International Journal of Bioelectromagnetism *www.ijbem.org*
Vol. 19, No. 1, pp. 25 - 35, 2017

Gender Differences Evaluation in Charity Campaigns Perception by Measuring Neurophysiological Signals and Behavioural Data

Ana Martinez-Levy[ab], Patrizia Cherubino[bc], Giulia Cartocci[bc], Enrica Modica[bc], Dario Rossi[bc], Marco Mancini[b], Arianna Trettel[b], Fabio Babiloni[abd]

[a] *Department of Communication and Social Science, Sapienza University of Rome, Rome, Italy*

[b] *BrainSigns Srl, Rome, Italy*

[c]*Department of Molecular Medicine, Sapienza University of Rome, Rome, Italy*

[d]*Department of Computer Science, Hangzhou Dianzi University, Xiasha Higher Education Zone, 310018, Hangzhou, China*

Correspondence: Ana Martinez-Levy: ana.martinezlevy@uniroma1.it, phone +39 06 49912223

Abstract. Nowadays it has clearly understood that emotions play an important role in the success of commercial advertising. Particularly, it has been observed as advertising campaigns of non-profit organizations need to create an emotional appeal in people, in order to generate a positive behavioral response. The charity sector has grown tremendously in the last decades and with it the need to create improved specific marketing strategies. The aim of the present paper is to show how the variation of the EEG frontal cortical asymmetry is related to the general appreciation perceived during the observation of a charity campaign, focusing on gender differences. With the use of neurophysiological and traditional measures, the responses of participants are evaluated through an electroencephalographic (EEG) index of approach or withdrawal motivation based on the frontal alpha asymmetry, called Approach-Withdrawal Index (AW), and an autonomic index deriving from the combination of the heart rate (HR) and the galvanic skin response (GSR) activity, called Emotional Index (EI), considered an indicator of the emotional involvement. An interview at the end of each experience reveals the behavioral data. Results show higher values for women than men of both neurophysiological indexes: for the EI with p=0,037 and for the AW index with p=0,035. The declared answers of participants at the end of the campaign demonstrate that the declared liking of women is statistically significantly higher than the declared liking of men (p=0,008). Finally, there is a correlation between the AW and the declared liking with p=0,007. Results suggest the presence of gender differences in the cognitive and emotional responses to emotion appealing charity advertisements.

Keywords: Emotion, charity, gender, approach-withdrawal.

1. Introduction

The non-profit sector has grown considerably in scale over the past twenty years in the UK and the US (Pharoah, 2000). Fundraising advertising is designed to raise funds and reflect the brand of the organization, but they may also be designed to raise awareness of a particular social issue (Douglas, 2004). There has been an increasing interest in the outcome of fundraising initiatives and the returns that might reasonably be expected to accrue from various forms of that (Palmer and Randall, 2002). As “consumers think narratively rather than argumentatively” (McKee, 2003), charity stories are usually

designed to take the consumer through different emotions and feeling states. The story should have a point of conflict and should also point the way to a happy ending through the help/donation of the consumer (Goodman, 2006). To garner the attention of potential donors and cut through the advertising clutter, images that generate emotions such as shock and fear are frequently used to encourage prosocial behavior (De Pelsmacker et al., 2011). In this context, several researchers have argued that responses to charitable appeals could be influenced by gender differences (Chang & Lee, 2011). Men tend to have an egoistic disposition, which is characterized by personality traits such as independence and autonomy; they tend to give in order to enhance their own standing or maintain the status quo (Shelley & Polonsky, 2002; Hall, 2004). Women, on the other hand, tend to show altruism, which is characterized by sympathy, understanding, and sensitivity to others' needs (Newman, 1996/2000; Hupfer, 2006; Andreoni & Vesterlund, 2001; Monk-Turner et al.2002, Whelan, 2002; Eagly & Koening, 2006); they give to promote social change or help others less fortunate than themselves. Those theories have been deducted from the declarative answers of participants during studies with traditional methods (qualitative or quantitative).

With the present study, in addition to traditional techniques such us questionnaire, neuroscientific technologies have been used to help to obtain a deeper response to advertising tests, particularly on charity campaigns. Through those technologies, it is possible to obtain, second by second, cognitive and emotional responses of consumers. A further advantage of these methods compared to traditional research is the lower sample size required. On the other hand, neurophysiological measures, such us the Emotional index (EI) (Vecchiato et al.,2014) and Approach-Withdrawal index (AW) (Davidson et al.,1990), respectively estimated using the autonomic and the electroencephalographic response generated in response to a stimulus have been used previously in numerously studies for public service announcements (Cartocci et al.,2016;Cartocci et al.,2017; Modica et al., 2017), product experiences (Modica et al.,2018) and to measure gender differences on commercial advertising with different products (Cartocci et al.,2016; Cherubino et al.,2016).

