Product placement effectiveness in music videos: Measuring neurophysiological signals, fixations and self-report data.

Ana C. Martinez-Levy[a,c], Giulia Cartocci[b,c], Enrica Modica[b], Dario Rossi[b], Marco Mancini[c], Arianna Trettel[c], Fabio Babiloni[b,c,d] , Patrizia Cherubino[b,c]

(a) Department of Communication and Social Science, Sapienza University of Rome, Rome, Italy
(b) Department of Molecular Medicine, Sapienza University of Rome, Rome, Italy
(c) BrainSigns Srl, Rome, Italy
(d) College of Computer Science and Technology, University Hangzhou Dianzi, Hangzhou, China

Correspondence: Ana Martínez: ana.martinezlevy@uniroma1.it

Abstract Product placement is a marketing technique that, by inserting products into a narrative structure, constitutes a likely effective tool to increase the visibility and notoriety of a brand. For years, the opportunities for product placement in music videos were limited. Recently there has been a growth of interest for this tool/advertising modality since the digital community allowed the possibility to move videos from television to the Internet. The scope of this study is to investigate the effectiveness of product placement in music videos. An electroencephalographic (EEG) index called mental effort (ME) has been analyzed, in addition to the emotional index (EI), calculated by the combination of Galvanic Skin Response (GSR) and Heart Rate (HR) signals. Self-report responses have also been collected through an online questionnaire and interviews, since one experimental question was to investigate whether viewing a video containing a commercial product could influence the declared recall of the product inserted in it and the spontaneous recall of the video itself. Furthermore, fixations related to the product inserted in videos have been obtained by the eye tracking technique (ET). Higher values of the ME ($p=0,016$) and EI ($p = 0,033$) have been found for videos with product placement in comparison to videos without it. In addition, results show that the number of fixations affects the recall of the showed products ($p<0,001$). These findings highlight that using product placement in famous singers' music videos is an effective technique for prompting product recall and how it helps to focus the visual attention on them.

Keywords: product placement, EEG, fixations, emotion, mental effort, recall.

Introduction

Product placement is a form of ever-expanding advertising, as it has different characteristics and advantages compared to traditional advertising. It is indirect advertising and therefore often perceived as less intrusive by the viewers (Nebenzhal and Secunda 2015). The American Federal Trade Commission defines product placement as "*a form of advertising whereby advertisers place branded products in TV programs for a certain fee or other consideration"*. This technique has its beginning in a natural way with the appearance of the cinematographer in 1895(Gonzalez and Garcia 2012). The Lumière brothers were the first to put into practice the technique of product placement and quickly commercial brands began a relationship with different media communication. In 1926, in the western movie "The Texas Streak", the Coca-Cola brand appeared for the first time in the film industry. Many other brands followed this example with appearances in cinematic productions. The interest in product placement increased dramatically in the 1980s when, with the release of the film "ET", the Reese's Pieces sweets from HersHey Foods increased their sales by 65% and became M & M's competitors (Nelli and Bensi 2007).Gradually, the spot began to break away and to differentiate itself from the film, even if it continued to be influenced in some ways. Currently, product placement is in fact widely used as a marketing technique within films and television programs, thus allowing the product to reach, and therefore be seen by, an extremely wide audience that is difficult to achieve through traditional advertising. To date, most research on product placement has been focused on movies and television, but not much research has looked more in-depth at product placement in music videos. While it has been studied how product placement during TV exposure increases the memorization of products (Law and Braun 2000), the few studies focusing on music videos have been conducted with traditional marketing techniques such as questionnaires or interviews. In 2010, the music industry received more than double the revenue from brand or product placement in music videos compared to 2000 (Plambeck 2010). Furthermore, in 2015, product placement in the music sector showed a growth of 15.9%. (PQ media 2015). The interest of marketers in brand/product placement lies in knowing that today's multi-screen world reduces the effectiveness of television breaks since people do not focus on ads anymore. Fans of music videos, on the other hand, are very engaged in watching the videos, typically viewing them many times suggesting that brand or product placement within popular music videos are likely to be more effective than the promotional messages of commercial advertisements. The traditional measurements used in marketing research include recall, which is a direct measure that suggests evidence of conscious processing. It relies on the audience's ability to identify the memory trace consciously (Scott and Craig-Lees 2010). During product

