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Application of frontal EEG asymmetry to advertising research

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ABSTRACT

The aim of the study was to identify frontal cortex activation in reaction to TV advertisements. We compared three consecutive creative executions of the world-famous Sony Bravia ads (“Balls”, “Paints”, and “Play-Doh”). We were looking for left hemispheric dominance, which according to the adopted theoretical model, indicated approach reactions of respondents to incoming stimulation. We ha ve found that dominant reactions were present only in response to one of the tested ads – “Balls”. Target group respondents reacted in such way to *emotional* part of the ad, as well as to its *informational* part (including product-benefit, product, and brand exposure scenes). No similar pattern was found for the remaining two ads. It yields a conclusion that frontal asymmetry measure may be a diagnostic tool in examining the potential of advertisements to generate approach related tendencies. We believe that methodologies based on measuring brain waves activity would soon significantly enrich marketing research portfolio and help marketers to go beyond verbal declarations of their consumers.

1. Introduction

Marketers are more and more skeptical of using only verbal measures to pre-test TV advertisements because of their limitations in providing an effective measure of internal reaction to external stimuli. The affect that consumers experience also cannot be adequately measured by self-reported verbal indicators, due its complexity and non-propositional structure (Davidson, 2004; Panksepp, 1998; Zajonc, 1980). Respondents tested using self-reported verbal measures are also more likely to give socially acceptable answers or not contemplated feedback (Nighswonger & Martin, 1981). Furthermore, many non-volitional and almost reflexive aspects of consumer behavior have not been fully emphasized in psychological measurement (Bargh, 1996; Cacioppo & Berntson, 1992; Cacioppo, Tassinary, & Berntson, 2007). Consumers may still have a “feeling of knowing” experience, even though they cannot trace a clear memory by verbal measures. Frequently unconscious processes may influence human functioning.(Berridge & Winkielman, 2003; Braidot, 2005; Kenning, Plassmann, & Ahlert, 2007; Ohme, 2007; Zajonc & McIntosh, 1992; Zaltman, 2000, 2003). In addition, scientific research indicate that our

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"conscious window" starts to be fully opened in ca. 300 ms after the stimuli, what means that most events below this threshold which are registered by our brain cannot be reported verbally (Libet, 2004). However, there is compelling evidence that some psychological processes, particularly those which occur beyond our conscious awareness, could be better understood by analyzing the consumer's brain and body responses, what in result points to utilizing different neuroscientific approaches to handle with this challenge (Ambler, Braeutigam, Stins, Rose, & Swithenby, 2004; Bechara, 2004; Damasio, 1994; Kenning et al., 2007; Ohme, 2003; Posner, 2004; Smith & Kosslyn, 2007).

2. Theoretical overview

2.1. Neurophysiologic measures to enrich marketing research

In the domain of psychologically supported marketing research, an experimental study using neurophysiological techniques usually starts with an intention to examine consumers' cognitive or affective processes in response to prefabricated marketing stimuli. These cognitive or affective processes, separately or jointly, serve as psychological antecedents to a variety of neurophysiological consequences produced by the human nervous system. Combining different physiological measures, such as EEG with peripheral GSR or EMG measures, it is now possible to offer cross-validation for the effects of external stimuli on consumers' psychological responses (Berman, Jonides, & Nee, 2006; Cacioppo & Berntson, 1992; Ohme, Reykowska, Wiener, & Choromańska, 2009).

Despite the fact that in the last decades several authors have investigated the capability of using the technology of measuring brain waves (EEG but also its modification such as SST-steady state topography) to understand the bases of processing of commercial messages, the number of relevant and acclaimed scientific studies is rather scarce (for review see: Wang & Minor, 2008). Most of this research was focused on investigating memory (Rossiter, Silberstein, Harris, & Nield, 2001; Silberstein, Harris, Nield, & Pipingas, 2000), attention (Smith & Gevins, 2004) and emotional processes (Kemp, Gray, Eide, Silberstein, & Nathan, 2002) and to asses predictive value of obtained results in the light of marketing practices and/or theories. In addition, there is also research using EEG (in event-related potential methodology) not only to dynamic but also static marketing stimuli e.g. studies of brand extension issue (Ma, Wang, Shu, & Dai, 2008; Zhang, Wang, Li, & Wang, 2003). We believe that the frequency of EEG application to advertising research will grow rapidly; as today, we possess technological and computational capabilities sufficient to perform most sophisticated experiments. Due to unsurpassed high time resolution of milliseconds (Nunez & Srinivasan, 2006) we have an opportunity to detect very small changes in commercial stimuli, which in turn can prove to have substantial effect in terms of marketing efficacy (Ohme et al., 2009).

