Evaluation of Emotional Responses to Television Advertising through Neuromarketing

Evaluación de las respuestas emocionales a la publicidad televisiva desde el Neuromarketing

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ABSTRACT

Since the last century, we have witnessed a steady evolution of advertising techniques in an effort to adapt to the new social context in the market. As a strategic resource, Neuroscience brings a new perspective by allowing you to explore those difficult or verbally unconscious motives behind consumer behaviours. The present work aims to discover the relationship between the emotions induced in audiovisual advertising messages and their impact on the memory of the subjects. To achieve this goal, an experiment was carried out with eight audiovisual advertising messages (six representatives of the basic emotions: joy, surprise, anger, disgust, fear and sadness, and two rational ones that show the technical specifications of the product). Neuromarketing techniques such as the electrical activity of the heart (ECG) and the electrodermal activity (EDA) of the subjects are used, on one hand; and, on the other, a conventional research technique, a questionnaire applied to the subjects that participated in the research. The results show variations in the measures performed in the commercials corresponding to joy, surprise and anger, while for both, remembrance of the message transmitted and activity of the advertiser, the commercial with the best results has been the one regarding sadness, advertisement that has also been considered the most attractive for participating subjects.

RESUMEN

Desde el siglo pasado hemos presenciado una evolución constante de las técnicas de comunicación publicitarias en un intento de adaptación a las nuevas realidades sociales del mercado. Como recurso estratégico, la Neurociencia aporta una nueva perspectiva al permitir explorar aquellos motivos difíciles de verbalizar o inconscientes que hay detrás de los comportamientos de los consumidores. El presente trabajo tiene como objetivo descubrir la relación entre las emociones inducidas en los mensajes publicitarios audiovisuales y su impacto en el recuerdo de los sujetos. Para alcanzar este objetivo se ha realizado un experimento con ocho mensajes publicitarios audiovisuales (seis representativos de seis emociones básicas: alegría, sorpresa, ira, asco, miedo y tristeza; y dos racionales) en el que se han utilizado, por un lado, técnicas de Neuromarketing como son la actividad eléctrica cardíaca (ECG) y la actividad eléctrica de la dermis (AED) de los sujetos; y, por otro, una técnica de investigación convencional, un cuestionario aplicado a los sujetos que han participado en la investigación. Los resultados ponen de manifiesto variaciones en las medidas realizadas en los mensajes correspondientes a la alegría, la sorpresa y la ira, mientras que, tanto para el recuerdo sugerido del mensaje trasmitido como para la actividad del anunciante, el anuncio con mejores resultados ha sido el de la tristeza, anuncio que también ha sido considerado el más atractivo para los sujetos participantes.

1. Introduction and the current situation

The loss of efficiency in advertising has forced marketing leaders to search for new tools to help them obtain a better knowledge of how information is processed and consumer behaviour; in that context, Neuroscience brings a new perspective by analysing the processes related to the decision-making which we normally carry out unconsciously (Norton, Frost, & Ariely, 2007; Moorman & Zaltman, 1985).

The needs of the persuasive communication sector to adapt to the changes in the social environment, have triggered a process of constant searching for efficiency. In the current state of advertising research, however, we can identify, among others, two challenges in which traditional techniques, created by the advertising environment with a marked rationalist bias, have not carried out any in-depth research:

a) Emotion-based advertising. In recent years brands have tried to create "emotional bonds with consumers and, to do so, they go beyond rational arguments or those based on the benfits of the product" (Roberts, 2005: 105). The study of emotions has been influenced by an evolutionist and neuroscientific school of thought which considers them innate and universal; it is a new, positive vision of emotions: reasoning and emotion go hand in hand when decisions are being made. Daniel Kahneman uses two systems acting in parallel to explain it: rapid, "effortless" thought –therefore using up little energy– and slow, deliberate and costly thought. For this author, the weight of emotions is greater than it used to be when it comes to decision-making. System 2 is too slow and inefficient to constitute a permanent substitute for System 1, designed by evolution, to carry out a continuous resolution of the main problems which an organism must solve in order to survive (Kahneman, 2012: 123); as a consequence, System 1 is the most-commonly used for everyday purchasing decisions.

