



Neuromarketing research using Electroencephalography (EEG)

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31.03.2017

About us

- Stiliyan Georgiev is a Senior Researcher at the Institute of Neurobiology at the Bulgarian Academy of Sciences. He works in the field of EEG research and cognitive science.
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The beginning

- We believe that we can overcome the weaknesses of traditional marketing research by recording and analyzing the physiological responses of respondents which they are being exposed to specific neuromarketing stimuli. We use the EEG method to test TV commercials before they are shown on TV.
- Our interest in the field of neuromarketing dates back to 2005. Since then we have conducted a number of neuromarketing studies, we have gained knowledge and know-how in neuromarketing and especially in neuromarketing research using Electroencephalography (EEG).

The beginning

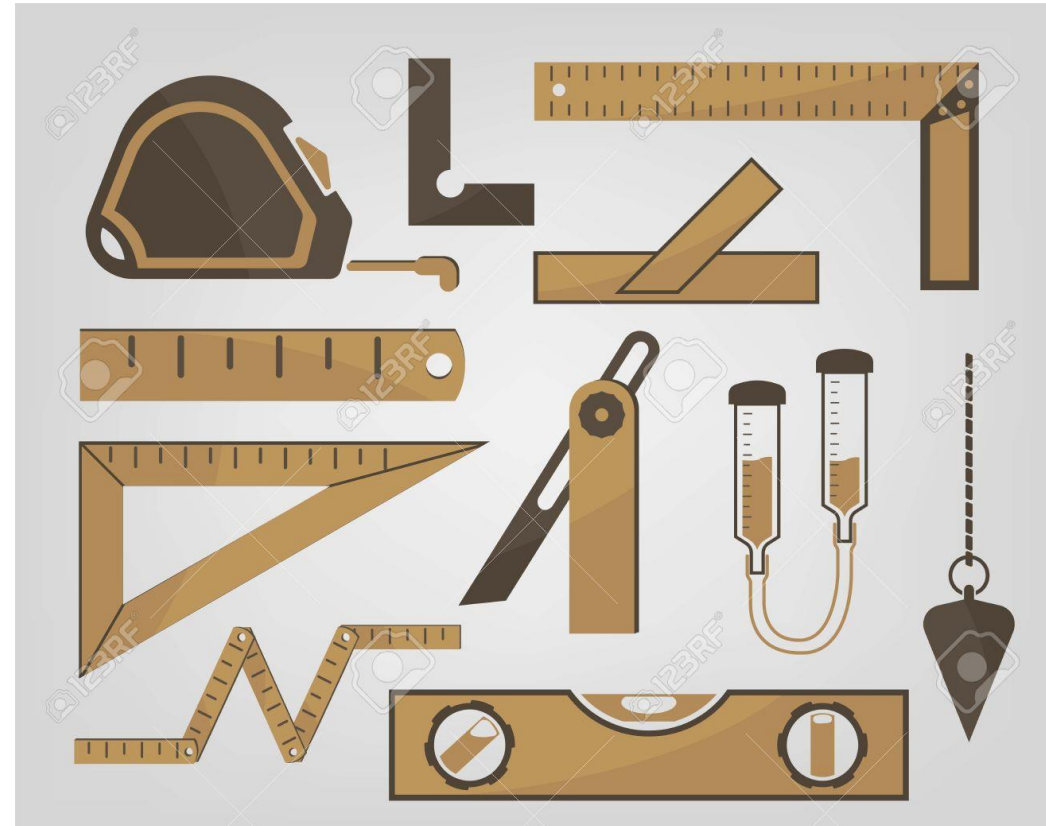
- As neuromarketing researchers we have rich experience in conducting academic and commercial studies.
- Initiators of and participants in the biggest neuromarketing research project in Bulgaria - “*The effects of TV commercials on viewers’ attention, memory and information processing*”, supported by the University of the National and World Economy, Sofia.

“Simply because people can express apparent preferences when asked does not mean these are accurate reflections of their thoughts and feelings or that they are the most relevant thoughts and feelings for the topic being investigated”.

Psychologist and Harvard Business School
professor Gerald Zaltman

Advertising Test Measures

- impact
- brand recall
- reactions
- associations
- recognition
- appeal
- persuasiveness
- image
- Comprehension
- spontaneous awareness
- prompted awareness



Observation Research

The systematic process of recording patterns of occurrences or behaviors without normally communicating with the people involved.