2.2. Frontal asymmetry as an indicator of approach-withdrawal tendencies

A large body of research on the relation between emotion and motivation has postulated the existence of two overarching motivational systems that organize behavior. One system involves behavior prompted by a possible desirable outcome, whereas the other involves behavior prompted by a possible aversive outcome. Davidson, Schwartz, Saron, Bennett, and Goleman (1979) proposed a similar model linked to research on frontal electroencephalographic (EEG) asymmetry during emotional states. He proposed that the left frontal cortex (PFC) is involved in a system facilitating approach behavior, whereas the right PFC is involved in a system facilitating withdrawal behavior from aversive stimuli. Using EEG measures to index ongoing frontal brain electrical activity during the processing of different affects, Davidson and Fox found substantial empirical support for the model in adults and infants (for review, see: Davidson, 1993; Davidson & Rickman, 1999; Fox, 1991).

To explain frontal asymmetries for valence emotional processing, the Davidson's model assumes that processing related to emotional valence itself is not lateralized in the PFC. Rather, emotion-related lateralization is observed because emotions contain approach and/or withdrawal components. Therefore, emotion will be associated with a right or left asymmetry depending on the extent to which it is accompanied by approach or withdrawal behavior (Davidson, 1993, 2004). Subsequently, Davidson, Marshall, Tomarken, and Henriques (2000) hypothesized that the approach and withdrawal systems would be associated with pre-goal attainment emotions; i.e. emotions that are typically generated while attempting to achieve a goal. For example, the approach system would be associated with enthusiasm but not contentment, which would be considered a post-goal attainment emotion. On this view, emotion should be understood in the context in which it arises. Different contexts can provide information about the function of an emotion. Lang, Greenwald, Bradley, and Hamm (1993) also emphasized the importance of function-in-context in understanding emotion.

To date, numerous independent studies have examined the relationship between emotion or emotion-related constructs and asymmetries in EEG activity over the frontal cortex. A review of these studies clearly suggests the existence of asymmetries in frontal EEG activity, including resting levels of activity and state-related activation (Coan & Allen, 2003). These asymmetries are ubiquitous and involved, both in trait predispositions to respond to emotional stimuli related to moderating function of the frontal cortex, and in changes in emotional state, which can be treated as a marker of emotional intensity (Coan & Allen, 2003). In our recent study (Ohme et al., 2009), the asymmetry model has been confronted with electromyographic (EMG) measures, which have been an instrument to test facial muscle movements, and they in turn are considered to reflect expression of positive or negative emotions (Dimberg, Thunberg, & Elmehed, 2000; Larsen, Norris, & Cacioppo, 2003). The research yielded empirical evidence that EEG analysis is a promising measure of emotional valence. Moreover, that study showed that the model of emotional frontal asymmetry (as hypothesized by Davidson) may be applied to analyze TV advertisements.

However, we are aware that the brain asymmetry either frontal or related to other brain regions is still rather empirical and conceptual construct with obvious limitations and some competing explanations (see further discussion for more on this topic) than versatile tool to understand brain reactions to any stimuli in terms of ongoing cognitive and affective processes. On the other hand, the quantity and quality of empirical evidence that supports Davidson's account of frontal asymmetry is compelling and we consciously opted for theory-driven research than only pure data-driven research (to be followed by model-oriented and theoretical work). Therefore, results of this research project should be viewed in the context of this choice and its interpretative consequences, especially.