b) Unconscious decisions. The fundamental principle of market research is that it is possible to ask people questions and their response will be true. The restrictions of verbal statements and ignorance of what we really feel makes it difficult at times to understand our own emotions. Consumer behaviour is a reflection of complex mental processes which motivate all human action and therefore "social psychologists are always studying the ways in which we are unaware of what really makes up our behaviour, and to what extent this contradicts the image we have of ourselves" (Graves, 2011: 41). Advertisers are more and more aware that most human decisions are taken intuitively, automatically and, very often, with no conscious control. (Matukin, Ohme, & Boshoff, 2016).

The boom in neuro-science being applied to the study of the consumer as a discipline is making it possible to deepen the understanding of current consumption needs, given that, within the motives which govern purchasing there are factors such as feelings, emotions and subconcious desires which motivate the decisions we take on a daily basis. (Lindstrom, 2008). Currently, researchers join the two main types of mental processes in their studies: conscious and unconscious, the latter are involuntary, taken without effort, very quick and they can be repeated at any time (Barghand & Chartrand, 1999).

The field of Neuroscience is an alternative, or can be complementary to, conventional research techniques (Vecchiato & al., 2014), as it facilitates the study of that motivation which is difficult to verbalise or is unconscious and which lies behind buying behaviour (Li, Wang, & Wang, 2016). In that context, the emotions make up the raw material of the audiovisual sector (Crespo-Pereira, Martínez-Fernández, & García-Soidán, 2015). Our current reality reveals the habitual use of emotions as the fundamental tools for creating positive advertising messages and transferring those feelings to brands (Shen & Morris, 2016). The revolution of emotions is measurable thanks to Neuromarketing (Alonso, 2015). Knowing some of the emotional levers which are activated in the consumer facilitates the identification of those that generate a greater somatic marker as a positive marker (Damásio, 2005) in the positioning and memory of a brand, given that it has been demonstrated that the greater the intensity of an emotion, the greater the advertising impact and memory that can be achieved.

From the field of Neuromarketing, the methods of Neuroscience are applied in order to analyse and understand human behaviour relative to markets and the marketing of goods and services (Babiloni, 2012; Vecchiato & al., 2011). As such, Neuromarketing analyses consumer behaviour from the perspective of the brain (Morin, 2011). It appeared after the combination of concepts which are applicable in the field of Neural Science, Psychology, Human Neurophysiology and even Neurochemistry (Kumar & Singh, 2015). As regards its relationship to advertising research, biometric techniques are used in the search for a detailed analysis of preferences, needs, experiences, emotions, memories, attention and perception in consumers, using the modern techniques and methodolgies such as electroencephalography (EEG), biometric techniques (galvanic or heart measurement, etc) and eye tracking. Thanks to these techniques which are based on clinical Neuroscience, it has been shown how a screening of the acivity of the brain makes it possible to research the emotional reaction to the viewing of an advertisement. In

addition, conclusions can be reached from these real-time brain reactions (Ariely & Berns, 2010) which are more accurate in terms of the communication of the product than those obtained by traditional qualitative and quantiative studies which are sometimes less reliable (Wood, 2012; Klaric, 2011). Therefore, "the mental processes of attention and emotion registered by commercials would appear to be a more reliable indicator of success, all the more so bearing in mind the importance of the two mental processes in the generation of remembrance of the commercial in the target public" (Tapia-Frade, Martín-Guerra, & Puente, 2016: 75).