Conditions for Using Observation:

- The needed information must be either observable or inferable
- The behavior should be repetitive, frequent, or in some manner predictable
- The behavior must be relatively short in duration

Machine Observation

Observations made by machines rather than people

Techniques include:

- Neuromarketing - researching brain patterns and certain physiological responses of consumers to marketing stimuli
 - Electroencephalograph (EEG)
 - Galvanic Skin Responses
 - Eye Tracking
 - Facial Action Coding Services (FACS) etc.



Facial Action Coding Services (FACS)

Can You Spot a Fake?



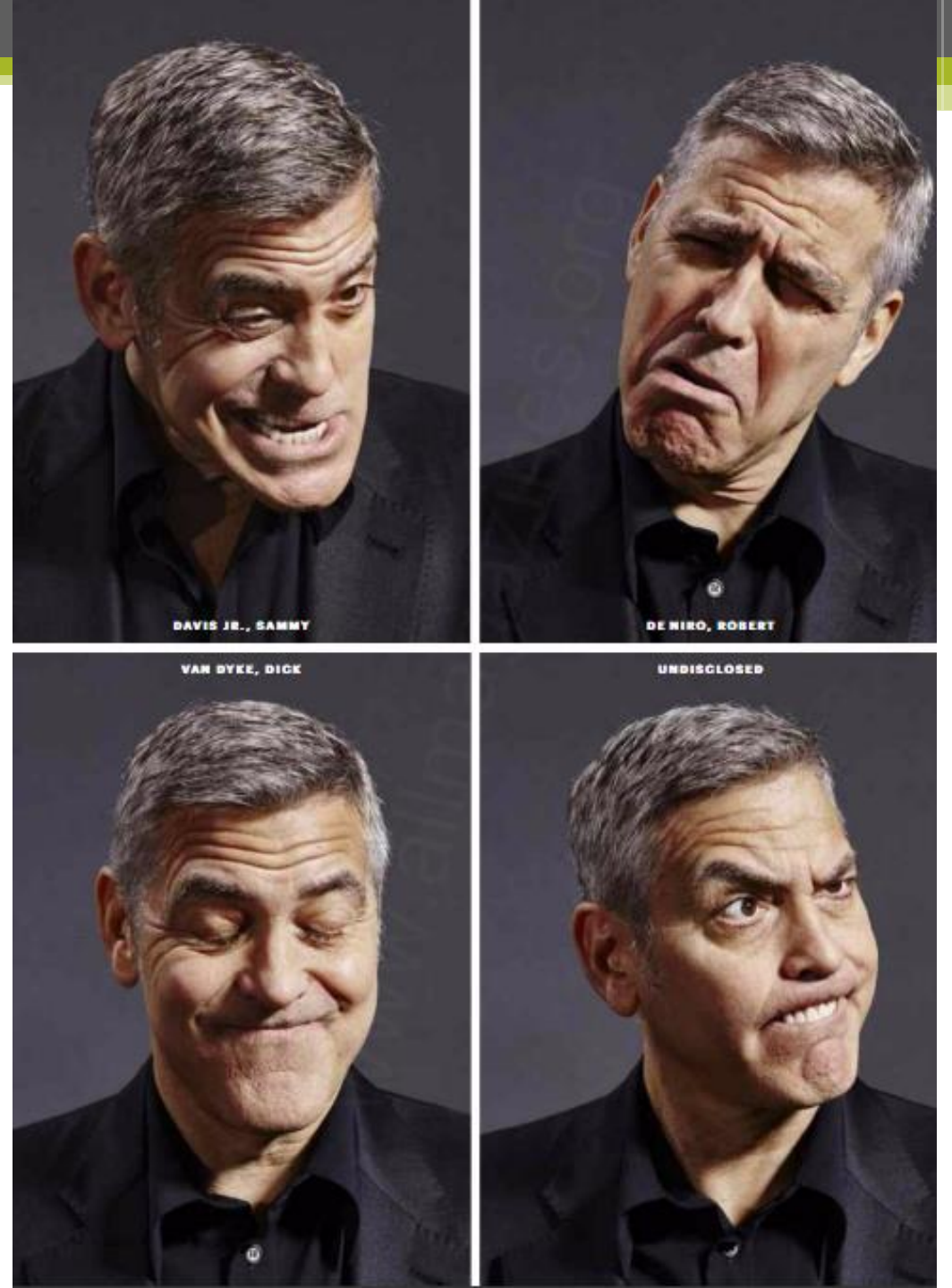
Which One Is Fake?

- **I**s it even clear if consumers like what you're selling? Some might tell you they like your product even if they don't. Who's really interested and who's just being polite?
- **A** true smile will involve the eyes as well as the mouth. Also, a true smile will curve the lips while a fake smile won't. In a fake smile, the corners of the mouth will move outward, not upward.