Gender differences were founded in several neuromarketing studies. Some evidence suggests a different perception between women and men, in general, with a higher approach motivation in case of advertising of a typical feminine item (e.g. a perfume), but mainly circumscribed to creativity (e.g. dancing) of a TV commercial. (Vecchiato et al., 2014). When the advertised product is an item often considered as masculine (e.g. a car), becomes evident the influence of the peculiar creativity of the commercial in order to produce effective advertising also towards women. In a study conducted by Vecchiato and colleagues (2013), it was revealed that the advertising creativity could affect in different ways for men and women, providing personalized suggestion to reach different audiences personalizing the TV commercial (for example in a short length reduction version). In Vecchiato' study, evaluating the emotional response, as indexed by heart rate (HR) and Galvanic Skin Response (GSR) variations, women showed an emotional profile presenting a major activity in the first section of the commercial, characterized by the presence of a famous actress and three pretty little girls, probably due to the identification by the women sample with the actress and a sort of maternal reaction toward the children; on the other hand men's emotional profile was predominantly activated in the final section, corresponding to the technical presentation of the product, probably due to the higher level of reward elicited in men by the product, in comparison to women (Vecchiato et al., 2013, pp.101-106).

The aim of this study was to provide evidence of possible gender differences in the cerebral and emotional perception of a charity advertisement in addition to those provided by the use of traditional market research techniques.

2. Material and Methods

2.1 Sample and Protocol

Twenty-two healthy subjects, 11 men and 11 women (37 ± 10), age ranging from 25 to 54, have been enrolled for the study and underwent EEG and behavioral data (declarative answer) recording. On a subgroup of 7 men and 7 women also autonomic recordings have been performed, for the analysis of the EI. The project involves healthy subjects that have been paid for their performances. Each subject fulfilled an informed consent after the explanation of the study. During the experimental procedure, each participant watches a video composed by a documentary, used as a baseline, and a commercial break of

11 advertisements, in which a charity campaign[1] of 60 seconds is inserted (Please see scenes on *figure 1)*. The experimental subjects enrolled in this study are then asked to comfortably sit in front of a computer screen where a video is presented. They are told to pay attention to what they would watch. Different technologies are used for the detection of biosignals, in order to obtain different indexes. The cerebral activity is recorded by means of a portable EEG system (BeMicro and Galileo software, EB neuro, Italy), which is used to estimate brain activity -related index (AW). In addition, the EI is calculated by the combination of GSR and HR signals, recorded with a sampling rate of 64 Hz through a Shimmer (Shimmer Sensing, Ireland) system and applied to the non-dominant hand of the participant (please refer to the following paragraphs for detailed information). After data recording, behavioral responses are also collected through an interview, so to collect the perceived pleasantness. At this stage, participants are asked to recall spontaneously the commercial video clips which they memorize. Then, the researcher, verbally, listed the sequence of advertisements presented within the documentary asking the subjects which advertisement they can remember. Successively, participants are asked to give a score ranging between 1 and 10 according to the level of pleasantness they perceived during the observation of each remembered advertising (1, lowly pleasant; 5, indifferent; 10 highly pleasant). These declarative results are then compared with the EI and AW index results.

In the following picture, the charity campaign commercial in test is shown, divided frame by frame.

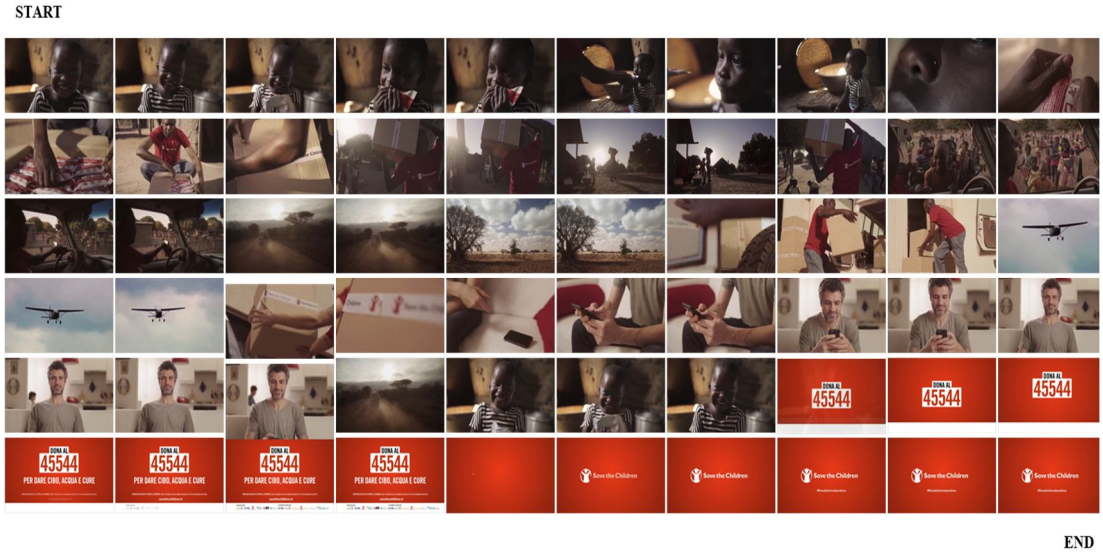

Figure 1. *The picture represents the frame sequence of the charity campaign. Each image represents each second of the advertising.*