It is becoming more and more common for advertisers to use experiential emotionality in the advertising messages of their products, in order to activate, to a greater or lesser degree, certain areas of the brain and identify the interest or feelings which are wakened and possible motivation for purchase. The advertising messages which reach the brain of subjects are transformed by the emotions using an unconscious process which gives the messages a personal significance, influenced by previous experiences and the knowledge of each individual (McClure & al., 2004). Therefore, the level of attraction to advertising stimuli would appear to be related to the response of the brain through the emotions of individuals. In different research a key pattern in the brain has been identified which becomes apparent when the brain perceives something new which catches its attention (Squires, Squires, & Hillyard, 1975). Likewise, the rest of the body undergoes a change which

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may be measured using biometric techniques to gauge the level of pleasure or rejection of the individual. (Jain, Flynn, & Ros, 2008).

Following on from these presuppostions, abundant research has been designed in an attempt to measure the emotional impact of advertising. By way of illustration we will mention some examples: the levels of attention and emotion have been analysed, in correlation with the impact and effectiveness of the advertisements which received prizes at the Cannes International Advertising Festival (Tapia-Frade, Martín-Guerra, & Puente, 2016); the effect of advertisements warning against tobacco consumption and the emotional response of subjects to the same have been assessed (Kim & Niederdeppe, 2014); the significant differences in the emotional variables when viewing messages which were devised for different cultures (Vecchiato & al. 2012) and for different genders (Vecchiato & al., 2014) have been checked; the relationship between long-term memory and the success of the advertisement has been shown (Young, 2009); the emotional differences depending on the advertising preferences of the individuals has been shown (Nomura & Mitsukura, 2015). These cases are only a small sample given the considerable increase in the number of scientific and popular articles on Neuromarketing in recent years, particularly in the United States (Victoria, Arjona, & Repiso, 2015).

2. Material and methods
2.1. Aims and objectives

The general aim of the research is to discover the relation between induced emotions in audiovisual advertising messages and their impact on the individual's memory.

The method for achieving that aim is to:

• Study how the different types of emotions used in audiovisual advertising messages influence the cardiac electrical activity and the electrical activity of the dermis of subjects.

• To find out the differences shown by both the cardiac electrical activity and the electrical activity of the dermis of subjects when exposed to emotional and rational messages.

• To ascertain what relationship exists between the cardiac electrical activity and the electrical activity of the dermis of subjects and the recall of brands and the messages they transmit.

2.2. The design of the experiment

Although is it true that in the field of Neuromarketing there is a "lack of work published by multi-disciplinary teams" (Victoria & al., 2015: 37), for a study of these characteristics, we consider the work of multi-disciplinary teams to be of vital importance. There should be not only researchers from the area of communication but also experts in Neuroscience and professionals from the area of psychology in order to analyse the phenomenon from all of those angles.

The emotional reaction and recall of a series of subjects has been analysed on viewing eight advertising messages of which six were representative of basic emotions and two had a specifically rational content based on the technical specifications of the products.

During the course of the experiment, the cardiac electrical activity and the electrical activity of the dermis of subjects was measured while they viewed eight uninterrupted messages all the time trying to simulate the features of an advertising spot on television; the position of the messages was established randomly to minimise the primacy (first) and recency (last) effect, of a serial position derived from the place where each brand appeared which can generate greater recall in the study population (Glanzer & Cunitz, 1966).

> With this research it has been shown that the cost of measuring the electrical activity of the heart (ECG) and the electrodermal activity (EDA), when a group of subjects is exposed to advertising stimuli, is slightly superior to that which means turning to more conventional research techniques, for example, the focus group. It is important to bear this factor in mind as, a Graves states, "we are at an exciting moment for understanding consumers. The breakthroughs in social psychology, research on the brain and in different technologies which trace the movements of buyers offer new information about what people do and why".

Before beginning the session, the subjects signed a consent form and, once in the room, each individual sat in front of a computer screen where the experimental stimulus appeared. They viewed it only once after a few minutes of neutral content to take the base rate of each of the participants. A few minutes after the data gathering process had finished, the participants answered a questionnaire to measure both spontaneous recall and that which is suggested by the brands, the messages, the situations, etc. In this way, we can see the relation between the emotion which each message transmits, the physiological reaction which it provokes in the individual and the efficiency measured in terms of recall.

