

## THE MEDIA BRAIN

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### Summary

In the fall of 2010, Sanoma Publishers, in collaboration with Neurensics and Uitbijter, decided to use fMRI technology to explore the media brain.

Exposure to media and advertising leaves traces in your brain. With fMRI it is now possible to look inside our heads to see exactly what happens when we read a magazine or watch a television show, and how we react when a reading or viewing experience is interrupted by advertising.

Our main questions were: can we show 'engagement' in the magazine reader's brain? And how does it influence the processing of advertising messages?

As a secondary question, we asked ourselves: does the brain of an experienced media planner 'look' at magazines and/or television (advertising) in a different way?

Under the supervision of Prof. Dr. Victor Lamme and Dr. Steven Scholte, 36 women were scanned in the MRI scanner of the Spinoza Neuro Imaging Centre in Amsterdam, in October and November 2010. Respondents were 25-49 years old and were regular readers or 'fans' of at least one of the magazines Viva, Grazia, Flow and Libelle, and one of their favourite television shows had to be The Voice of Holland, Ik hou van Holland, Crime Scene Investigation or Goede Tijden, Slechte Tijden. They were in the scanner for around 60 minutes.

This survey led us to a number of conclusions.

- Reader-magazine engagement does exist and you can demonstrate it in the human brain. But as it turns out, a magazine is not necessarily your best friend.
- Advertising in your favourite magazine is processed better than advertising in other magazines.
- Advertising that 'fits' the magazine out-performs advertising that is not related to the magazine content.
- In contrast to television advertising, magazine advertising is welcomed by the brain.

### Neuro Research

Everything with the prefix 'neuro-' qualifies as a 'trending topic'. People are shoved into MRI scanners for anything, these days. Neuro-psychology, neuro-biology, neuro-marketing: there is no self-respecting field of research which does not have a 'neuro-branch', at least in the making. We bet that the first neuro-political scientists are already busy preparing to cut the brains of voters into virtual slices.

When Read Montague repeated the Pepsi Challenge in an MRI scanner in 2004, it made headlines in the advertising press all over the world. When the test subjects did not know what they were drinking, they had a preference for Pepsi. But when they knew which brand they were tasting, almost everyone wanted Coke. More than that, they really liked the taste of CocaCola better. Their medial prefrontal cortex had triumphed over the more primitive reward systems in their brain, which clearly preferred Pepsi.

But what use is this information to a media advisor? Can you plan a campaign based on the lighting up of certain brain areas?

According to the Danish publicist Lone Frank, neuro research is The Fifth Revolution in science. After Copernicus, who displaced the earth from the centre of the universe, Darwin, who toppled man from his pedestal as the crown of creation, Freud, who showed us the depths of the subconscious, and DNA research that laid bare the building blocks of our existence, during the coming years the stage will be set for the neuro scientists (Frank, 2009). Everywhere in the world, the brightest minds get the biggest budgets to find out exactly how this 1.5 kilos of 'little grey cells' shapes our 'doing' and our 'being'.

Things are moving rapidly as regards new insights into our brain. And as regards the field of marketing. The question, of course, is: why do we eventually prefer Coca Cola? How did Coca Cola manage to acquire that brain position? Undoubtedly, it will be a combination of all the advertising for the product that you have seen in your lifetime, together with the stimulation of your reward centre caused by drinking brown sugar-water.

More and more scientific research is showing that the decisions people take are not very well predicted by what they say in advance. That goes for choosing a partner or quitting smoking, but also for buying a new car or a house. What people tell us they are going to do is often something very different from what they actually do. Brain research shows us the reason for those inconsistencies. Buying decisions, for instance, are not made by the structures in the brain that produce conscious thoughts and form our explicit judgement. On the contrary, it is mostly subconscious mechanisms that urge us to buy, mechanisms like emotions, long-forgotten previous experiences, fears and desires, as well as all kinds of external influences. It was Antonio Damasio who, even in 1994, long before fMRI, showed that without emotions we are incapable of making 'rational' decisions (Damasio, 2005, see also du Plessis, 2011). Behavioural economics gives many stunning examples of how choice behaviour can be greatly influenced, or even reversed, by changing the external conditions (Thaler & Sunstein, 2009; Ariely, 2009).