Observation Research

Facial Observation

Researchers could be misled if they don't use special observation techniques such as Facial Action Coding Services



Neuromarketing research using Electroencephalography (EEG)

We believe that we can overcome the weaknesses of traditional marketing research by recording and analyzing the physiological responses of respondents which they are being exposed to specific neuromarketing stimuli. We use the EEG method to test TV commercials before they are shown on TV.



PROJECT: “THE EFFECTS OF TV COMMERCIALS ON VIEWERS’ ATTENTION, MEMORY AND INFORMATION PROCESSING”

The aim of our research was to collect data and to create “know how” which will allow researchers to objectively distinguish the more likeable and memorable commercials from the less likeable and memorable ones prior to showing them to the general public by using EEG methodology which is readily available, inexpensive and brings controlled conditions closer to a real setting.



PROJECT: “THE EFFECTS OF TV COMMERCIALS ON VIEWERS’ ATTENTION, MEMORY AND INFORMATION PROCESSING”

We adopted the following working hypothesis:

There is a set of electroencephalographic parameters which can be used to predict with a high degree of accuracy which advertising ideas will be successful. Putting these advertising ideas into practice will help achieve the desired marketing objectives of the company.

We recorded EEG in two audio-visual sessions.

ADVERTISEMENT SET
KIA
Coca Colla
L'equipe
New Yorker
Pepsi Max
Mercedes
Volkswagen
Mtel
Garnier
7 Days
Zazoo

1st Task Session

News set	Commercials	News set	Commercials	Interview and new instructions
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2nd Task Session

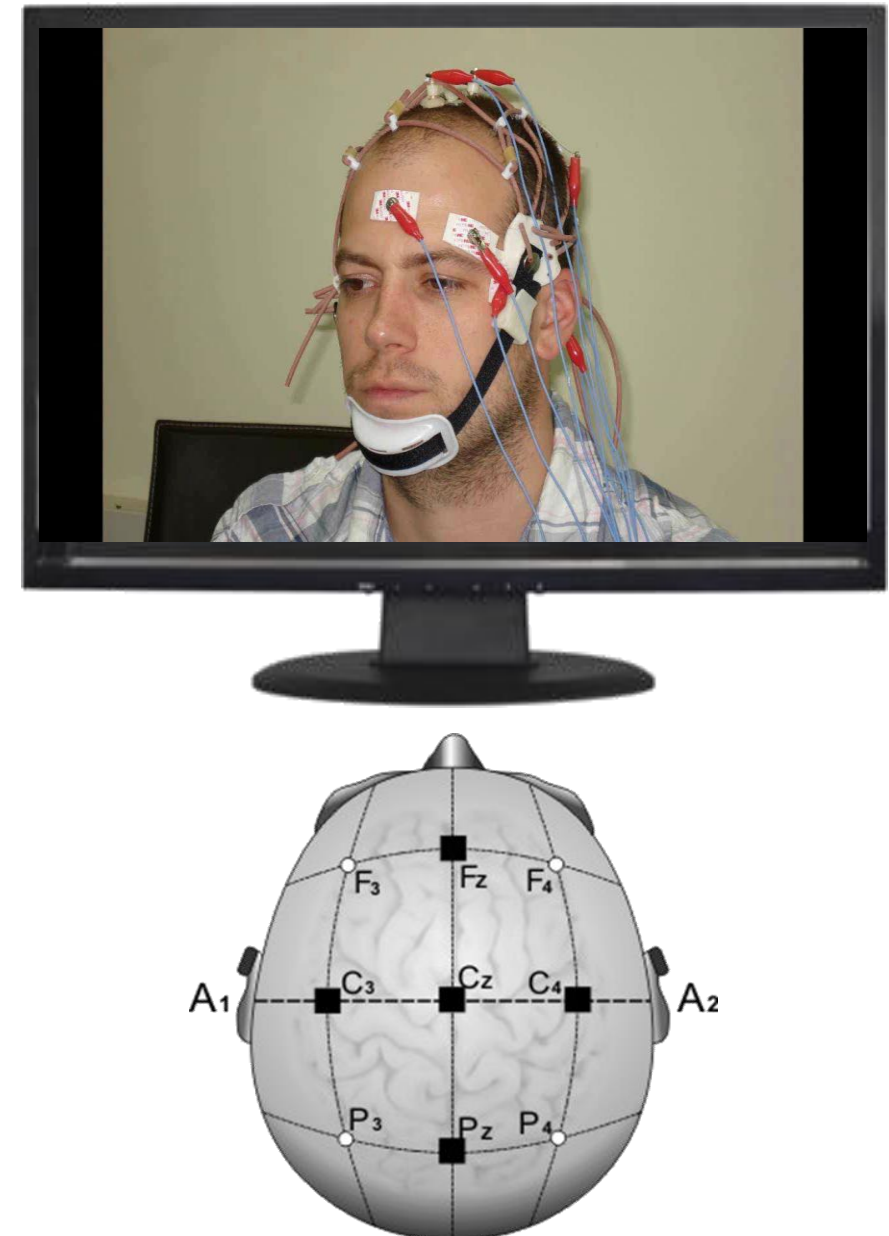
Commercials	Personal interview
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For the news set we rendered real news from CNN and 3 popular Bulgarian TV channels - BTV, NOVA and TV7. The 11 advertisements were: KIA, Coca Cola, L'equipe, New Yorker, Pepsi Max, Mercedes, Volkswagen, MTel, Garnier, 7Days and Zazoo Condoms. Three of the advertisements (MTel, Garnier and 7Days) were familiar to the Bulgarian public.