3. Present research

3.1. Research objective

In this research we wanted to further explore the idea of frontal asymmetry measure as a diagnostic method to examine a potential of TV advertisements to generate approach related behavior, which can be modelled as important dimension in effective advertising (see: Ohme et al., 2009). The goal of our study was to compare selected scenes of TV ads: emotional part scenes, product – benefit scenes, product scenes, and brand scenes. For this purpose we decided to choose three commercials of a Sony Bravia flat screen TV. On one hand, they belong to the same Sony Bravia global campaign, refer to the same product and brand, use the same rational information, base on the same consumer insight and strategy; moreover they were all created by the same advertising agency, and were equally praised and awarded – all of this provides a ''common denominator'' for comparisons. On the other hand, each of the ads utilizes a different kind of creative solution, what in turn enables to analyze and compare three different ''numerators of the fraction''. In other words, we have three different ad stories which end with almost identical product-benefit-brand sequence. We planned to identify the amount of approach-withdrawal reactions in response to each of the three ads.

3.2. Description of the stimuli

We tested the following Sony Bravia commercials: ''Balls'' (2005), ''Paints'' (2006), and ''Play-Doh'' (2007). All three based on the same strategy and their aim was to show the uniqueness of color (offered by the Sony TV's) by filming spectacular, colorful, specially organized events. However, each ad employed an individual creative solution. They were highly appreciated both among experts and among consumers, received the Cannes Golden Lion Awards in 2006 (''Balls''), 2007 (''Paints'') and 2008 (''Play-Doh''), and brought world recognition to their creator, London-based advertising agency.

The ads were evaluated by 5 competent judges (advertising experts), who consistently identified two different parts of the ad in terms of content type - first, with the aim of building emotional engagement and second aimed at presenting product information. Therefore, all three spots could be divided into two parts (Table 1). The first part – named ''*emotional*'' – shows the event and builds emotional engagement by picturing vitality, joyfulness and colorfulness (250.000 colorful bouncing balls on the streets of San Francisco, 70.000 l of Paints exploding in Glasgow, 40 animators moving play-doh rabbits in the middle of Manhattan). In the end of this part all the colors are integrated. These original scenes are enriched with specially chosen music (by Jose Gonzales, Rossini, and Rolling Stones, respectively). The second part –named ''*informational*'' – presents the product information and consists of three subscenes: the exposition of the benefit (''color''), the product itself (''Sony Bravia'' TV), and the brand (''Sony'') (Fig. 1).

These scenes are very similar among all three ads, however there are some formal changes between the first ad and the other two. In ''Balls'' ad we see one additional element that briefly precedes the exposition of the brand – it is a certain kind of animation (spinning blue spots) with a headline (''like no other''). Moreover, the background color of the brand scene is blue in ''Balls'', and red in ''Paints'' and ''Play-Doh''.

3.3. Variables and hypothesis

The *emotional* part and the *informational* part served as the independent variables (both described on 3 levels, i.e.: ''Balls'', ''Paints'' and ''Play-Doh'' Sony Bravia ads). For more detailed analysis of the *informational* part, the product, brand and product-benefit scenes were considered additional independent variables. Product and product-benefit scenes were described on three levels (i.e. three different Sony Bravia ads) and the brand scene on four levels (one from each ''Paints'' and ''Pay Doh''

Table 1
The division of the Sony Bravia ads into *emotional* and *informational* parts.

	Emotional part	Informational part		
		Product benefit	Product	Brand
Balls (2005)	0–18.8 s	18.9–22.0 s	23.4–27.8 s	27.9–29.8 s (with animation) 28.5–29.8 (without animation)
Paints (2006)	0–20.4 s	20.5–24.2 s	24.3–28.9 s	29.0–29.8 s
Play Doh (2007)	0–22.7 s	22.8–25.2 s	25.3–29.0 s	29.1–29.8 s