Media form an important part of those 'external conditions'.

For the Media Brain study by Sanoma, Uithijter and Neurensics, a technique known as BOLD (Blood Oxygenation Level Dependent) fMRI was used. To explain some of the basic concepts involved, we refer to 'Functional Magnetic Resonance Imaging, Second edition' by Huettel, Song and McCarthy. "Magnetic Resonance Imaging (MRI) uses strong magnetic fields to create images of biological tissue. (...) To create images, the scanner uses a series of changing magnetic gradients and oscillating electromagnetic fields, known as a pulse sequence. Depending on the frequency of the electromagnetic fields, energy may be absorbed by atomic nuclei. For MRI, scanners are tuned to the frequency of hydrogen nuclei, which are the most common in the human body due to their prevalence in water molecules. After it is absorbed, the electromagnetic energy is later emitted by the nuclei, and the amount of energy depends on the numbers and types of nuclei present. (...) Much of our knowledge about the brain has come from the study of its structure (...) However, structural studies are limited in that they cannot reveal short-term physiological changes associated with the active functioning of the brain. Functional neuroimaging studies can help overcome this limitation by both identifying the different parts of the brain where particular mental processes occur and by characterizing the patterns of brain activation associated with those processes. (...) Most fMRI studies measure changes in blood oxygenation over time. Because blood oxygenation levels change rapidly following the activity of neurons in a brain region, fMRI allows researchers to localize brain activity on a second-by-second basis, and within millimetres of its origin. (...) Functional MRI is a measurement technique: researchers measure changes in function, typically increases or decreases in blood oxygenation, while a subject performs an experimental task." (Huettel *et al.*, 2009)

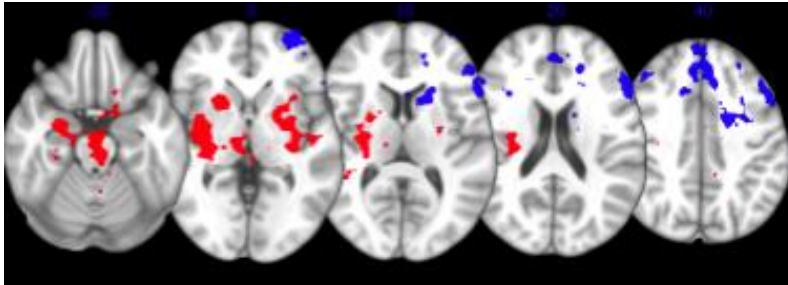
Figure 1. fMRI scanner at the Spinoza Center in Amsterdam



Most brain activity that is being measured cannot be interpreted directly. This means that activity in brain region X (e.g. the Amygdala) cannot be uniquely identified as psychological process Y (e.g. fear). The reason for this is twofold. First, the location of brain areas may differ from person to person, and brain areas often do not correspond to a unique anatomical pattern. The second reason is that the connection between a brain area and a psychological function is not a one on one relationship. To give meaning to certain brain activity – for example, when viewing a television commercial or a magazine advertisement – we use so-called 'neural mappers'. In a 'mapper', emotions (fear, trust, desire) or behaviour (anticipation of loss or profit) are charted, based on a known task or set of stimuli. These are established for each test person separately, based on BOLD fMRI recordings. The next step is to mark in a network of brain areas (a combination of several separate anatomical regions, specific to that 'mapper'), in which voxels were active and how active they were. A voxel is a volume in a 3-dimensional space: the 'pixels' of the brain. The 'mapper' thus identifies for each test subject the network of neurons specifically involved in a certain emotion or behaviour.

The next step is to measure the activity of that brain network when a certain stimulus is presented, like a package, brand, magazine ad or TV commercial. The activity of the voxels is added, so that in the end a single score results. Neurensics uses several 'mappers' based on scientific knowledge from neuro-scientific and psychological literature. These 'mappers' fall into two categories: 'basic mappers', used to evaluate the impact of the stimuli that are presented, and 'value mappers', used to assess the value the brain attaches to these stimuli. The 'value mappers' are divided into positive and negative 'mappers'. When combined, these 'mappers' give a 3D Brain Rating®. Positive and negative 'mappers' are 'added' and projected on the X-axis and Y-axis respectively. The 'basic mappers' are projected on the z-axis.