2.2 EEG Recordings and Signal Processing

The EEG signal is recorded using a 10-electrodes-based EEG frontal band (Fpz, Fp1, Fp2, AFz, AF3, AF4, AF5, AF6, AF7, AF8) by means of a portable 24-channels system (BEmicro, EBneuro, Italy). The signals are acquired at a sampling rate of 256 Hz and the impedances were kept below 10kΩ. Each EEG trace is then converted into the EEGlab format in order to perform signal preprocessing such as artifacts detection, filtering, and segmentation. The EEG signals are band-pass filtered at 2–30 Hz and the artifacts contribution, in particular, ocular artifacts, are removed by using the independent component analysis (ICA). The EEG data are re-referenced by computing the common average reference (CAR). Individual alpha frequency (IAF) is calculated for each subject, from EEG data recorded during a "closed eyes" condition preceding the experimental task, in order to define four bands of interest according to the method suggested in the literature (Klimesch, 1999). Such bands are reported in the following as IAF ± n Hz, where IAF is the individual alpha frequency, in Hertz, and n is an integer displacement in the frequency domain which is employed to define the band ranges. In particular, we focus the present

[1] Please find the following link of YouTube to watch the tested video advertising: https://www.youtube.com/watch?reload=9&v=nFA5eHzcCWk

analysis on the alpha bands [IAF-4 ÷ IAF+2] (Klimesch, 1999). Therefore, the EEG signals from all the electrodes are filtered for each subject within their own alpha band.

To summarize the activity from all these electrodes, the Global Field Power (GFP) is then computed. This is a measurement introduced by Lehmann and Skrandies (1980) to summarize the overall activity over the scalp surface. GFP is computed from the entire set of electrodes by performing the sum of the squared values of the EEG potential (filtered in a specific band, in our case alpha band) at each electrode, resulting in a time-varying waveform related to the increase or decrease of the global power in the analyzed EEG.

The cerebral appreciation is monitored in the target population by using the Approach-Withdrawal index, according to the theory related to the EEG frontal asymmetry theory (Davidson, 2004). The AW index is correlated to the unbalance of the right and left the prefrontal activity. The formula used is the following:

$$AW=GFP_{\alpha\_right} - GFP_{\alpha\_left}$$

The GFP_{α_right} and GFP_{α_left} stand for the GFP calculated among right (Fp2, AF4, AF6, AF8) and left (Fp1, AF3, AF5, AF7) electrodes respectively, both in the alpha band. The waveform of the AW cerebral index is estimated for each second and then averaged for all the duration of the stimuli. The AW index is then standardized according to the baseline EEG activity acquired at the beginning of the experiment. Positive AW values mean an approach motivation toward the stimulus expressed by the subject, while negative AW values imply a withdrawal tendency. The AW index was normalized returning z-score values across the whole experiment for each subject. In fact, such an index has been defined by taking into account the frontal EEG asymmetry's theory by Davidson and co-workers (Davidson, 2004).

2.3 The Autonomic data recordings and signal processing

The Blood Volume Pulse (BVP) and GSR are recorded with the Shimmer System (Shimmer Sensing, Ireland) with a sampling rate of 64 Hz. For the recording of these signals, three sensors (two electrodes and one photoplethysmographic sensor) are placed to the palmar side of the middle phalanges of the second and third fingers on the non-dominant hand of the participant, according to published procedures (Boucsein et al., 2012). In order to obtain the HR signal from the BVP, it has been used the Pan-Tompkins algorithm (Pan and Tompkins, 1985). The constant voltage method (0.5 V) is employed for the acquisition of the skin conductance, then by using the LEDAlab software (Benedek & Kaernbach, 2010), the tonic component of the skin conductance (Skin Conductance Level, SCL) is estimated.

In order to combine GSR and HR signals producing a monodimensional variable which returns the emotional state of subjects, the EI is defined by taking into account the GSR and HR signals (Vecchiato et al., 2014). We refer to effects plane (Russell & Barrett, 1999; Posner et al., 2005) where the coordinates of a point in this space are defined by the HR (horizontal axis) and the GSR (vertical axis). Several studies have highlighted that these two autonomic parameters correlate with valence and arousal, respectively (Mauss & Robinson, 2009). The interpretation of the EI implies that the higher the value the more positive the emotion experienced by the subject is, and vice versa.

2.4 Statistical Analysis

Paired *t*-tests are performed for testing the differences between the gender groups for the AW, EI and behavioural responses. A logistic regression is used for investigating the correlation between gender groups concerning the declared liking and AW values.

3. Results

Concerning gender differences, statistically, significant differences were obtained for both indexes.