placement exposure, unconscious processing takes place on the audience mind, and so implicit measures should determine the conscious effects (Auty and Lewis 2004; Law and Braun 2000; Van Reijmersdal et al. 2007). With neuromarketing research, it is possible to obtain consumer insights without a verbal declaration of participants through different neurophysiological tools. Different indexes or psychologic constructs can be analyzed with those techniques and different stimuli can be tested, not only product placement (please see Cartocci et al. 2017; Cherubino et al. 2017; Martinez-levy et al. 2017; Modica et al. 2018.). The aim of this chapter is thus to contribute to the as of yet sparse literature for product placement studies relative to music videos using neuromarketing techniques. Specially, the levels of two different neurophysiological indexes such as ME index and EI of participants during the visualization of music videos were measured. Also, eye fixations on products and self-report answers of participants were analyzed, in order to see how products inserted in music videos are watched and if they are recalled.

Methodology and Sample

The research involved 22 healthy volunteers (12 Males, 10 Females; average age =25,18 ±2,28). During the study, brain activity, physiological reactions and eye-movements of each participant were measured. Particularly, the experimental task consisted in watching a film in which a series of music videos were inserted. The participants were told to pay attention to the film. It contained eight music videos: four of them with a commercial product inserted and the other four without. All music videos were randomized, and the total duration of the film was ten minutes. After watching the film, each participant saw twenty images of different products, with eight of them being present in the previously observed videos and 12 of them, the distractors, not. After each image, an online questionnaire was administered in order to collect the product's recall, with the following questions: *How much do you like this product from 0 to 10? / Do you remember if these products were on the music videos that you saw before*? At the end of the experience a short interview took place, with the aim to collect the spontaneous recall of the videos, the products, and the individual music preferences. The music videos with product placement (PPV) were: Coldplay "Adventure Of A Lifetime"; Avicii "Wake Me Up"; Jennifer Lopez ft. Pitbull "Live It Up"; Lady Gaga and Beyoncé "Telephone". On the other hand, the music videos without product placement (NPPV) were: Pharrel Williams "Happy"; U2 "Ordinary Love"; Adele "Hello"; Mark Ronson ft. Bruno Mars "Uptown Funk". The products that appeared in the PPV were "Polaroid" photo camera, "Nokia" and "Sony" smartphones; "ICE" watch; "Ralph Lauren" brand clothing; "Chanel" and "Swarovski" sunglasses; "Beats" speakers. The products inserted as distractors were "Fujifilm" and

"Kodak" photo cameras; "Htc" and "Lg" smartphones; "Liu Jo" and "Swatch" watches; "Calvin Klein" and "MCS" brand clothing; "Gucci" and "Rayban" sunglasses; "Bose" and "Jbl"speakers. Figure 1 shows the experimental protocol.

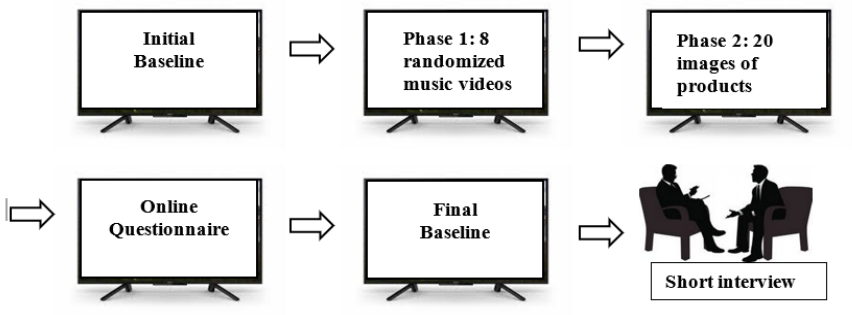

Fig. 1 The picture shows the experimental protocol.

During the experimental procedure with videos and images, the neurophysiological data was recorded. Particularly, the bio-signals recorded during the entire experimental protocol were Electroencephalography (EEG), Heart Rate (HR), Galvanic Skin Response (GSR) and Eye-Tracking data (ET).