Figure 2. Example of a 'mapper'; parts that signal trust are blue, parts that signal distrust are red



The use of these kinds of 'mappers' and the corresponding analyses have led to a breakthrough in the field of the prediction of human behaviour. On the basis of a single 'anticipation mapper', Levy predicted choice behaviour in relation to various articles like CDs, books and DVDs, with an accuracy of 50% to 83% (Levy *et al.*, 2011). What is remarkable is that these predictions were better than a prediction based on the financial value that the test persons attached to these products. Apparently, the scanner knows what people want better than they do themselves.

## Research design

One of the characteristics of neuromarketing is that, with a relatively small sample of sample of test subjects, reliable conclusions can be drawn concerning the quality of a product, brand, advertisement, commercial or package. What is being measured in the brain of a single test person will in many cases be representative for the target group as a whole. This, amongst other things, has been demonstrated in a study into the trustworthiness of faces. (Engell *et al.*, 2007). The 'reliability-mapper' for a single test-subject who was shown one of the test portraits was highly correlated – not with that subject's personal opinion regarding the trustworthiness of the person shown in the portrait, but rather with the average 'trustworthiness' score given for that face, based on a standard questionnaire.

For this survey, we scanned 36 people. The test persons were selected by the agency Van Hellemond & Co (Esomar member). 32 subjects had to meet the following criteria:

- Women in the 25-49 year age-group, divided into two groups: 25-34 years old and 35-49 years old. They had to be comparable in terms of education and socio-economic status.
- The selected group had to be subdivided into 4 groups of 8 women who had a long-standing relationship with one of four magazines: Viva, Grazia, Flow and Libelle.
- The group were also asked to state their favourite television show, also equally divided between 4 programmes: The Voice of Holland (talent show), Ik hou van Holland (family entertainment), Crime Scene Investigation (crime) and Goede Tijden, Slechte Tijden (soap opera).
- Besides our primary test subjects, we also scanned 4 media strategists, employed at different media-buying agencies. They also met the conditions described above.

Each respondent received a sum of €75 for their cooperation.

Three experiments were conducted while the respondents were in the scanner. The first was aimed at establishing the nature of the attachment/relationship between a reader and her magazine. It is often assumed that your favourite magazine can have the status of a trusted friend, or, in the online language of today: BFFL (Best Friends For Life). To investigate this, Neurensics used what is called a 'similarity analysis'. In this analysis, the pattern of activity caused by one stimulus is compared to the pattern of activity evoked by another stimulus. Does the brain respond to a favourite magazine in the way it would to a good friend? (Kriegeskorte, 2008)

In this survey, a similarity analysis was used in order to compare the patterns of activity generated by magazines with pictures of loved ones and friends, as contrasted with pictures of people the respondents disliked. Respondents each e-mailed 10 pictures: 5 of people who fell into the category of 'loved ones' or 'best friends', and 5 of people who evoked a strong negative

emotion like anger, annoyance or irritation. Because each respondent had a 'favourite' magazine, we could compare the emotions those magazines generated with the emotions evoked by the pictures of people they loved or hated.

The second experiment involved the effect of attachment to the magazine on advertising effects. Test subjects were shown a magazine cover, followed by a magazine advertisement. The brain's response to the advertising was measured, and we looked at how these responses were moderated by the previously-shown magazine cover.

In total, respondents were presented with 7 different magazines: their favourite magazine, three magazines they had also read during the past year, and 3 magazines they never read. 11 different magazine advertisements were used. For the Brain rating, 4 different neural 'mappers' were used.

1. Attention – does the picture shown draw the attention of the subjects, does it stand out, does it succeed in waking up our brain, or is it dull and uninteresting?
2. Positive desire – does the stimulus arouse desire? Do we feel attracted to the product shown? Is it sexy, does it stimulate buying intention?
3. Trust – do we trust the information shown to us? Does it make our brain quiet or anxious? Does it evoke doubt or security?
4. Visual processing – is the information shown processed and stored into memory? Can it build a long-term association?