3.1. Approach Withdrawal Index

For the AW index, a p=0,035 is reported for all sample (22 subjects). On *Figure 2* a higher total average of women than men for the total advertising is shown.

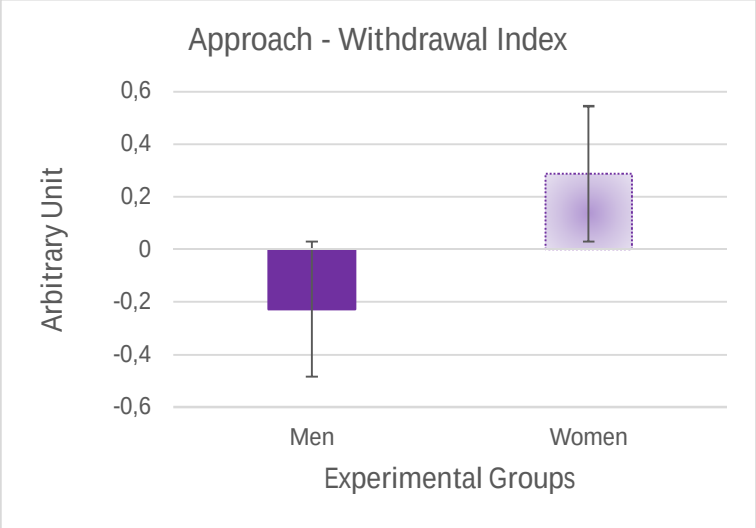

Figure 2 *The graph shows the total average AW values reported by women and men during all the spot. Error bars represent standard error.*

As shown in *Figure 3* women show a higher cerebral approach than men to the advertising in most part of it. Particularly, on the scenes where empathy plays an important role for the effectiveness of the campaign, such us, children images, undeveloped country images, donation images, and green number.

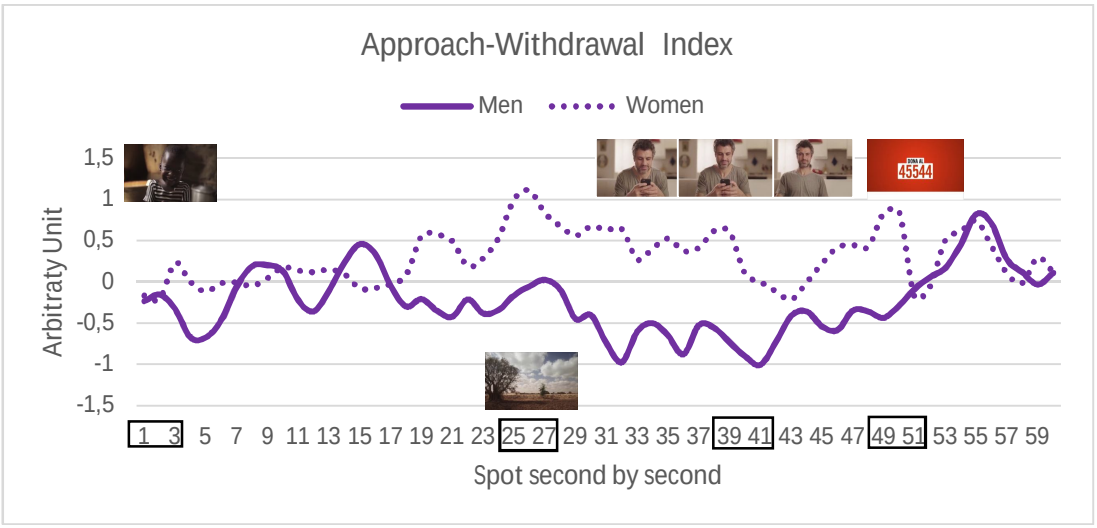

Figure 3 *The graph shows the average AW values reported by women and men second by second of the spot with representative images.*

3.2. Emotional Index

For the EI a p= 0,037 is reported for a subgroup of 14 participants. As shown in *figure 5*, the average of the emotional involvement is higher for women than men.

Figure 4 *The graph shows the total average EI values reported by women and men during all the spot. Error bars represent standard error.*

Particularly, observing the advertising second by second (F*igure 5)*, the moment with a child at the beginning generates a different emotion between men and women. In women the emotion increases, in men, it decreases. This may represent a feeling of empathy and protection of women towards the child. There are other significant moments of the creativity of this advertising, such us, the donation moment and the green number which have higher emotional involvement values in women than men (See *Figure 5*).