EEG Recording and Signal Processing

The EEG activity was recorded using ten electrodes (Fpz, Fp1, Fp2, AFz, AF3, AF4, AF5, AF6, AF7, AF8) placed on the frontal portion of the scalp of participants through a portable 21-channels system (BEmicro, EBneuro, Italy). Even though the system allowed to record up to 21 channels, a ready-made headband with only ten electrodes placed over the prefrontal and frontal cortex was used, since only this area was of interest for the study. This approach also reduced invasiveness and increased the participant's comfort compared to traditional EEG caps. The reference and the ground electrodes have been placed respectively on the left and right earlobes. The signals have been acquired at a sampling rate of 256 Hz with the impedances kept below 10kΩ. After the acquisition phase, the raw EEG signal has been digitally pre-processed by using the EEGLAB (Delorme and Makeig 2004) Matlab toolbox. Firstly, a notch filter (50 Hz) was applied in order to reject the main current interference. Secondly, the gathered signal has been band-pass filtered by a 5th order Butterworth filter ([2÷30] Hz) in order to reject the continuous component as well as high-frequencies interferences, such as muscular artefacts. The Independent Component Analysis (ICA), in particular the SOBI algorithm (Belouchrani et al. 1997) has then been applied to EEG data to identify and remove the component related to eye blinks and eye movements, since their contribution overlaps the EEG bands of interest (Di Flumeri et al. 2016). After the component has been manually selected and removed, the EEG signal has been reconstructed. After these conservative steps – until

now no EEG data has been lost – in order to clean the EEG signal as much as possible, segments still affected by artefacts have been automatically detected and rejected. To compute the activity of the cortical areas of interest in a specific frequency band, the Global Field Power (GFP) was then computed. This measurement summarizes the synchronization level of the brain activity over the scalp surface (Lehmann and Michel 1990). The formula to calculate the GFP is the following:

$$GFP = \frac{1}{N}\sum_{i=1}^{N} X_{\theta_i}(t)^2$$

Where θ is the considered EEG band on the frontal cortical area, N is the number of electrodes included in the area of interest and *i* is the index of the electrodes. To evaluate the ME, EEG activity in the theta band of all the frontal electrodes has been considered for the GFP computation. An increase in the frontal theta would imply an increase in the task difficulty or a higher decodification of information (Wisniewski et al. 2015). ME index was estimated for each second, and then normalized considering the index of the baseline (1 minute of open eyes).

The Autonomic Data Recordings and Signal Processing

The Shimmer System (Shimmer Sensing, Ireland) with a sampling rate of 64 Hz is used to record the Blood Volume Pulse (BVP) and Galvanic Skin Response (GSR). For this, two electrodes are placed on the palmar side of the middle phalanges of the second and third fingers on the non-dominant hand of the participant in order to acquire the GSR signal according to published procedures (Boucsein et al. 2012). Furthermore, a photoplethysmographic sensor is placed on the thumb of the same hand for the BVP recording. The Pan-Tompkins algorithm (Pan and Tompkins 1985) is utilized to obtain the heart rate (HR) signal from the BVP. The constant voltage method (0.5 V) is employed for the acquisition of the GSR; then, with the help of LEDAlab software (Benedek and Kaernbach 2010), the tonic component of the skin conductance (Skin Conductance Level, SCL) is estimated. The combination of HR and GSR signals produces a monodimensional variable which returns the emotional state of subjects (Vecchiato et al. 2014). Therefore, for the EI we refer to effects plane (Russell and 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 pointed out that these two autonomic parameters correlate respectively with valence and arousal (Mauss and Robinson 2009). The interpretation of the EI indicates that the higher the value, the more emotional engagement is experienced by the subject and *vice versa*.