The third experiment compared the reaction of the brain to advertising on television, as compared with magazine advertising. We interrupted the television shows selected by the respondents with a short (1' 30'') commercial) advertising break, and also interrupted the reading of a magazine on an e-reader by showing an ad. For measurement purposes, the minimum timeframe for watching a magazine page was 10 seconds. After 10 seconds, the respondent could click on to the next page.

We presented advertising both in favourite and non-favourite TV-shows, just as we presented the magazine advertising in favourite and non-favourite magazines.

For this experiment, the 4 'mappers' used in the second test were supplemented by 'anger' and by 'disgust'.

5. Anger – is the attention generated by the stimulus positive or negative? Negative emotions can be connected to the product shown and may work counterproductively.
6. Disgust – the stimulus shown may provoke physical 'pain' or repulsion. The brain would try to avoid this stimulus in the future.

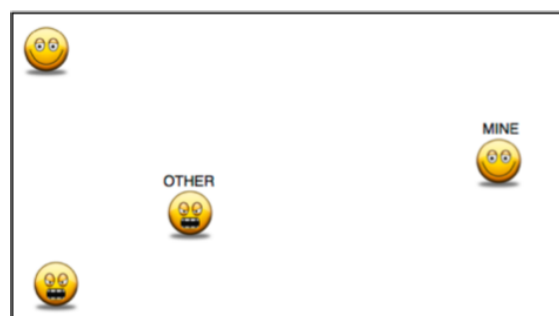
These extra 'mappers' were added in order to enable better charting of possible annoyance caused by advertising.

## Results

### Reader-magazine engagement

The similarity analysis shows that as far as the brain is concerned, the relationship you have with your favourite magazine is not the same as the relationship you have with your best friend. In fact, the differences are remarkably large. The similarity between the relationships with persons and magazines is shown in the 2- dimensional similarity graph in Figure 3.

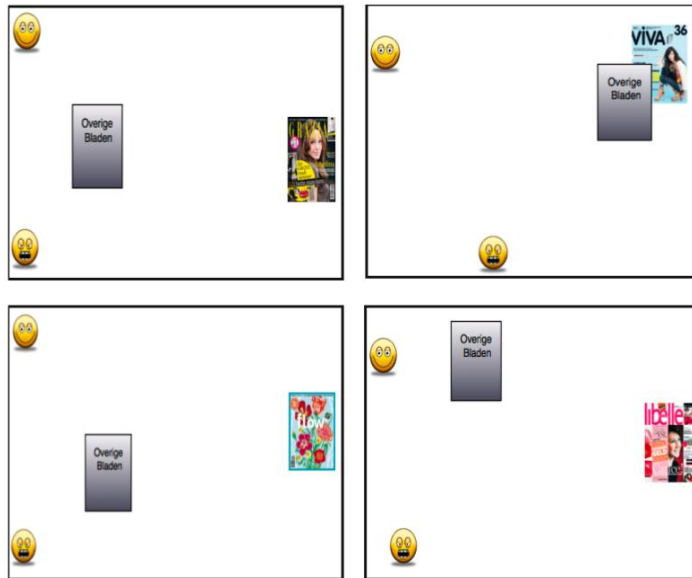
Figure 3 Similarity map, magazines and friends



Two things stand out. 'Friends' (left smiley) and 'enemies' (left angry) are vertically opposed. Your own favourite magazine (Mine) is positioned just as far from 'friends' as it is from 'enemies'. The other magazines are closer together, but the distance between the favourite magazine and other magazines is horizontal. This indicates that the brain categorises reader-magazine engagement entirely differently from the way in which it categorises an interpersonal relationship.

So as to be sure that this conclusion is the same for every reader-magazine relationship, and is not caused by differences between persons who prefer one magazine to another, the same analysis has been conducted on a magazine-by-magazine basis. This shows no differentiation from the general trend. We do not experience our relationship with a magazine in the same way as we experience the relationship with our friends.