2.3. Choice of sample subjects and stimuli

The advertising messages had to meet a series of characteristics: a duration of between 30 and 45 seconds to avoid this variable affecting the memory, brands which were not well-known to the participants and which had not been shown in our country to avoid the recall being triggered by the accumulation of impacts in the individual as a result of varying levels of subject exposure to the message.

All advertisements have been selected by a group of eight (four academics and four publicists); firstly, they chose, from a series of 24 audiovisual advertising messages, the six which were most representative of surprise, fear, sadness, joy, disgust and anger; we are speaking of the most representative of each emotion because it is very difficult to find one single emotion in any given advertising message. Afterwards, this group selected two

rational messages; in other words, those in which the formative content is the most important component, focussing on the product and its features and attempting to convince with logical arguments. The experts were given information in advance about the criteria for identifying each type of emotion and the task to be undertaken: selecting the eight messages which, afterwards, would serve as an experimental stimulus in the research.

Using groups of experts to evaluate the characteristics of the commercial messages is a frequent practice in research on advertising and creativity as it eliminates the possibility of bias derived from the involvement of researchers in the decision-making (Koslow, Sasser, & Riordan, 2003; Arroyo, 2006; Ariely & Berns, 2010) as each advertisment attempts to be a unique product, making it difficult to assess some of its elements, for example, the predominant emotion.

The order of the messages, which was determined randomly, was the following: 1) Disgust: NYC Health (https://-goo.gl/RWgL1Z); 2) Anger: Government of Georgia (https://goo.gl/SgATDr); 3) Surprise: Lovable (https://goo.gl/UYKx8F); 4) Fear: Samsung (https://goo.gl/yzgTxZ); 5) Joy: Cadbury (https://goo.gl/YO4Grz); 6) Rational: Luna.com (https://-goo.gl/Pr7tLk); 7) Sadness: SickKids (https://goo.gl/X6JsdD); 8) Rational: Square.com (https://goo.gl/naScfL).

Some 36 subjects took part in the experiment, with the values of 10 of them discarded due to defects in the quality of the signal received or because of physiological problems, to maintain the normal scientific rigour for research in clinical medicine; in the end, we worked with 26 individuals (9 male and 17 female), all of them students of different undergraduate or postgraduate degrees at the Universidad Rey Juan Carlos, between 18 and 27 years of age, resident in the Community of Madrid, not students of the Communication Faculty, fluent in English; a sample which could be considered adequate in this type of research (Vecchiato, & al., 2010; Tapia-Frade & al., 2016) as, according to Monge-Benito and Fernández-Guerra (2011: 32), "while questionnaire-based market studies require hundreds of replies, Neuromarketing consultants, such as Sands Research, assure that a sample of 30-40 subjects is enough for each demographic group to obtain results with a margin of error of 1% (…) or, depending on the margin of error permitted, with an even smaller sample group".

2.4. Register of physiological signs and analysis methodology

The electrical activity of the heart was registered (ECG) using a derivation from three electrodes, positive and negative on the wrists, and the reference electrode on the forearm of the subject. From the ECG, the sign for RR intervals was obtained, i.e., the time between pulses, by identifying the peak R of the QRS complex (Sörnmo & Laguna, 2005).

For the ECG register, the BITalino system was used (Plux Wireless Bioignals S.A. Portugal), which facilitates the register of physiological signals with a frequency interval of 1 KHz (Da-Silva, Lourenço, Fred, & Martins, 2014). The electrodermal activity was also recorded (EDA) placing a couple of electrodes on the palm of the non-dominant hand. The EDA was recorded continuously for the whole duration of the videos and afterwards it was processed using our own software developed in Python. The EDA signal was measured using a band-pass filter, with high and low frequencies of 0.2 and 1 Hz respectively, with the aim of obtaining the tonic component of the EDA (Vecchiato & al., 2012; Roth, Dawson, & Filion, 2012).