Eye-Tracker Recordings and Signal Processing

To identify eye fixations on the proposed stimuli, eye-tracking data have been acquired through the Tobii Pro X2-30 screen-based eye tracker with a sampling frequency of 30 Hz. For this, firstly all the artefactual or not physiological points of gaze were automatically removed. Secondly, eye-tracking data were analyzed with Tobii studio 3.4.8 for the extraction of information regarding fixations in each area of interest (AOI), such as number of fixations on each AOI; in this case, the AOI were the products inserted in music videos. Basing upon the total number of fixations recorded on the screen throughout the movie, the percentage of fixations eye tracking metric has been performed for each subject in order to evaluate the visual attention elicited by each specific AOI. It has been obtained by dividing the number of fixations of each participant for each AOI by the total number of fixations recorded on the screen throughout the movie for each participant.

Data analysis:

For the product's recall analysis, a t-test was performed for evaluating the fixation percentage on recalled and non-recalled products during the online questionnaire.

A t-test was also used for assessing differences between both kinds of videos (PPV and NPPV) with the data from the spontaneous declared recall of products during the final interview.

Paired t-tests were performed for evaluating differences between PPV and NPPV with data from the mental effort index and data from the emotional engagement index.

Results

Eye Fixations and Recall of products

The first evidence of the present research is the relation between self-reported data and eye-tracking data. This relation is between the recall of products obtained during the online questionnaire, where participants answered to the question "*Do you remember if this product was present in the music videos you just saw?",* and the percentage of fixations that was dedicated to each product contained in each AOI during the videos' visualization. Figure 2 shows that the participants that remember the products included in the music videos are also those who have dedicated, on average, a higher percentage of fixations on the products ($t=-3{,}735$; $p<0.001$). An image representation of the heatmap for the fixation during a PPV is shown in Figure 3.

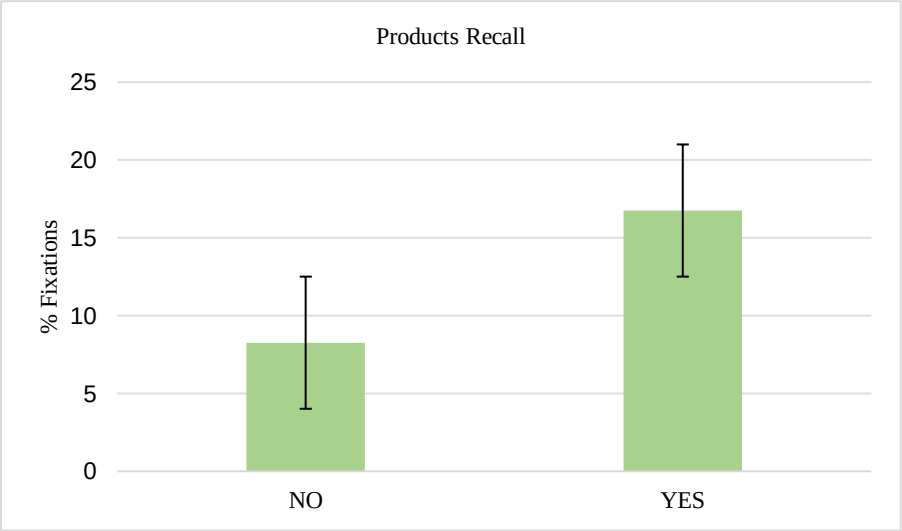

Fig. 2 The graph shows the statistical results from the t-test considering the fixation percentage on recalled (YES) and non-recalled (NO) products during the online questionnaire. Error bars represent standard error

Fig. 3 The picture shows a heatmap image detected during a PPV visualization

Spontaneous Recall of videos: Product placement videos VS Non-product placement videos

There is a higher spontaneous recall of PPV than NPPV within the interview results. The difference is not statistically significant ($p>0,05$). Notwithstanding, Figure 4 demonstrates the difference in the participants' answers, which confirms that the placement of products, at least in this case, has led to greater remembrance not only of the products, but of the video itself.