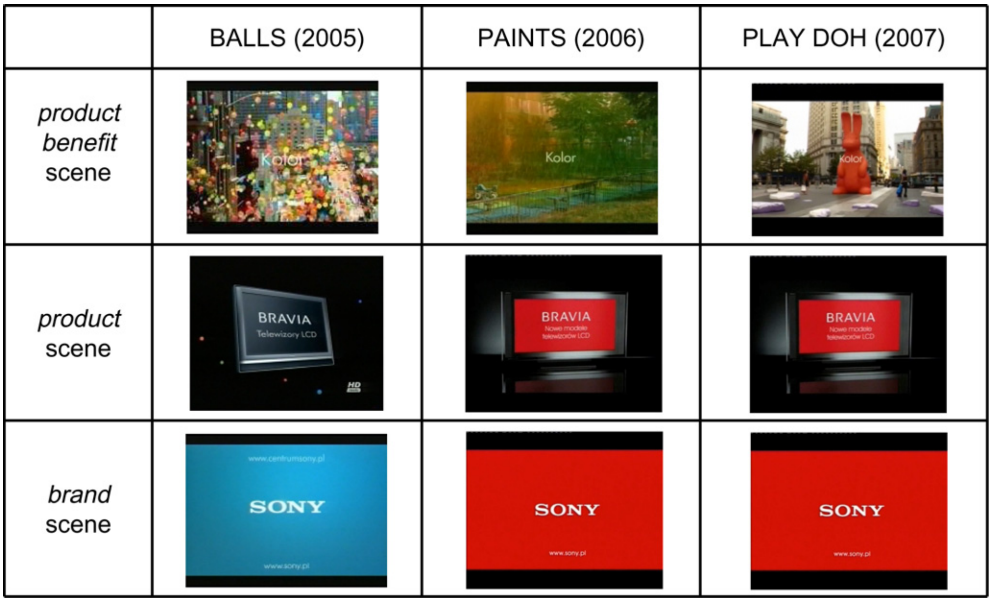

Fig. 1. The comparison of scenes exposing of *product benefit*, *product* and *brand* in the different Sony Bravia ads.

ads and 2 from "Balls" ad – version including and excluding the animation). EEG metrics were dependent variables measured by the lateralization of the amount of alpha waves within the frontal and frontal cortex. We wanted to compare which scenes would produce the strongest approach related tendencies. The approach tendency was indicated by greater relative left frontal activation, later on referred to as "left hemispheric dominance". Due to its exploratory nature only bidirectional hypotheses were proposed. Our main hypotheses were that there would be significant differences in the left hemispheric dominance among three Sony Bravia TV ads in their *emotional* parts [H-1]; as well as in their *informational* parts [H-2]. As the *informational* part consists of three subparts (repeated in all three tested ads), i.e. presenting product benefit, the product itself and the brand, we expected differences also among these subparts. Thus, our additional hypotheses were that there would be significant differences among three Sony Bravia TV ads in their *product-benefit* scenes [H-3]; in their *product* scenes [H-4]; and in their *brand* scenes [H-5].

4. Method

4.1. Participants and procedure

The research was conducted on 45 right handed respondents (24 females; 21 males), aged 26–45 ($m = 34.4$; SD = 5.83) with income average plus, planning to buy a flat screen TV within three months from the research. The recruitment took place around shopping areas, and respondents were invited for the test when qualified as meeting the recruitment criteria (verified by a recruitment questionnaire). Respondents were informed that they would watch a series of commercials while their neurophysiologic responses would be registered. No other task was presented. They were paid for participation.

A within-subjects design was used; each participant was presented with three Sony Bravia ads and 30 other ads serving as distracters, with a 20 s black screen in between. All ads (including distracters and the tested ads) were counterbalanced and presented in random order. The only task of the respondents was to watch the stimuli presented on the screen. The ads were shown in 3 blocks each separated with a buffer assignment (a cognitively engaging task e.g. fragments of the Stroop test). The ads were placed in different blocks, which were rotated. Each block started with a buffer ad serving as a "warm-up" before the tested ads. Before the exposition of each ad a baseline was measured for 15 s. The test was conducted individually; the ads were shown on a computer screen. During the exposition of the stimuli respondents were left alone in the research room, while their behavior was constantly monitored by a camera. At the start of the test respondents were advised to look carefully at the screen. Before the presentation of each stimulus, a fixation countdown screen was presented to ensure that the respondents focus on the ads. Upon the completion of the test, participants were interviewed and thoroughly debriefed.

