrategia de marketing. México, D. F.: McGrawHill.
Phillips, M., Drevets, W., Rauch, S., & Lane, R. (2003). Neurobiology of emotion perception I: The neural basis of normal emotion perception. Biological Psychiatry, 54(5), 504-514.
RAE (Ed.) (20022) Diccionario de la lengua española (23 ed.). España: Real Academia Española.
Rivas, J., & Esteban, I. (2004). Comportamiento del consumidor: ESIC Editorial.
Rivera, L. F. S., & Flórez, J. A. R. (2017). Bases neurales de la toma de decisiones e implicación de las emociones en el proceso. Revista chilena de neuropsicología, 12(2), 32-37.
Robinette, S., Brand, C., & Lenz, V. (2001). Marketing emocional: el método de Hallmark para ganar clientes para toda la vida. Grupo Planeta (GBS).
Romanski, L., & LeDoux, J. (1992). Equipotentiality of thalamoamygdala and thalamo-cortico-amygdala circuits in auditory fear conditioning. Journal of Neuroscience, 12(11), 4501-4509.
Rovira, C. (2016). La metodología del eye tracker: de la investigación de la lectura al estudio de mapas conceptuales. Hipertexto. neto , (14).
Ruiz, C., & Arranz, A. (2003). Eficacia de la Publicidad Emocional. Un Estudio Comparativo entre la Ejecución de Tipo Emocional e Informativa. Documento de Trabajo "Nuevas tendencias en Dirección de Empresas", 9(3), 1 - 32.
Sanarai, (2023). Emociones: qué son, cuáles son sus funciones y como gestionarlas mejor. Equipo Editorial Sanara. 26 de junio 2023. Tomado de: https://www.sanarai.com/blog/emociones-que-son-como-gestionarlas-mejor
Schiffman, L., & Kanuk, L. (2005). Comportamiento del consumidor: Pearson Educacion.
Schiffman, L., & Kanuk, L. (2009). Consumer Behavior (10 ed.). New York: Prentice Hall.
Silva, C. J. (2003). Biología de la regulación emocional: su impacto en la psicologóa del afecto y la psicoterapia. Terapia psicológica, 21(2), 163.
Simón, V. M. (1997). La participación emocional en la toma de decisiones. Psicothema, 9(2), 365 - 376.
Solomon, Michael (2017). Comportamiento del consumidor. Pearson. México.
Squire, L. R. (2008). Fundamental neuroscience. Amsterdam; Boston: Elsevier / Academic Press.
Torres, J. S. S., Córdoba, W. J. D., Cerón, L. F. Z., Amézquita, C. A. N., & Bastidas, T. O. Z. (2015). Correlación funcional del sistema límbico con la emoción, el aprendizaje y la memoria. Morfolia, 7(2), 29-44.
Vallejo, L. Tapia, A. & Zabala, H., (2023). Neuromarketing Mix. Escuela Superior Politécnica de Chimborazo. Dirección de Publicaciones Científicas. Riobamba-Chimborazo.
Vázquez, P. G., Basile, F. J. G., & López, J. A. G. (2021). Fundamentos teóricos de la educación emocional: Claves para la transformación educativa. Ediciones Octaedro.
Vergara, R. G. (2006). Naturaleza del estado de ánimo. Revista chilena de Neuropsicología, 1(1), 29-40.
Wukmir, V. J. (1967). Emoción y sufrimiento: endoantropología elemental. Editorial Labor.
Zak, P. (2004). Neuroeconomics. Philosophical Transactions of the Royal Society B: Biological Sciences, 359(1451), 1737 - 1748.