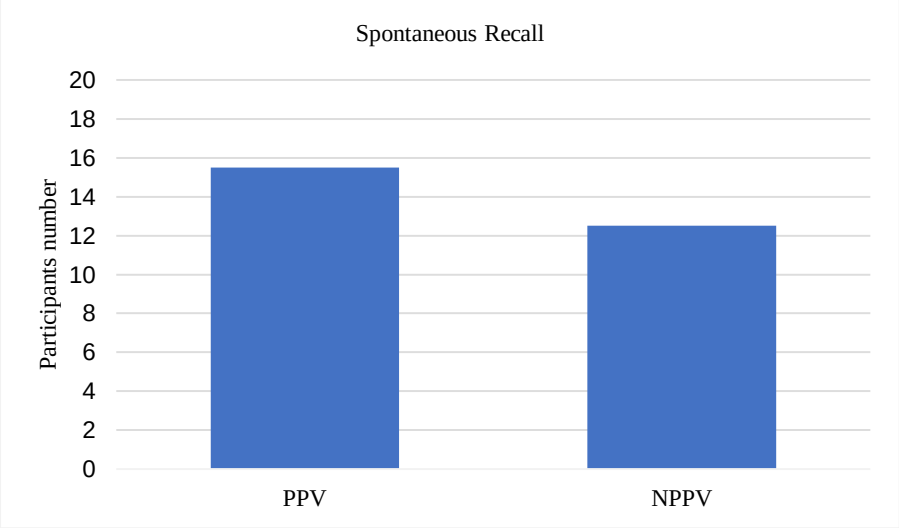

Fig. 4 The graph shows the different answers of participants for the spontaneous recall of videos during the interviews

Mental effort: Product placement videos VS Non-product placement videos

Regarding the cognitive index of mental effort, from the comparison between PPV and NPPV, a higher cognitive effort emerged for the first ones (see figure 5). This difference was statistically significant (t=2,786; p = 0,016).

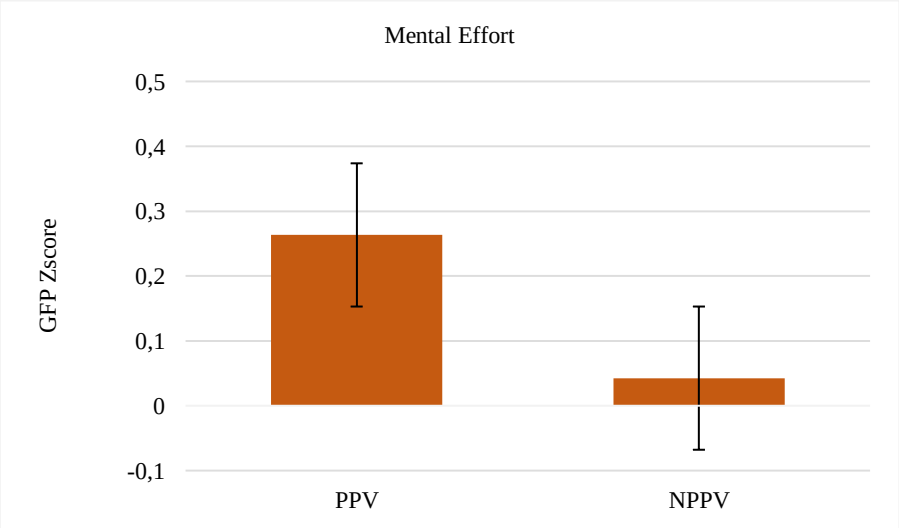

Fig. 5 The graph shows the statistical results from the t-test conducted for the ME index values concerning the comparison among PPV and NPPV. Error bars represent standard error

Emotion engagement: Product placement videos VS Non-product placement videos

Both kinds of videos evoked a negative emotional reaction. Nevertheless, in comparison to the NPPV, the PPV achieved a less negative emotional engagement. This statistically significant difference is demonstrated in figure 6 (t= 2,405; p = 0,033).