Figure 4 Similarity analyses per magazine



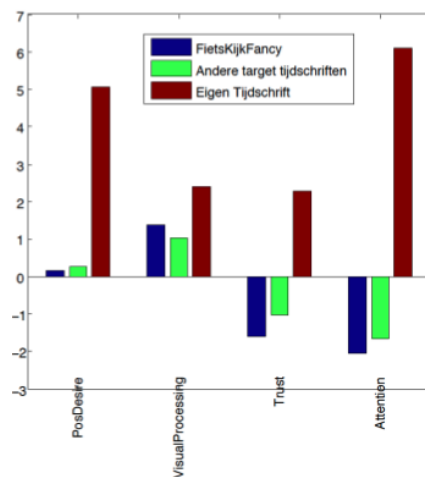
It is remarkable, however, that readers view their favourite magazine completely differently from the way in which they view other magazines. The distance between your 'own' magazine and other magazines is equal to the distance between 'friends' and 'enemies'. This leads to the observation that reader-magazine engagement is an important issue. For the reader, it makes a great difference whether she is reading her 'own' magazine or another one.

In conclusion: reader-magazine engagement does exist, but it is not comparable with human friendship.

### Advertising processing in different magazines

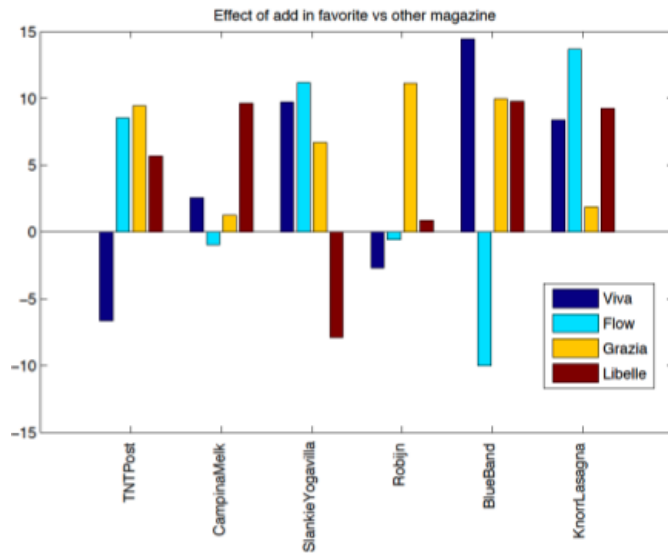
Does the relationship between a reader and a magazine influence the way advertising is processed? Yes it does! Ads in the favourite or 'own' magazine score better on all aspects measured than does the same ad in any other magazine. They get more attention, are examined more closely, are trusted more and evoke more desire.

Figure 5. Mapper scores for favourite magazines, other magazines that are read, and unfamiliar magazines



However, this does not hold true for every ad in every magazine. If there is no match or 'fit' between the content of the ad and that of the magazine, then there can be negative scores as well. For advertising, it definitely is an advantage to be in your favourite magazine, but it does have to have a reason to be there.

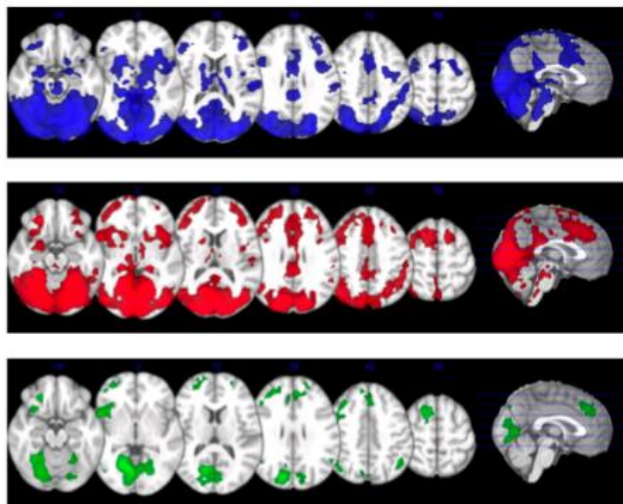
Figure 6. Effects of advertising in favourite versus other magazines, by ad



### Advertising processing: TV and magazines

Does the brain respond differently to an advertising break in your favourite TV show as compared to the way it responds to an ad that appears when you turn the page of a magazine? The analysis is based on the data as shown in figure 7. Shown in blue (top line) is the activity evoked by a page with editorial content. Shown in red (middle line) is the activity evoked when looking at an advertising page. Both editorial and advertising content result in activity in different visual, attention-oriented and cognitive parts of the brain. The difference between the two is shown in green in the bottom line. It is clear that ads evoke more activity than editorial pages. But how should this be interpreted?