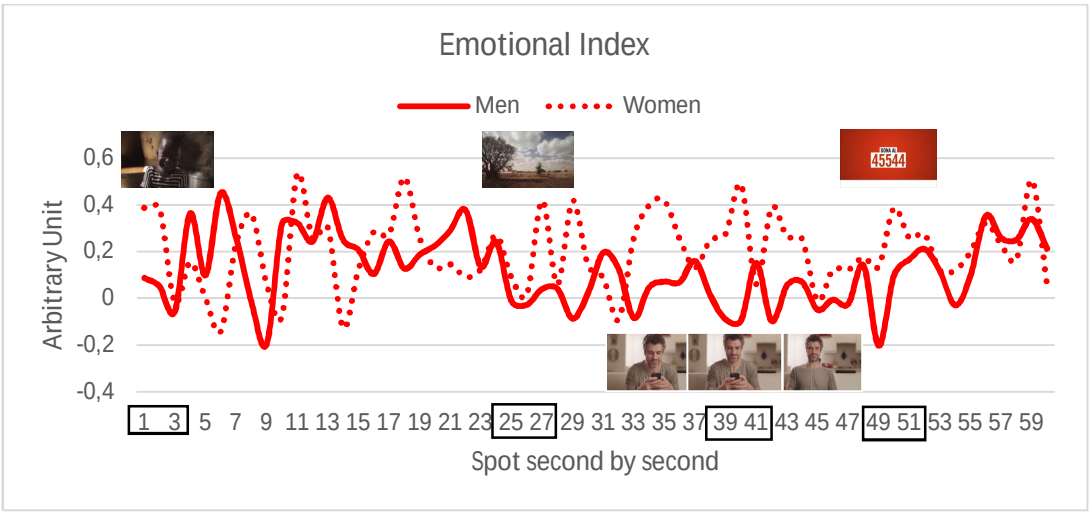

Figure 5 *The graph shows the average EI values reported by women and men second by second of the spot.*

3.3. Qualitative test

The declared liking of women is statistically significantly higher than the declared liking of men (p=0,008) *(figure 8).* The following graphs show a higher dispersion of votes for men than women (f*igure 6 and figure 7*), for who almost all votes are between 8 or 10. As the tendency for neural indexes responses obtained with EEG demonstrates also higher values for women than men, both, declarative votes and AW results are confronted on the following section (see *figure 9*).