4.2. Recordings and analyses

The EEG recording was made by a 16-channel Contact Precision Instruments amplifier. Electrodes were located in accordance with the 10–20 International Electrode Placement System (Cacioppo et al., 2007). The reference electrode was placed on the right ear. The presentation software by neurobehavioral systems was used to present the stimuli and to send the markers recorded together with the EEG data to allow the synchronization. Artifacts removal, data reduction and analysis were performed using MATLAB computation environment by Mathworks. Artifacts removal was performed using an Independent Component Analysis (ICA). Then the power of alpha band (8–12 Hz) in each of the frontal electrodes (Fp1, Fp2, F3, F4, F7, F8) was calculated using Fast Fourier Transformation with coherent power gain correction applied (Hanning window). The alpha power in the ipsilateral electrodes was averaged and compared to the power of contralateral electrodes. The baseline was calculated using the same procedure from the data gathered during 15 s period preceding each commercial. The data were corrected using the baseline measurements.

Left hemispheric dominance was indicated by a relatively greater left hemispheric activation in the frontal and frontal regions (measured in the alpha band). Right hemispheric dominance was indicated by a greater right hemispheric activation.

The results are presented two-ways. First we focus on "relative" comparisons among the ads, i.e. referring each result to the others. Then we focus on "absolute" comparisons, i.e. we refer each result to the baseline value (which is to reflect no frontal asymmetry and is interpreted in the Davidson's model as neutral reaction to a stimulus).

5. Results

5.1. Testing main hypothesis [H1] comparison of emotional parts among the ads and [H2] comparison of informational parts among the ads

The analyses were performed using the repeated measures ANOVA and post hoc tests with Bonferroni correction. All assumptions for the test were met.

5.1.1. [H1]

When comparing the first, *emotional* part of the ads we observed significant differences between reactions toward the ads ($F(2, 40) = 3{,}5$; $p < 0.05$). There was a significantly greater relative left frontal activation generated by the emotional part of "Balls" ad than by the emotional part of "Play-Doh" ad ($t(40) = 2554$; $p < 0.01$) and slightly greater (tendency $p = 0.07$) by "Paints" ad than by "Play-Doh" ad. We did not observe any significant differences between "Balls" and "Paints" ads (Fig. 2). In comparison to the baseline value only "Balls" ad generated greater relative left frontal activation (at a tendency level) ($t(41) = 1887$; $p = 0066$) (Fig. 2).

5.1.2. [H2]

The results of the second, informational part of the ads did not show significant differences between the ads, however a tendency was observed ($F(2, 40) = 2{,}78$; $p = 0.068$). The post hoc analysis indicated significant differences between one of the ads and the other two. We observed significantly greater relative left frontal activation generated by "Balls" ad than by "Paints" ad ($t(40) = 2107$; $p < 0.05$) and "Play-Doh" ad ($t(40) = 1970$; $p < 0.05$) (Fig. 3). In comparison to the baseline value "Balls" ad generated greater left frontal activation ($t(41) = 2553$; $p < 0.01$).

5.2. Testing additional hypotheses [H3, H4, H5] – comparison of the scenes within the informational parts among the ads

To test these hypotheses separate repeated measures ANOVA and post hoc tests with Bonferroni correction were computed. Again all assumptions for the tests were met.