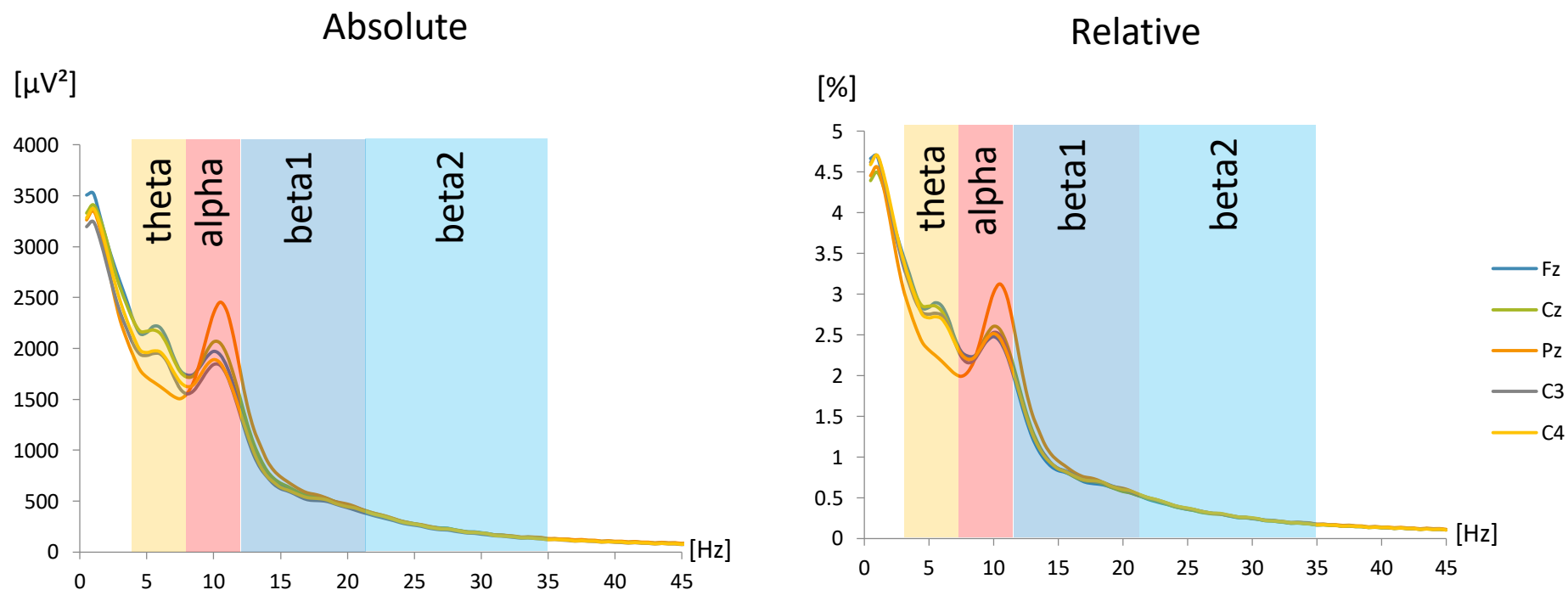
The second task session started just after the first one – the respondents were asked to watch the commercials once again and to rate each commercial on a like-dislike scale (from 1 – dislike; 5 – indifferent; to 10 – like). In fact, at this stage the experiment was revealed and respondents were acquainted with the real purpose of the study.

METHODOLOGY

- The data has been collected using the EEG method, which provides data with high temporal resolution, is comparatively cheap and non-invasive.
- We investigated 61 healthy volunteers.
- The data was collected in the time interval between 5 and 9 pm in order to bring the experimental environment closer to prime TV time.
- The EEG was recorded from 5 electrode positions (Fz, Cz, Pz, C3 and C4).