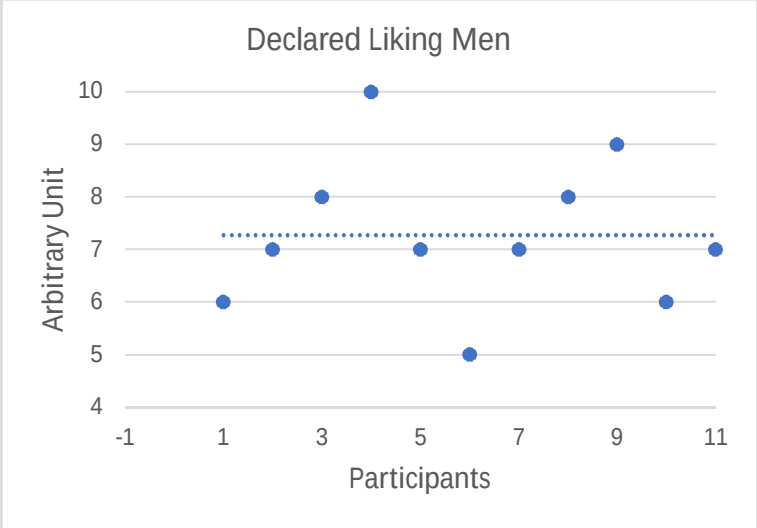

Figure 6 *The graph shows the men votes on the declared liking.*

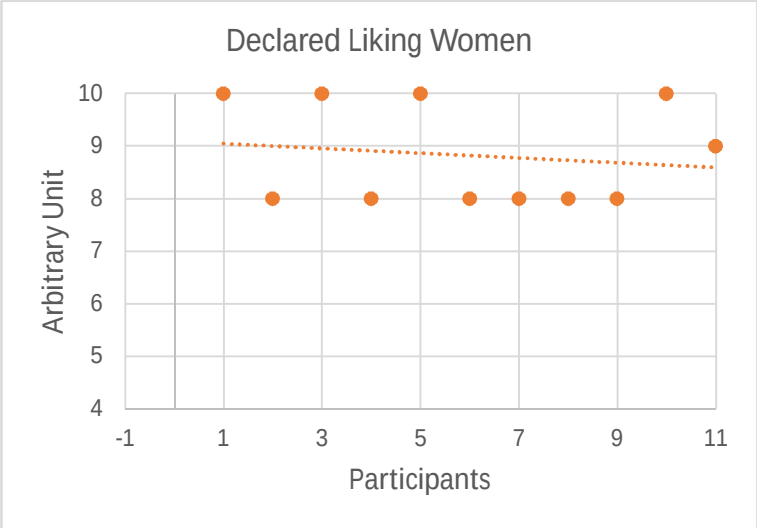

Figure 7 *The graph shows the women votes on the declared liking.*

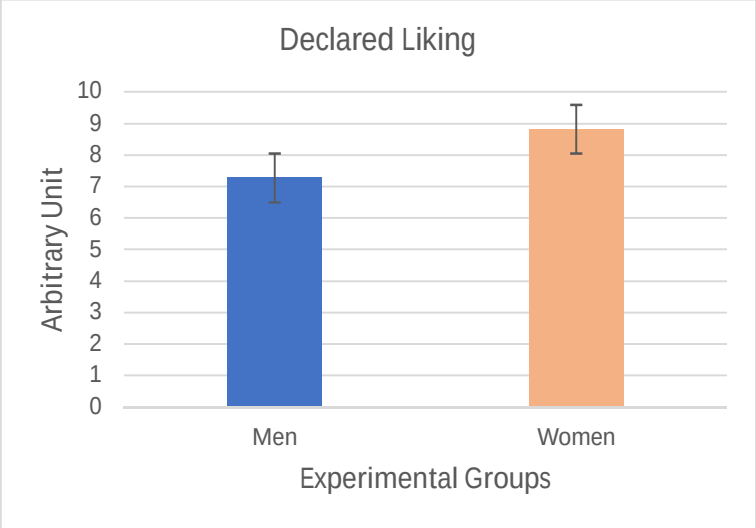

Figure 8 *The graph shows the average declared liking values reported by men and women. Error bars represent standard error.*

3.3. Approach-Withdrawal Index and Qualitative test

Furthermore, there is a correlation between the gender difference in the AW index and the declared liking(p=0.007). *Figure 5* shows that women (up on the gender axis), have higher values for the AW index (dark red part on the graphic) as well as higher values for declared liking in comparison to men.

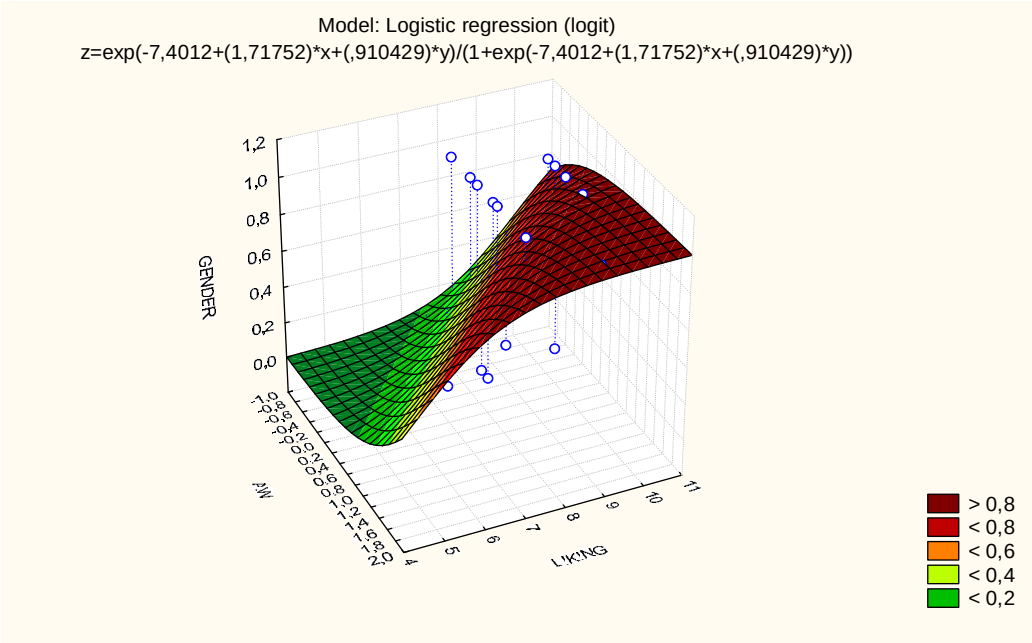

Figure 9 *The graph reports the logistic regression showing a statistical difference between gender groups concerning declared liking and AW.*

4. Discussion

Non-governmental organizations (NGO) operate in a competitive market and survive with funding from membership fees and donations from supporters. Knowing and motivating potential donors has become increasingly important. Advertising is one of the key means of communication used by these organizations (Dos Santos et al., 2016).

In this context, value congruity is a strong determinant of attitudes towards charity (Supphellen & Nelson, 2001) and the evaluation of charity appeals (Brunel & Nelson, 2000). Women tend to give money

for altruistic motives, whereas men are often concerned with egoistic motives such as gaining prestige (Brunel & Nelson, 2000; Nelson et al., 2006). Chang and Lee (2011) catalog charity advertising based on their content as altruistic or egoistic. The present campaign is considered altruistic as the definition of altruistic says "showing a disinterested and selfless concern for the well-being of others and egoistic as the drive to maintain and enhance favorable views of oneself, and generally features an inflated opinion of one's personal features and importance". On the creativity of the tested advertising, it shows the work of the NGO and the conditions in an underdeveloped country, giving the possibility to help others. Empathy plays an important role in this type of advertising and helps to understand that gender differences in responding to emotional appeals for help are likely to be explained by differences in empathic tendencies (Wang, 2008). Gender plays a moderating role because women tend to show more empathic emotions and consequently more intention to help than men when exposed to advertising with sad emotional appeals (Wang, 2008). The present data suggest a clear gender difference also on the cerebral and autonomic response. The higher emotional involvement and cerebral approach of women to the stimulus, in this case, could be explained by empathy towards children in poor living conditions.