The RR interval signal allows us to determine the activity of the autonomic nervous system (ANS). One of the most powerful tools for determining that activity is the heart rate variability (HRV) (Camm & al., 1996). In this work two indices were used, SDNN (standard deviation of NN intervals) and SampEn (Sample Entropy), which allows the HRV to be quantified (Camm & al., 1996; Richman & Moorman, 2000). These indices have been used widely in other fields for stratifying the risk of sudden heart attack death (Lombardi & al., 2001; Goya-Esteban & al., 2010), and also to assess healthy subjects (Goya-Esteban & al., 2012) and they are apt for the measuring of advertising.

The RR interval signal was recorded during the entire viewing of the advertisments. In the subsequent analysis, it was segmented according to the duration of each of the messages. Each segment was pre-processed to eliminate any possible artifacts and, after that, the proposed HRV indices were calculated. In addition, the time between centred heart rate (mean removed), in order to eliminate the influence of the base heart rate of each subject.

One of the aims of the piece of work is to analyse the relationship that exists between ANS activity, as measured by HRV indices, and the recall of the different messages. In order to establish that relationship, a series of dichotomous variables were created for each subject according to their answers in the questionnaire. These variables scored 1 when the subject correctly remembered the adveriement that showed the specific emotion and indicated that they had felt that emotion. In that way, two groups were created for each emotion with the aim of analysing the ANS activity and its relation to the emotion and the memory of each advertisment.

The statistical differences between each group were evaluated using a hypothesis contrast based on a bootstrap resampling (Efron & Tibshirani, 1994). The choice of this method was due to the number of subjects in each group being different and, in some cases, small. In addition, some of the group does not comply with the normality hypothesis for the application of classic methods. This type of method has been used widely in studies in the area of health (Barquero-Pérez & al., 2015).

2.5. Recall measurement

The questionnaire was used to measure both the spontaneous recall and also the suggested one in order to know the relationship between the physiological measurements of the subjects and the recall of different elements of the messages.

Using the spontaneous memory, information is recovered without the need for any reinforcement; in this research, the goal is to ascertain the relationship between the predominant emotion in the message and the memory of different elements of the advertisement. The suggested recall implies the use of a series of keys which serve to facilitate the memory of the subjects.

The questionnaire has three sections:

• Demographic variables: age, gender, education and nationality.

• Spontaneous recall: the individual is asked about their direct remembrance of the brands which appear in the messages, the sector or activity of each advertiser and

Figure 1. Representation of the mean value of heart rate in each advertisement, by gender.

the message which is transmitted in the advertisments. They are also asked what emotions they have felt and in relation to which advertisements.

• Suggested recall: the subject is asked what brands they remember seeing from a list of brands which includes those which appear in the messages used in the experiment; they are also shown a series of different situations, some of which really contain the messages, so that they associate them with the brand which they have recognised beforehand.
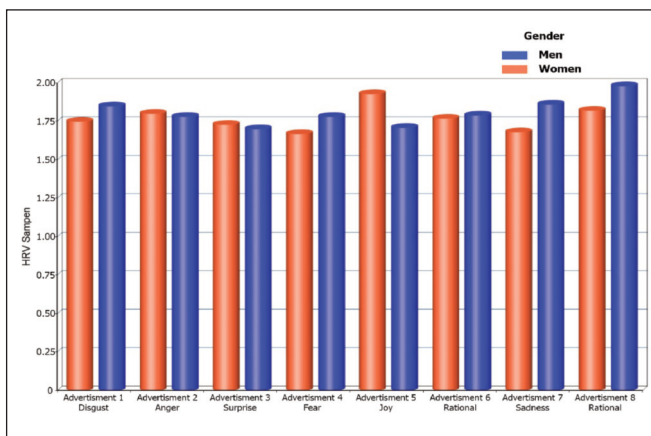

Figure 2(a). Average SampEn value for each of the advertisements, by gender.

3. Results
3.1. Activity of the autonomic nervous system of the subjects grouped by gender

Following the structure set out in the methodology, we develop the results obtained from the ANS according to gender, in three stages.