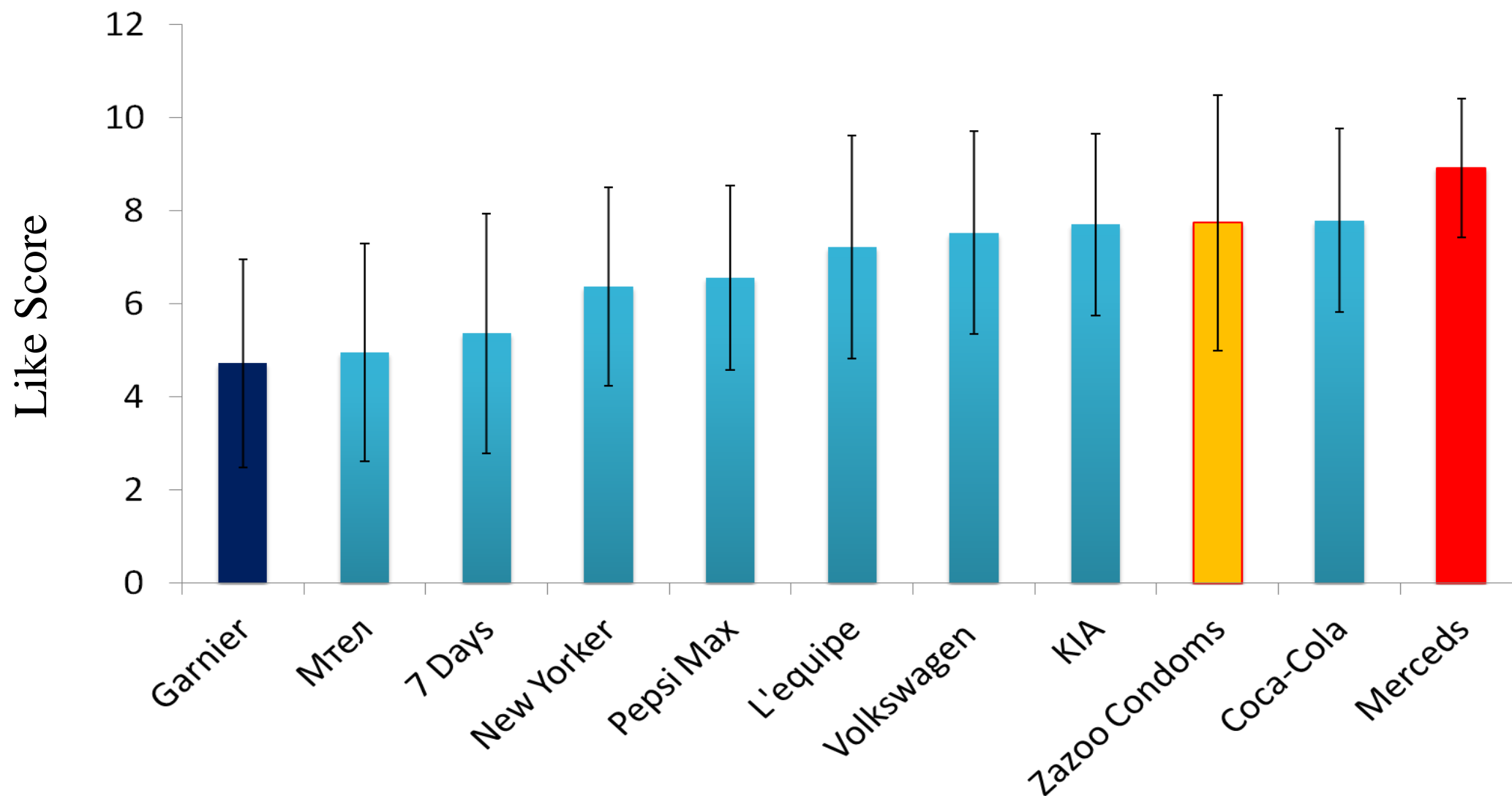


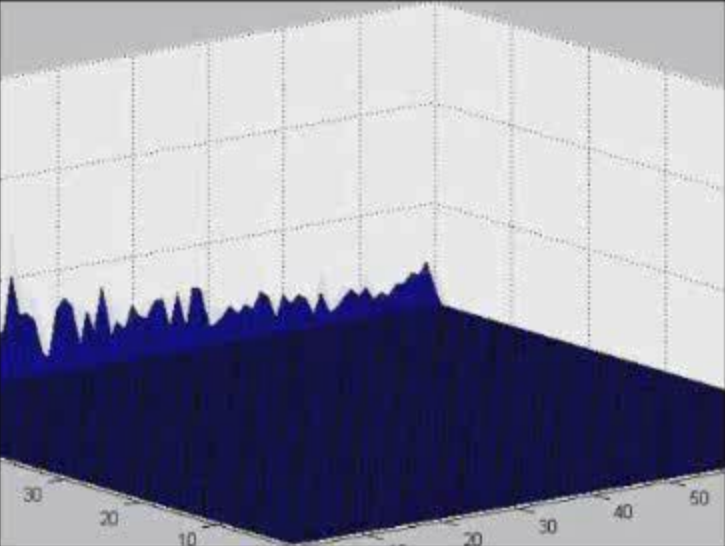
We calculated the average absolute and relative power spectra in theta (4 – 7.5 [Hz]), alpha (8 – 12.5 [Hz]), beta1 (13 – 22.5 [Hz]) and beta2 (23 – 35 [Hz]) frequency bands for each separate commercial for each advertisement set.



theta (4 – 7.5 [Hz]), alpha (8 – 12.5 [Hz]), beta1 (13 – 22.5 [Hz]) and beta2 (23 – 35 [Hz])