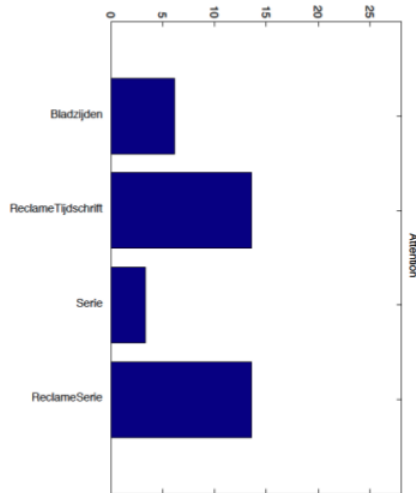
Figure 7. Brain activity when viewing editorial pages as contrasted with advertising pages



Is the difference caused by annoyance because the reading experience is being interrupted by the ad? Or is it interest in the ad that accounts for the heightened activity? Does the ad merely draw attention or is the content too being processed? Does the advertiser get what he wants or is he just shooting himself in the foot by annoying the reader? And what do we see in the situation where a TV show is being interrupted by an advertising break?

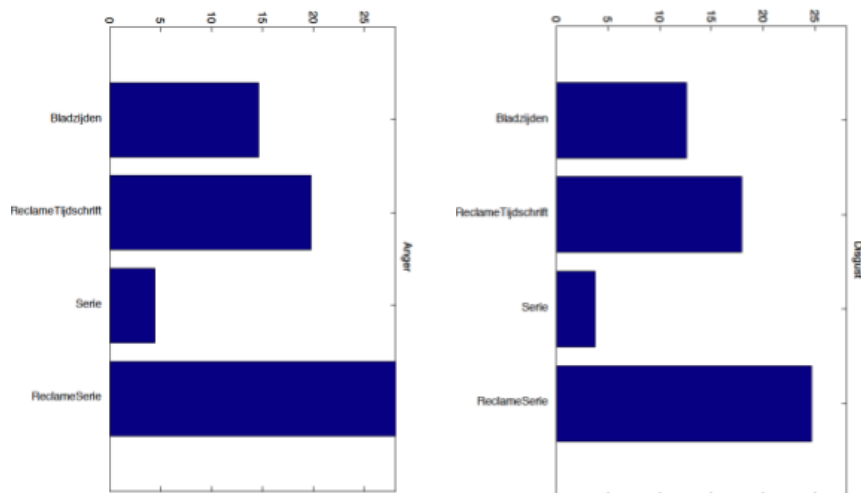
The next graphs show what is called 'voxel power per cubic'. It can only be used for reasons of comparison. What we see in figure 8 is that both advertising pages and TV advertising (bars 2 and 4 respectively) attract more attention than the editorial content of the magazines and the TV shows themselves.

Figure 8. Attention scores for editorial content, advertising pages, TV shows and TV advertising



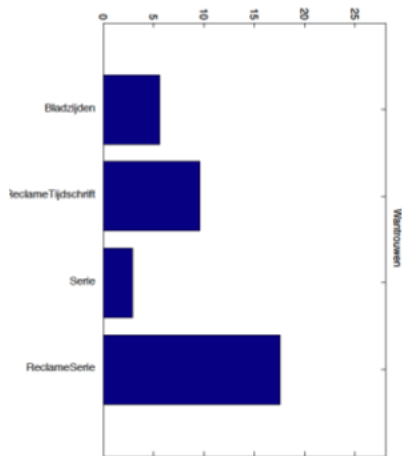
When examining the emotions that are evoked by looking at advertising in magazines or on TV, we see some striking differences.