Thus, both emotional and cognitive appreciation is increased on average for women in a subgroup of 14 participants half women and half men for emotion and in a total group of 22 participants half women half men for AW index and for the declarative level of liking. In fact, previous research (Chang & Lee, 2011) suggests that men are more likely to be influenced by self-referencing, but a limitation of this study is a sample consisting only of young people; in the present study, instead, adults, as well as young people, are examined.

However, as the numbers of actual donations received by the NGO divided by genders are not available to us, we are not able to confirm a real result with the final action; we are however able to confirm the difference between the appreciation of the campaign by neurophysiological measures and behavioral data results.

5. Conclusions

The present study shows differences between female and male groups in the behavioral and neurophysiological response during the visualization of a charity campaign. Behavioral data shows higher values of liking for women than for men and the two analyzed indexes with neuroscience data show higher values for women than for men. Analysed advertising is a charity campaign where emotions play an important role and the empathy with social causes is a factor that influences on the efficacy of it.

This study confirmed the prevalence of the approach of women to social causes already studied with traditional techniques by the proposed neurophysiologic technology. In particular, it was observed the gender-dependence of the relation between EEG frontal cortical asymmetry with the general appreciation perceived during the observation of a charity campaign.

Such technology could provide a deeper analysis on a frame by frame of the processed advertising with the aim to reduce costs of such no-profit campaign due to the use of a smaller sample size when compared to standard market research. There is an evidence of the importance of how the public, in public services advertising (PSA) as well as in commercial advertising campaigns should be targeted. Additionally, to the specific targeting of a campaign, the peculiar creativity ("the story", the concept) displayed in the advertisement, represents a key feature in determining the effectiveness of the commercial (Cherubino et al., 2016).

Regarding future research, it appears promising to compare the results of neurophysiological indexes and behavioral perception with the outcome of campaigns in the form of, for instance, calls and donations to examine if the cognitive perception and the individual declared perception are congruent with the final decision to act.

References

Alonso Dos Santos, M., Lobos, C., Muñoz, N., Romero, D., & Sanhueza, R. (2017). The Influence of Image Valence on the Attention Paid to Charity Advertising. Journal of Nonprofit & Public Sector Marketing, 29(3), 346-363.

Andreoni, J. & Vesterlund, L. (2001). Which is the fair sex? Gender differences in altruism. Quarterly Journal of Economics, 116(1), pp. 293–312.

Benedek M., & Kaernbach C. (2010). A continuous measure of phasic electrodermal activity. J Neurosci Methods. 190(1–5):80–91.

Boucsein W., Fowles D. C., Grimnes S., Ben-Shakhar G., Roth, W. T, Dawson, M. E., et al. (2012) Publication recommendations for electrodermal measurements. Psychophysiology. 49(8):1017–34.

Brunel, F. F. & Nelson, M. R. (2000). Explaining gendered responses to 'help-self' and 'help-others' charity ad appeals: the mediating role of world-views. Journal of Advertising, 29(3), pp. 15–28.

Cartocci, G., Cherubino, P., Rossi, D., Modica, E., Maglione, A. G., Di Flumeri, G., & Babiloni, F. (2016). Gender and age-related effects while watching TV advertisements: An EEG study. Computational intelligence and neuroscience, 2016

Chang, C. T., & Lee, Y. K. (2011). The 'I' of the beholder: How gender differences and self-referencing influence charity advertising. International Journal of Advertising, 30(3), 447-478.

Cartocci, G., Caratù, M., Modica, E., Maglione, A. G., Rossi, D., Cherubino, P., & Babiloni, F. (2017). Electroencephalographic, Heart Rate, and Galvanic Skin Response Assessment for an Advertising Perception Study: Application to Antismoking Public Service Announcements. Journal of visualized experiments: JoVE, (126).

Cartocci, G., Maglione, A. G., Modica, E., Rossi, D., Cherubino, P., & Babiloni, F. (2016). Against smoking public service announcements, a neurometric evaluation of effectiveness. Frontiers.

Cherubino, P., Trettel, A., Cartocci, G., Rossi, D., Modica, E., Maglione, A. G., & Babiloni, F. (2016). Neuroelectrical indexes for the study of the efficacy of TV advertising stimuli. In Selected Issues in Experimental Economics (pp. 355-371). Springer, Cham.

Decety, J., & Lamm, C. (2006). Human empathy through the lens of social neuroscience. The Scientific World Journal, 6, 1146–1163.

De Pelsmacker, P., Cauberghe, V. & Dens, N. (2011). "Fear appeal effectiveness for familiar and unfamiliar familiar issues", Journal of Social Marketing, Vol.1 No.3, pp. 171-191.