Findings







Highest Evaluation



Lowest Evaluation



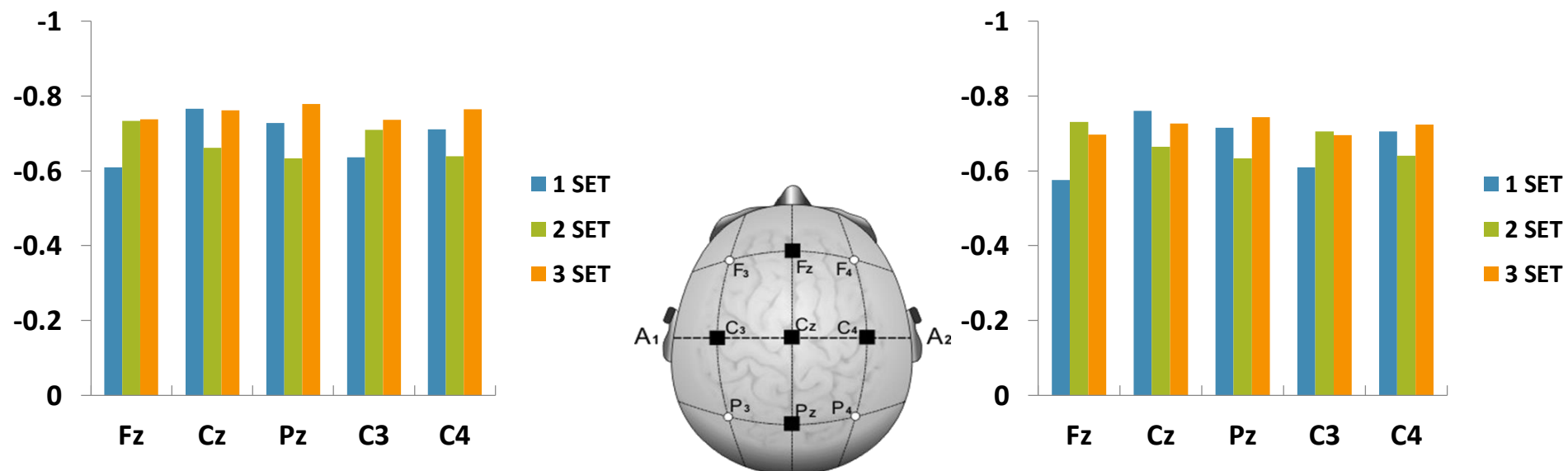
Smallest Evaluation Variation



Greatest Evaluation Variation



RELATIVE THETA

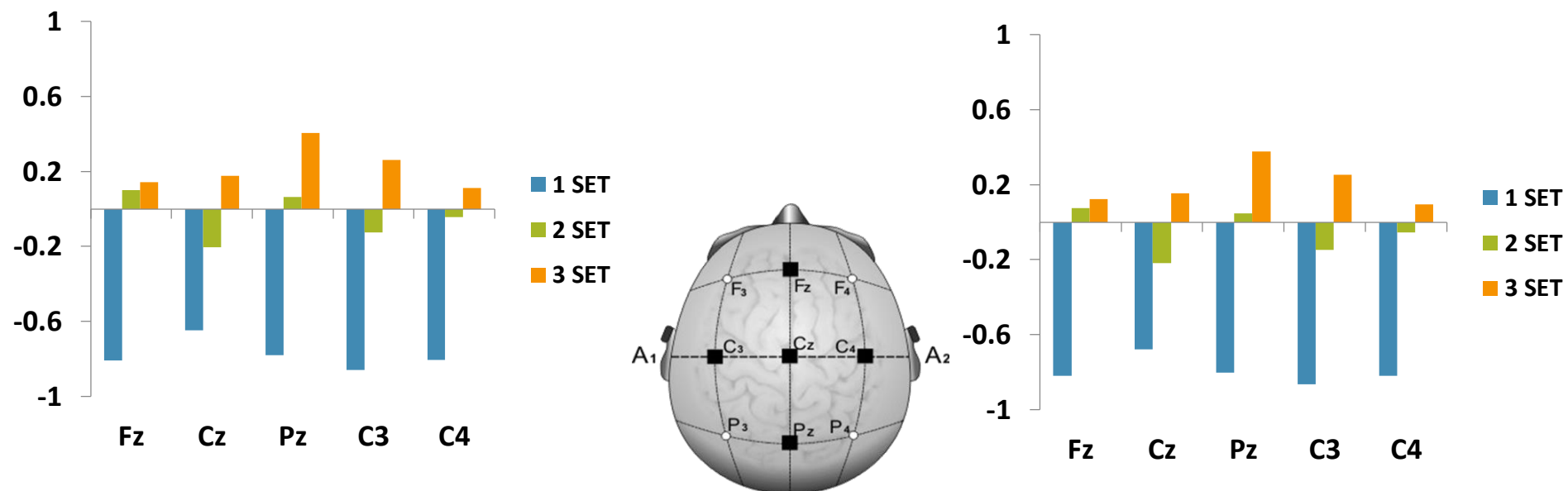


a)	Fz	Cz	Pz	C3	C4	b)	Fz	Cz	Pz	C3	C4
1 Set	*-0.609	*-0.766	*-0.728	*-0.636	*-0.711		-0.576	*-0.761	*-0.716	*-0.610	*-0.705
2 Set	*-0.734	*-0.662	*-0.634	*-0.710	*-0.639		*-0.731	*-0.664	*-0.634	*-0.706	*-0.641
3 Set	*-0.738	*-0.762	*-0.779	*-0.737	*-0.765		*-0.697	*-0.727	*-0.743	*-0.695	*-0.724

Table 1. Pearson r correlation coefficients between the degree of liking and **relative theta** EEG activity a) and between the normalized degree of liking and relative theta EEG activity b).