5.2.1. [H3] product-benefit scenes

We observed significant differences in reactions to the product-benefit scenes ($F(2, 40)=4{,}58$; $p < 0.01$). "Balls" ad generated greater relative left frontal activation than "Paints" ad ($t(40) = 2931$; $p < 0.01$) as well as than "Play-Doh" ad

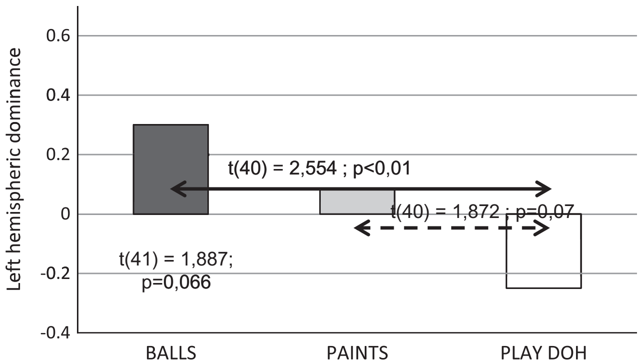

Fig. 2. Reactions to the *emotional* part of the different Sony Bravia ads.

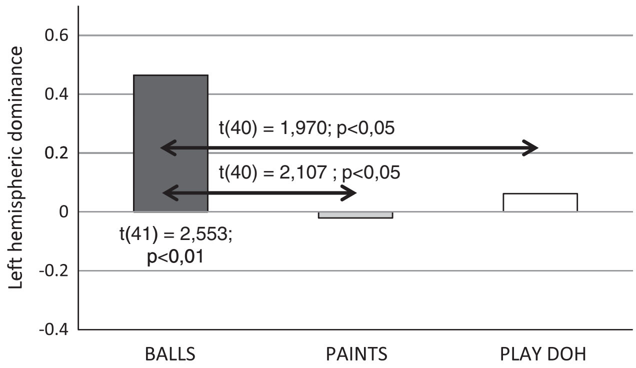

Fig. 3. Reactions to the *informational* part of the different Sony Bravia ads.

($t(40) = 2117$; $p < 0.05$) (Fig. 4). In comparison to the baseline value "Balls" ad generated greater relative left frontal activation to the product-benefit scene ($t(41) = 2295$; $p < 0.05$), whereas "Paints" ad generated greater relative right frontal activation ($t(42) = -2075$; $p < 0.05$) (Fig. 4).

5.2.2. [H4] product scenes

We did not observe any significant differences in reactions to the product exposure scenes (Fig. 5). In comparison to the baseline value only "Balls" ad generated greater relative left frontal activation to this scene ($t(41) = 2385$; $p < 0.05$) (Fig. 5).

5.2.3. [H5] brand scenes

We did not observe any significant differences in reactions to the brand exposure scenes between the ads. In comparison to the baseline value none of the ads generated significant lateralization effects, however, when including the animation, the brand scene in "Balls" ad generated greater relative left frontal activation ($t(21) = 2392$; $p < 0.05$) (Fig. 6).

5.3. Discussion of results

When we compared respondents' neurophysiologic reactions to the parallel *emotional* parts we identified a statistically significant difference among the three ads in the amount of left frontal relative activation. Moreover, post hoc analyses revealed that that "Balls" ad generates significantly stronger left hemispheric dominance comparing to "Play-Doh"ad. In the light of these observations, we consider our first main hypothesis [H-1] confirmed.

When we compared respondents' neurophysiological reactions to the parallel *informational* parts we identified a difference only on a trend level among the three ads in the amount of left frontal relative activation. However, post hoc analyses revealed that that "Balls" ad generates significantly stronger left hemispheric dominance than the remaining two ads. In the light of these observations we consider our second main hypothesis [H-2] confirmed.

When we compared respondents' neurophysiological reactions to the parallel scenes within *informational* parts among the ads we found statistically significant differences among product-benefits scenes in the amount of left frontal relative activation. We have not found significant differences among product and brand scenes. However, only "Balls" ad scenes

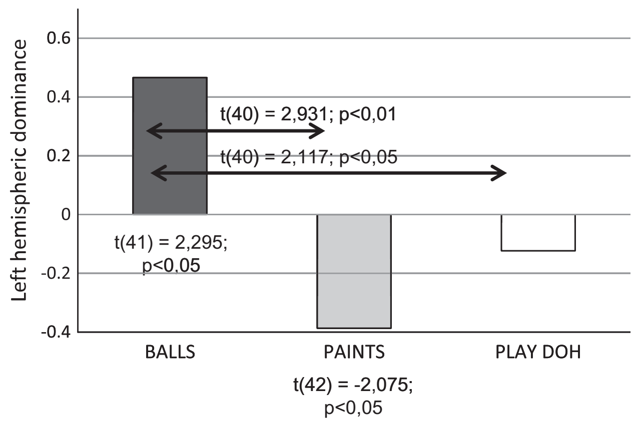

Fig. 4. Reactions to the informational scene presenting the *product benefit* of the different Sony Bravia ads.