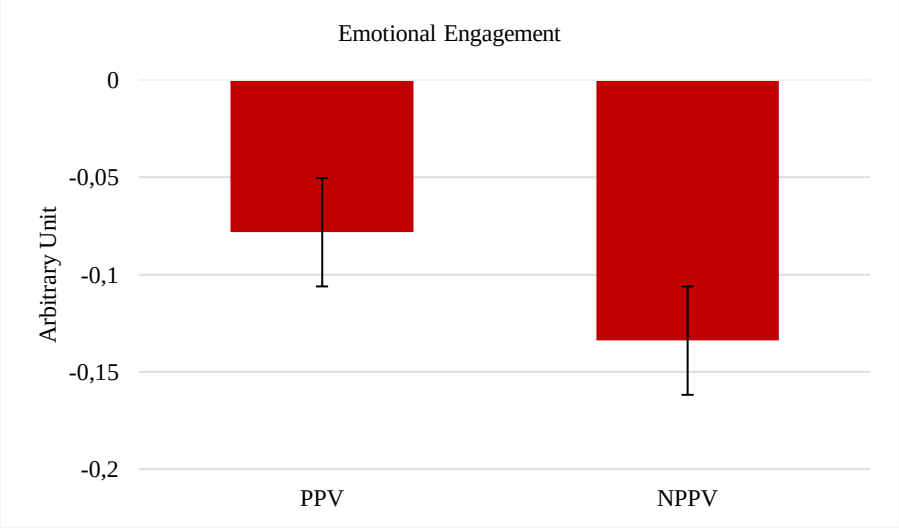

Fig. 6 The graph shows the statistical results from the t-test conducted for the Emotional Index values concerning the comparison between PPV and NPPV. Error bars represent standard error

Discussion

In accordance with the analyzed indexes of ME index and EI, it has been confirmed that music videos with a product or brand inserted have higher levels of both than music videos without product placement. Regarding the ME index, different researches have previously identified that changes in the EEG spectra reflect levels of mental effort on different tasks (Aricò et al. 2014; Berka et al. 2007; Borghini et al. 2014; Cartocci et al. 2015; Cartocci et al. 2016; Cartocci et al. 2017). During the visualization of a music video, this index could be connected to the presence of commercial products, which require a higher information processing. In addition, the emotional engagement during the visualization of the videos differed between PPV and NPPV. In particular, the former had higher EI values compared to the latter. Since the PPV had higher content decoding, this could be explained with the context of the video being more comprehensible and thus generating a higher level of emotional engagement. The results of self-report data collected through the online questionnaire reveal that for those who remembered the products included in the music videos, there was, on average, a higher percentage of fixations on the products. Therefore, the relation between the number of fixations dedicated to a product and the recall gives us information to confirm a significative, positive relation between both measures. As sown by connectedness research, the intensity of the relationship viewers develop with television programs and characters affects their memory of placements (Russell et al. 2004). Recall is a direct measurement relying on an audience member's ability to identify the memory trace consciously, which indicates evidence of conscious processing. Although recognition also provides a direct measurement, its

relationship with unconscious processing is not clear, given that recognition often serves to identify sensory memory content (Baddeley 2007). The relationship between memorization and attention has been widely studied in marketing research, with the consensus being that greater allocation of attention to a stimulus facilitates its memorization (Unsworth and Spillers 2010). In marketing and particularly in product placement, it is crucial to understand how visual attention influences product and brand recall. During this study we utilized different videos with and without product placement to analyze and compare the perception of real top ten music videos. An important limitation of the study is that participants might potentially be familiar with the inserted products. The video type might furthermore influence results by reflecting individual differences in terms of music preferences and liking of the video's contents.

Conclusion

This study sought to determine whether the insertion of commercial products in music videos effects on implicit responses of consumers to the videos as well as to the products themselves and consequently also on the conscious recall. Connecting the number of fixations with visual attention and products' recall answers with their memorization, results denote that products with higher visual attention have higher memorization. Likewise, PPV show higher values for mental effort, emotional engagement and spontaneous recall than NPPV. These results highlight the importance of a selected product positioning during a video exposure, as well as, of the time of the products' appearance during their insertion in different communication media. This can help marketers ensuring that visual attention to the products will lead to a higher level of recall.

For future studies in this field, it appears promising to consider the context of music videos for more targeted brand or product placement. An in-depth analysis could denote the eventual perfect match between the type of video and the product promotion suiting the company's strategy. Likewise, in future studies videos could be "lab-processed" in order to test the same videos with and without product placement. Results could shed light on the influence of product appearance and less on the perception of the video itself, reducing the bias of the context in videos.

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