Figure 9. Anger and disgust scores for editorial content, advertising pages, TV shows and TV advertising



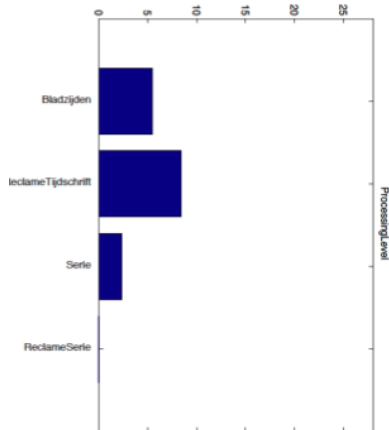
Reading a magazine on an e-reader (with an obligatory pause of 10 seconds per page before you can move on) does evoke some aggression. But there is an enormous increase in aggression when the TV series is being interrupted by a commercial break. This is not compensated for by positive emotions. The end result is a complete lack of trust in television advertising. While magazine advertising also meets with some scepticism, it nevertheless does far better than TV advertising. (Figure 10)

Figure 10. Distrust scores for editorial content, advertising pages, TV shows and TV advertising



The results for the last ‘mapper’ ‘processing level’ turned out to be really sensational. While the ‘*communis opinio*’ would be that a TV commercial has more ‘impact’ than a magazine ad, the results for ‘processing level’ indicate the opposite. As a result of the emotions aroused by the interruption of the viewing experience, TV commercials are only minimally processed and then stored away into the memory structures of the brain.

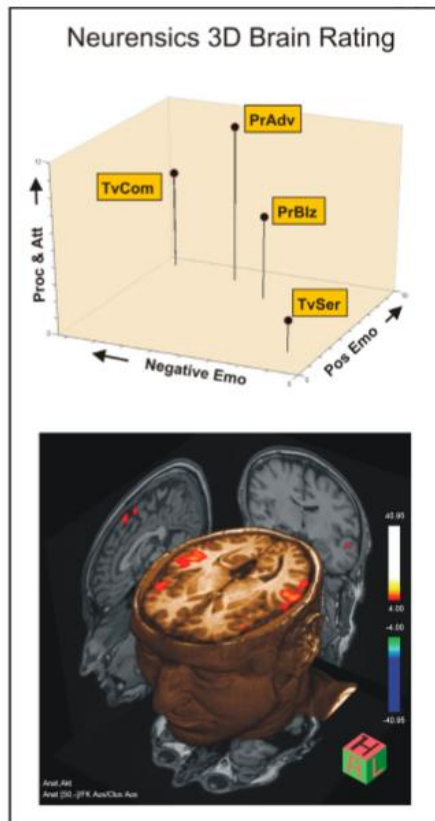
Figure 11. Processing level for editorial content, advertising pages, TV shows and TV advertising



When we present these results in a 3-dimensional view in which the positive emotions (positive desire, sexiness and food attraction) are combined into one factor – as are the negative emotions (anger, disgust, distrust) and the ‘basic mappers’ (attention and processing level) – this results in the following 3D Brain Rating®



Figure 12. 3D Brain Rating of all 'mappers'



Looking at this picture, the differences between print advertising and TV-commercials stand out clearly. TV-commercials evoke most negative emotions. This is hardly compensated for by slightly more positive associations. In the end, the processing levels for TV commercials are significantly lower.

### Implications for media planning

Research into the relationship between a reader and her magazine is not new. Whether we call it quality of reading or engagement, the fact is that if people are really avid readers or loyal 'fans' of a publication, then the magazine has an added value for the advertiser, which has literally left its traces in the brain. But the results also show that the advertiser and media planner have to pay close attention to the match between the advertising message and the content of a magazine.

In 1991, the Dutch publishing house Weekbladpers did a survey in which they asked FHV/BBDO to develop different print ads for the same products, each created with the readers of a specific magazine in mind. Some of the ads were printed in the magazine for which they were developed and some in the 'wrong' magazine. The ads with the right 'fit' turned out to be significantly more effective. Of course, it can be expensive to develop 'fitting' advertisements for each particular magazine. If costs are prohibitive, then it might prove to be better planning to restrict the campaign to those titles for which there is a reasonable 'match', rather than to try and increase advertising reach by selecting a number of non-matching titles.