In the first one (Figure 1) we can see the heart rate using the time between pulses, once the median has been eliminated. Even though the sample size means that the differences between men and women cannot be considered statistically significant, we do find important differences in advertisment 5 (joy) and in number 1 (disgust). It is worth noting, in the case of men, a high heart rate (small values for the time between pulses) in advertisment 5, and a considerable fall in the same in advertisment 1.

Secondly, we found that the electrodermal activity (EDA) did not reveal significant differences between men and women, in any of the messages.
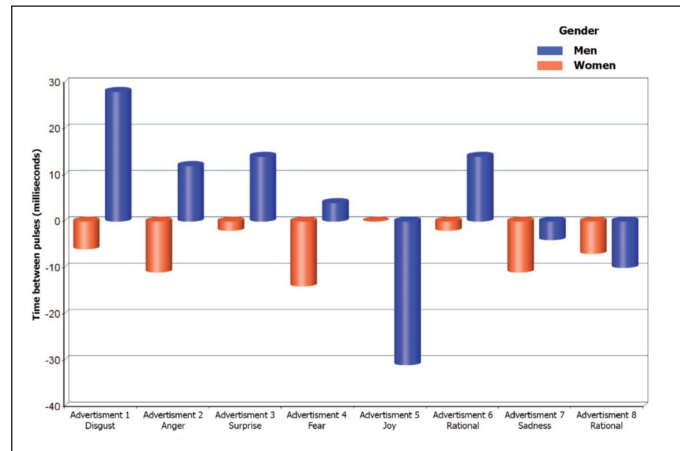
Finally, the results obtained in relation to the SampEn indices (Figure 2a) and SDNN (Figure 2b), show that, in both cases, the largest differences in terms of values are once again found in advertisement 5, with this message being the only one in which the complexity of the activity of the ANS, measured by SampEn, is greater in women that in men.

Figure 2(b). Average SDNN value for each advertisement, by gender.

3.2. Activity of the autonomic nervous system of the subjects as grouped by memory-emotion

During the viewing of the advertisements, the emotions which triggered SNA activity which was significantly different when the message was remembered were: joy, anger and surprise. The other emotions did not generate changes in ANS activity, irrespective of their recall.

Figure 3 shows the SDNN index, where we can see a greater value for subjects who remembered and felt joy with advertisement 5, which implies a greater HRV.

Those subjects who remembered advertisement number 3, and said that they felt surprise, registered a significantly lower heart rate (greater time between beats) as is reflected in Figure 4 (next page).

Those subjects who remember advertisment 2 and felt the emotion of anger, experienced a significant increase in their heart rate (shorter time between beats) (Figure 5) (next page).

As with the analysis of the differences according to gender, the EDA did not provide information which allows us to identify significant differences in any of the emotions analysed.

3.3. Memory of brands, activities and messages

It was observed that the spontaneous memory of brands is quite low: none of the subjects remembers the brands that appear in the first three audiovisual messages: NYC Health, Government of Georgia and Lovable; 3 subjects remember Samsung; 2 Cadbury; 6 Luna.com; 1 SickKids; and 1 Squire.com. This memory does not depend on the position of the advertisement in the experiment nor the previous knowledge of the brand as the best-remembered one does not have activity in our country and corresponds to a purely rational message.

When individuals are asked about the spontaneous memory of the activities of the advertisers, without asking them to do so in the order in which they appeared, the results are quite high: twenty subjects remember the one which corresponds to message 7, 18 to one and three, 11 to two and eight, 10 to four, 9 to five and four to six.

As regards the recall of the message which advertisements transmit, without asking the subjects –once again– to do so in the order in which they appeared, we find: 25 remember the message transmitted by advertisement 7, 22 number one, 19 number 3, 17 number twelve, 10 number 5, 8 number four, 7 number sixteen and 6 number eight.