Davidson R. J. (2004) What does the prefrontal cortex "do" in effect: perspectives on frontal EEG asymmetry research. Biological Psychology, 67(1-2), 219–233.

Douglas C. W. & Sargeant, A. (2004). Taking risks with advertising: The case of the not-for-profit sector, Journal of Marketing Management, 20:9-10, 1027-1045

Eagly, A.H. & Koening, A.M. (2006). Social role theory of sex differences and similarities: implication for prosocial behavior. In: Dindia, K. & Canary, D.J. (eds): Sex Differences and Similarities in Communication. Mahwah, NJ: Lawrence Erlbaum Associates, pp. 161–177

Goodman A. (2006). Storytelling as best practice. LA: A. Goodman.

Hall, H. (2004). Gender differences in giving: going, going, gone? New Directions for Philanthropic Fundraising, 43, pp. 71–81.

Hupfer, M.E. (2006) Helping me, helping you: self-referencing and gender roles in donor advertising. Transfusion, 46(6), pp. 996–1005.

Klimesch W. (1999) EEG alpha and theta oscillations reflect cognitive and memory performance: a review and analysis. Brain Research Reviews, 29, (2-3), 169–195,

Lehmann D. & Skrandies, W. (1980). Reference-free identification of components of checkerboard-evoked multichannel potential fields. Electroencephalogra Clin Neurophysiol 48, 609-621.

Mauss, I. B., & Robinson, M. D. (2009). Measures of emotion: A review. Cognition and emotion, 23(2), 209-237.

McKee, R., & Fryer, B. (2003). Storytelling that moves people. Harvard Business Review, 81(6), 51-55

Modica, E., Cartocci, G., Rossi, D., Martinez Levy, A. C., Cherubino, P., Maglione, A. G., & Di Feo, P. (2018). Neurophysiological Responses to Different Product Experiences. Computational intelligence and neuroscience.

Modica, E., Rossi, D., Maglione, A. G., Venuti, I., Brizi, A., Babiloni, F., & Cartocci, G. (2017, September). Neuroelectrical indices evaluation during antismoking public service announcements on a young population. In Research and Technologies for Society and Industry (RTSI), 2017 IEEE 3rd International Forum on (pp. 1-5). IEEE. Monk-Turner, E., Blake, V., Chniel, F., Forbes, S.,

Lensey, L. & Madzuma, J. (2002) Helping hands: a study of altruistic behavior. Gender Issues, 20(4), pp. 65–70.

Pan J, Tompkins W. J. (1985). A Real-Time QRS Detection Algorithm. IEEE Transactions on Biomedical Engineering. BME-32(3):230–6.

Nelson, M. R. Brunel, F. F., Supphellen, M. & Manchanda, R. V. (2006). Effects of culture, gender, and moral obligations on responses to charity advertising across masculine and feminine cultures. Journal of Consumer Psychology, 16, pp. 45–56.

Newman, R. (1996). Know your donor: gender differences in giving. Fund Raising Management, 27, pp. 31–34.

Newman, R. (2000). Gender differences in philanthropy. Fund Raising Management, 31, pp. 28–29.

Palmer, P. & Randall, A. (2002). Financial Management in the Voluntary Sector, London, Routledge.

Pharoah, C. (2000). Dimensions of the Voluntary Sector, Charities Aid Foundation, West Malling, Kent.

Posner J, Russell J. A, & Peterson B. S. (2005). The circumplex model of effect: An integrative approach to affective neuroscience, cognitive development, and psychopathology. Dev Psychopathol. 17(3):715–34.

Russell J. A., & Barrett L. F. (1999). Core affect, prototypical emotional episodes, and other things called emotion: Dissecting the elephant. Journal of personality and social psychology, 76(5), 805.

Shelley, l. & Polonsky, M. J. (2002). Do charitable causes need to segment their current donor base on demographic factors? An Australian examination. International Journal of Nonprofit and Voluntary Sector Marketing, 7(1), pp. 19–29.

Supphellen, M. & Nelson, M. R. (2001). Developing, exploring, and validating a typology of private philanthropic decision making. Journal of Economic Psychology, 22(5), pp. 573–603.

Vecchiato, G., Cherubino, P., Maglione, A. G., Ezquierro, M. T. H., Marinozzi, F., Bini, F., & Babiloni, F. (2014). How to measure cerebral correlates of emotions in marketing relevant tasks. Cognitive Computation, 6(4), 856-871.

Walter, H. (2012). Social cognitive neuroscience of empathy: Concepts, circuits, and genes. Emotion Review, 4(1), 9–17.

Wang, C. L. (2008). Gender differences in responding to sad emotional appeal: A moderated mediation explanation. Journal of Nonprofit & Public Sector Marketing, 19(1), 55-70.

Whelan, D. (2002). The new director has ambitious plans for women donors' network. Chronicle of Philanthropy, 28 November.