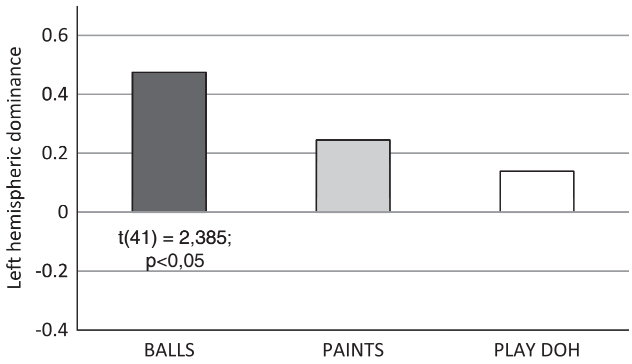

Fig. 5. Reactions to the informational scene presenting the *product* of the different Sony Bravia ads.

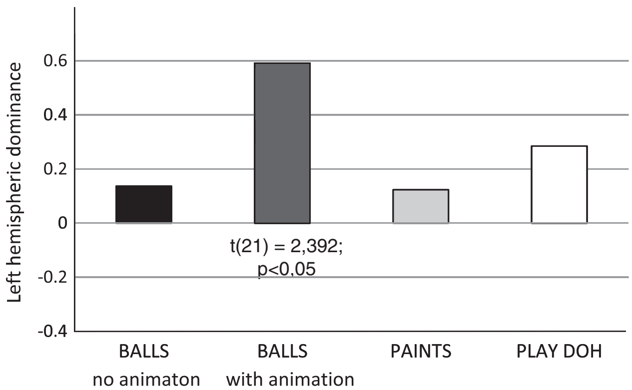

Fig. 6. Reactions to the informational scene presenting the *brand* of the different Sony Bravia ads.

generate significantly stronger left hemispheric dominance in comparison to their baseline value. No such effect was observed for "Paints" and "Play-Doh" scenes. Thus our additional hypothesis [H-3] was confirmed, whereas hypotheses [H-4 and H-5] were confirmed only partially.

6. General discussion

Our research revealed that the three tested ads produce different approach-withdrawal reactions. "Balls" ad generates approach related reactions toward its *emotional* part as well as product-benefit, product, and brand (with animation) scenes. "Play-Doh" ad does not generate approach related reactions toward its *emotional* part and its *informational* part, including product-benefit, product, and brand scenes. "Paints" ad does not generate approach related reactions toward its *emotional* part and to two out of three elements of its *informational* part, i.e. product and brand scenes. Its third element, i.e. product-benefit scene, induces withdrawal related reactions. The above yields conclusion, that the frontal asymmetry measure turns out to be a diagnostic tool in examining the potential of advertisements to generate approach related behavior. Only one of Sony Bravia TV commercials – "Balls" – managed to maintain approach related reactions throughout all scenes. Performance of the two remaining ads turned out to be much poorer on this dimension.

For "Balls" we have observed that approach related reactions in the first (*emotional*) part have been somehow sustained in the second (*informational*) part. It is as if the *emotional* part has been a prime for approach related reactions to the *informational* part. The analyses of reactions to the two other ads have not yielded any additional information in that respect. Therefore we still do not know whether this "assimilation" priming effect would be replicated in other TV ads and thus lead to a more general finding. Moreover, even when we manage to establish the existence of such assimilation, we have no additional information about its symmetry.