With the suggested recall, the subjects remember a considerable number of brands, irrespective of their position or the previous knowledge. SickKids (advert 7) is the best-remembered (16 subjects) whereas a well-known brand such as Samsung (message 4) is only remembered by 5 individuals and the first advert (NYC Health) is only remembered by 6.
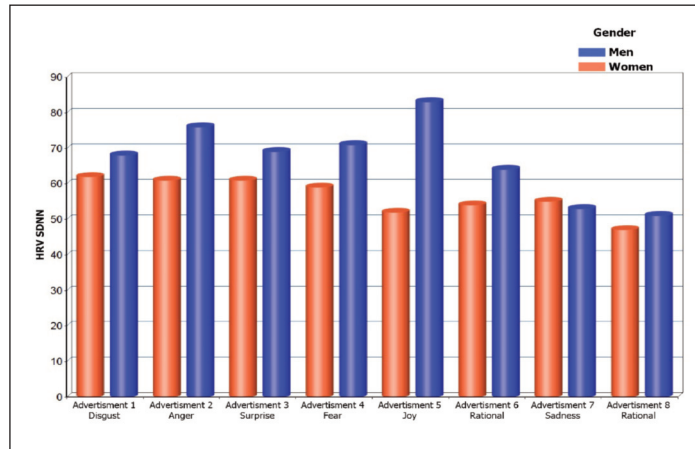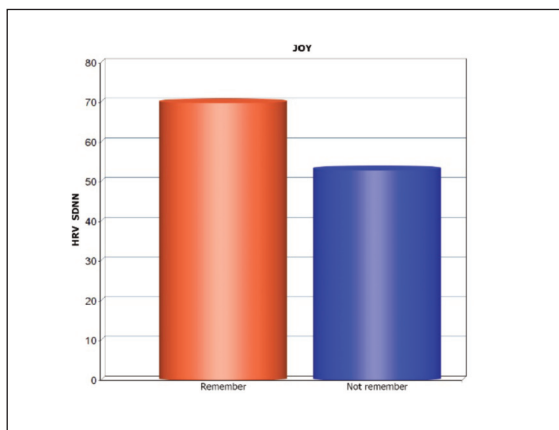

Figure 3. Deviation of the HRV measured by SDNN between the subjects who remember and feel the emotion of joy with advertisement 5, and those who do not.

These data are related to the messages' appeal and ability to catch the attention: for 12 subjects, the most attractive one was SickKids, for 10, Lovable, and, for 9, NYC Health. The ones which were considered least attractive were the two rational advertisements (only one subject considered them attractive).

Finally, the subjects had to relate different situations, some of which appeared in the advertisments shown (suggested recall), to the brands which appeared in the messages; the two advertisements which were considered the most appealing obtained the best results: advertisment 3(Lovable) and advertisement 7 (SickKids); in both cases, more than half of the subjects correctly related the situations to their respective brands.

Figure 4. Deviation of time between pulses between subjects who remember and feel the emotion of surprise with advertisment 3, and those who do not.

4. Discussion and conclusions

Firstly, in accordance with what Shen y Morris (2016) state, we can conclude that the advertising research improves its efficiency when it integrates, within the same design, techniques of Neuromarketing and conventional techniques which are sufficiently proven, for example the questionnaire. In this piece of work, we have used the first to record the subject's emotional answer, while they view the advertising messages, and, with the second, it has been possible to gauge the efficiency of the messages by measuring the recall of different elements of the advertisements – this cannot be obtained using only Neuromarketing techniques.

We can conclude that using emotions in advertising messages influences the recall, both in brands and the messages they transmit. This is so because these advertisements have obtained better results than the rational messages, as was pointed out by Wood (2012), among others.

It has been shown that the activity of the Autonomic Nervous System (ANS), quantified by means of the variation in the heart rate (HRV) of the subjects, was significantly different in those participants who remembered those advertisments which transmitted joy, surpise and anger, even though the direction of the variation differs depending on the emotion analysed. In particular, those who state they felt joy and correctly recalled the brand of the communication had a higher ANS activity. The heart rate was higher in the subjects who stated they had felt anger and remembered the message correctly. On the other hand, the heart rate was significantly lower in the subjects who felt surprise and remembered the advertisement.