In our experimental setting, the TV commercials were nowhere near as well processed as the magazine ads were. If this conclusion had been drawn with reference to a study based on a questionnaire, it is likely that its objectivity would be questioned. It was after all a magazine publisher who funded the research. (A few months later, Sanoma publishers bought the TV stations of SBS Netherlands). But the brain does not lie. There are researchers who use MRI scanning as an improved version of a lie detector. Our findings correspond with the results of research into the differences between media with 'external' and 'internal' pacing. Though the amount of 'control' over the speed and duration of watching commercials and ads while in an MRI scanner is not comparable to the way one would act while sitting on the couch at home, the results are in agreement with those obtained in a more 'natural' test environment. TV advertising is experienced as a more annoying interruption of viewing than the disruption of reading experience caused by an ad in a magazine.

Surprising indeed to see that magazine ads are being processed better than TV commercials. The indubitable effectiveness of TV-commercials as measured in tracking research is caused in large measure by the high frequency with which the consumer is exposed to it. Erwin Ephron has argued that if we were to buy print with the same frequency as we watch TV, print would

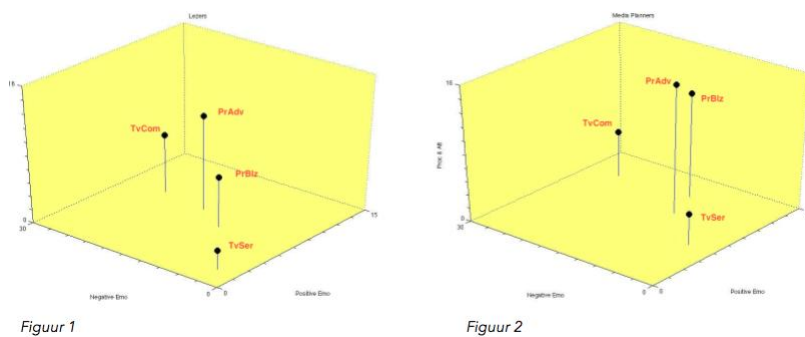
probably do much better. *"We know from experience that??? it takes at least 50 points-a-week in TV to see sales effects in-market. A heavy magazine schedule delivers 20 points a week. Twenty points won't work with TV either. Print at TV weight produces response."* (Ephron, no year given)

In a study by media agency Kobalt and research agency Daphne, it also emerged that if you look at the results of a print campaign amongst regular readers of the magazines used in the campaign, then the return on investment from print turns out to be much better than is often assumed (Den Boon and Faasse, 2003).

### The media brain

Out of curiosity, we also asked four media strategists from leading media buying agencies in the Netherlands to participate as test subjects in our research. One might imagine that after a number of years in the media planning and buying business one develops a different mental picture of the various media and of advertising therein. It turns out that the 'media brain' of our professional test subjects did not differ all that much from that of the 'average' Dutch woman. On the whole, media strategists (on the right) do have slightly more positive emotions and a better processing of advertising.

Figure 13. The media brain



### Conclusions

It is fascinating to be able to see 'live' what happens in the head of the viewer and reader at the moment when advertising is being shown. The results of the media brain survey agree remarkably well with the results of a number of 'classic' studies of media and advertising. That is reassuring. Apparently our measurable behaviour is in many cases certainly a result of what happens inside our skull. The media brain survey has the merit of showing which processes are responsible for the way media and advertising work.

The bond between a reader and her magazine results in trust which planner and advertiser can gratefully use. But they have to try and achieve a certain amount of congruence between the magazine content and the advertising. Most planners do not have an MRI scanner on hand while planning. But instruments like the TGI survey, available in most countries, could help us to understand what readers are looking for in a specific magazine. By the way, this would be a profitable strategy for TV planning too.

Showing an ad in a magazine leaves more traces in the brain than showing a TV commercial does. That puts the price-value relationship of television versus print in a new perspective. It would advocate our buying less – *but more targeted* – TV airtime, and spending more on print, albeit only in 'matching' titles.

There is much to be desired in terms of additional research. What exactly is the role of frequency? What happens in our heads as we are confronted with a commercial or ad more frequently? What about other media? How do brand representations form in our heads?

Technical advances will in the future make it possible to do fMRI research under more 'natural' conditions. There are also ethical considerations which researchers will have to answer. But in our opinion, brain research offers a unique opportunity of enhancing our knowledge of 'how advertising works' in the coming years.

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