At this point we would like to raise an important issue of alternative conceptual interpretations of the hemispheric asymmetry phenomenon. Although, we interpret results of the experiments in the light of Davidson's model of frontal emotional asymmetry, other possibilities also do exist. One of more relevent is suggested by the hemispheric encoding/retrieval asymmetry (HERA) model (Tulving, Kapur, Craik, Moscovitch, & Houle, 1994). The HERA model proposes that the left frontal cortex plays a preferential role in encoding information into long term memory (LTM), irrespective of whether or not it can be verbalised. By contrast the right frontal cortex plays a preferential role in the retrieval of information from LTM, irrespective of whether or not it is verbalised. In its original form, the HERA model was challenged by neuroimaging studies, pointing to the involvement of both left and right anterior frontal regions in LTM encoding. In particular, they reported that encoding of verbalised material preferentially elicited left frontal activity, while imagery that is not verbalised, such as unfamiliar faces, elicited corresponding right frontal activity (Kelley et al., 1998). This issue is still the subject of some controversy, with a number of researchers continuing to report a specific role for the right frontal cortex for encoding into LTM non-verbal stimuli such as faces (Sergerie, Lepage, & Armony, 2005). Theoretical basis of our research (i.e. Davidson model) forced some constraints in designing experiments and in result, above mentioned and also other controversies related to the HERA model, cannot be fully addressed in this paper. Although, we do not exclude the possibility that some aspects of the HERA model can be reconciled with Davidson model; it requests further investigations.

The third model of relation between frontal asymmetry and some psychological phenomena has been explored by Heller since the early 1990s (Heller, 1993). He argues that the frontal and right parieto-temporal regions are involved in emotion. The frontal region is involved in the modulation of emotional valence in the same manner as that proposed by Davidson and his colleagues: greater relative left frontal activity during the processing of positive emotions and greater relative right frontal activity during the processing of negative emotions. In addition, Heller further postulates that the right parietal region is involved in the modulation of autonomic and behavioral arousal, with higher levels of right parietotemporal activity associated with higher levels of arousal. However, we have to note that in our research we haven't taken into consideration parieto-temporal region of the brain an in consequence it is very limited interpretative space to confront our results with the model proposed by Heller.

7. Conclusions

Our finding that only one of the three similar strategically and all highly praised marketing communications performs well on the approach dimension is relevant not only theoretically but also practically. It gives grounds to reconsider the tested ads and seek improvements for some of its imperfections. These findings would be very hard (if ever) to obtain *via* traditional consumer research methods, which are based on conscious declarations and consumers or advertisers introspection. Moreover, the observation that in "Balls" ad the scenes from the *informational* part, i.e. product-benefit, product, and brand (with animation) generated more approach related reactions than its *emotional* part are quite contrary to the existing theoretical knowledge and practitioners intuition on what is more and what is less emotionally engaging for consumers who watch TV commercials.

Due to the exploratory nature of the study, our findings should be considered observational. Any further explanations of particular reaction patterns and their theoretical and practical implications would be premature at this time. At this early stage of development of the frontal asymmetry measure to advertising, anything that goes beyond methodical observation might be entering controversial and speculative grounds. However, when a comprehensive set of such observations (for each major product category) is collected for data mining we would be ready to propose reasonable explanations and possible predictions. In fact, we would try to establish which of the tested ads are probably more efficacious in forming mind-based brand equity (see: Hansen & Christensen, 2007).

On a more general level, our results suggest that brain waves measures could detect subtle consumers' physiological approach reactions to marketing stimuli (see: Ohme et al., 2009). Brain-waves based methodologies would soon significantly enrich marketing research portfolio and help marketers evaluate their TV advertisements, not only on a synthetic, general level, but also on an analytic, sequential level, when high time resolution stimulation often occurs. It is possible that in the future EEG-based research would be applied in parallel with EMG and GSR as well as integrated with traditional self-report methods, more advanced experimental designs, reaction time measures and behavioral indices like shelf-tests (Ohme, 2008). This *Integrated Approach* in consumer research would essentially contribute to development of an emerging discipline – *Biometric Economy*. However, as posited by Kenning et al. (2007), it is important that market researchers keep in mind that numerous research techniques remain still in their infancy, and further research is necessary to facilitate the confident application of these techniques.

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