It has been shown that when the subject considers the message attractive or it has a higher capacity to catch the attention, the recall of the brand and the message it transmits is greater. However, it would be interesting to ascertain to what extent the experiences and previous knowledge of the subject influence these results (McClure & al., 2004).

As regards the recall of the message which is transmitted by each advertisement, the one which is associated with the emotion of sadness (broadcast in the seventh position) is the one which obtains the best results: 25 subjects remembered the message; the second-best in terms of recall corresponds to the emotion disgust (22 subjects), shown first; the third corresponds to surprise (19 subjects) broadcast third. In this case, the messages which are least remembered correspond to the rational communications.

Unlike the results obtained in other studies which conclude that greater brand recall is generated by the messages which appear first (Li, 2010), it has been shown that the order in which the advertisements are shown to subjects does not have a
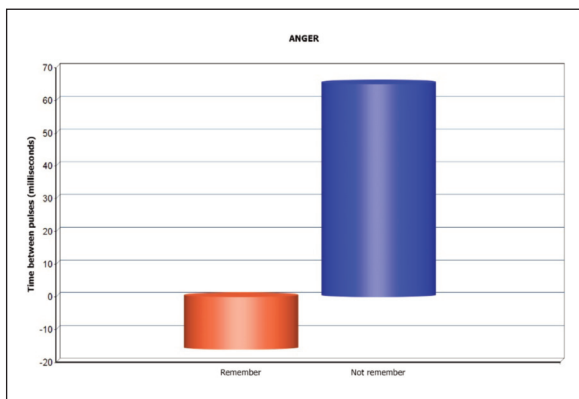

Figure 5. Variation of the time between heartbeats for subjects who remember and feel the emotion of anger with advertisement 2, and those who do not.
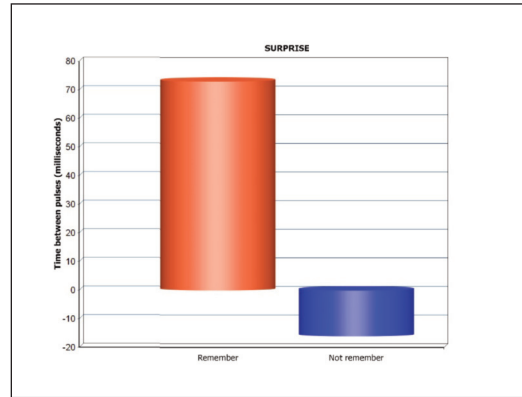
determining effect on the recall thereof as the first message shown in the block (emotion disgust for NYC Health) did not obtain the best results in the spontaneous recall or the suggested recall.

With the indices used in this work to determine HRV and EDA, we created models of latent variables, using "partial least square path modeling", in order to obtain an objective characterisation of the ANS activity in relation to the brand recall in advertising messages. Long term, the aim is to have a model to help with the design of advertisements to maximise brand recall.

Regarding the significant differences between genders in the emotion variables, (Vecchiato & al., 2014), although the data do reveal differences, the high standard error makes it impossible to reach that conclusion, based on the results obtained. It would be interesting to do a more in-depth study along those lines to ascertain whether or not there are significant differences between men and women when it comes to watching advertising messages in which different emotions predominate.

Finally, Neuromarketing as a recent discipline has shown itself to be a very important tool in the efficiency of the research of advertising market. One of the most frequent criticisms of Neuromarketing has been the cost of the research when this type of technique is used; however, with this research it has been shown that the cost of measuring the electrical activity of the heart (ECG) and the electrodermal activity (EDA), when a group of subjects is exposed to advertising stimuli, is slightly superior to that which means turning to more conventional research techniques, for example, the focus group. It is important to bear this factor in mind as, a Graves states, "we are at an exciting moment for understanding consumers. The breakthroughs in social psychology, research on the brain and in different technologies which trace the movements of buyers offer new information about what people do and why" (2011: 287).

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