* $p < 0.05$

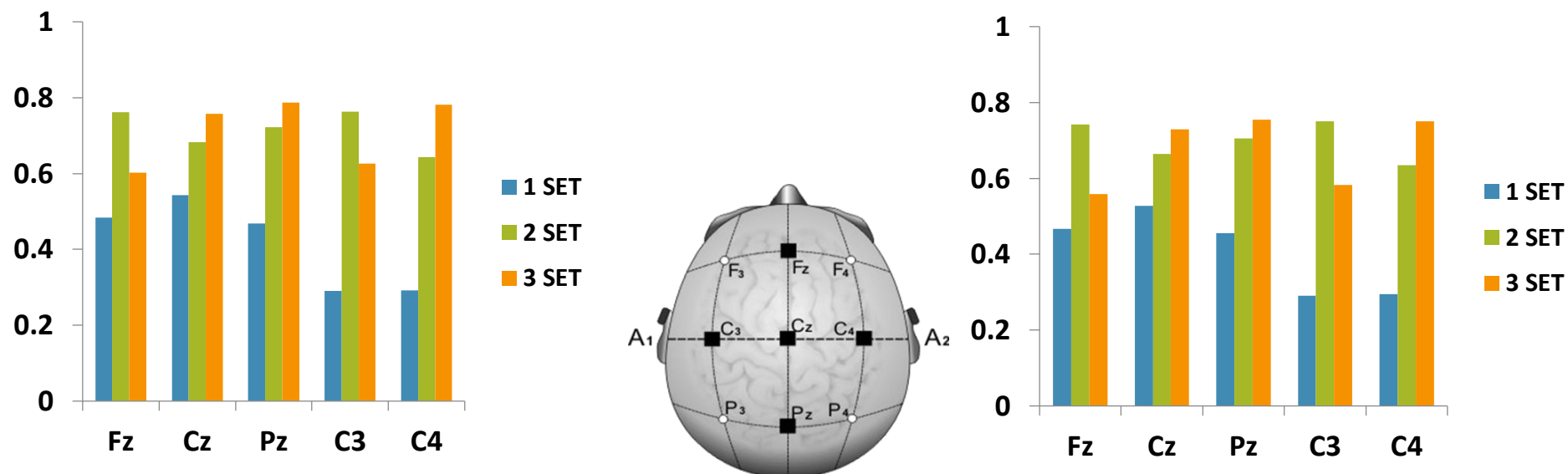
RELATIVE BETA1



a)	Fz	Cz	Pz	C3	C4	b)	Fz	Cz	Pz	C3	C4
1 Set	*-0.810	*-0.649	*-0.782	*-0.861	*-0.805		*-0.819	*-0.679	*-0.802	*-0.866	*-0.820
2 Set	0.1	-0.205	0.064	-0.126	-0.043		0.075	-0.218	0.046	-0.147	-0.055
3 Set	0.143	0.177	0.405	0.262	0.112		0.123	0.154	0.377	0.252	0.095

Table 2. Pearson r correlation coefficients between the degree of liking and the **relative beta1** EEG activity a) and between the normalized degree of liking and the relative beta2 EEG activity b). * $p < 0.05$

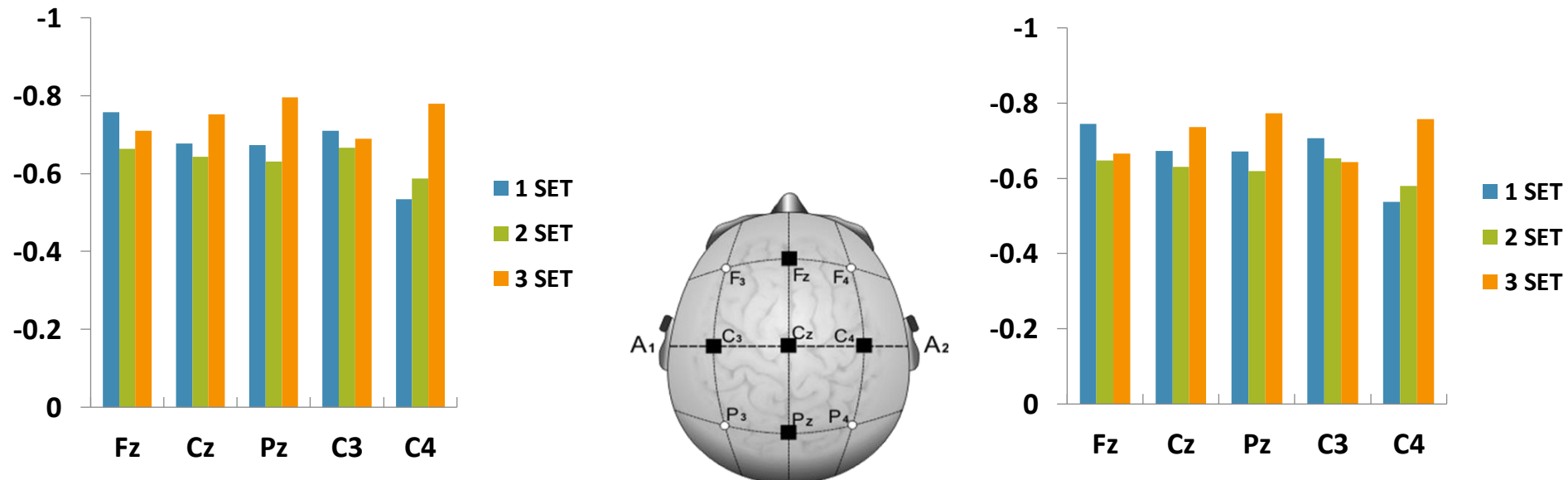
RELATIVE BETA2



a)	Fz	Cz	Pz	C3	C4	b)	Fz	Cz	Pz	C3	C4
1 Set	0.484	0.543	0.468	0.29	0.292		0.467	0.527	0.456	0.291	0.295
2 Set	*0.762	*0.683	*0.722	*0.764	*0.644		*0.742	*0.664	*0.705	*0.750	*0.635
3 Set	0.602	*0.758	*0.787	*0.626	*0.782		0.558	*0.729	*0.755	0.582	*0.751

Table 3. Pearson r correlation coefficients between the degree of liking and the **relative beta2** EEG activity a) and between the normalized degree of liking and the relative beta2 EEG activity b). * $p < 0.05$

RELATIVE BETA1/BERA2 RATIO



a)	Fz	Cz	Pz	C3	C4	b)	Fz	Cz	Pz	C3	C4
1 Set	*-0.758	*-0.678	*-0.673	*-0.710	-0.534		*-0.745	*-0.673	*-0.671	*-0.707	-0.537
2 Set	*-0.664	*-0.643	*-0.631	*-0.666	-0.587		*-0.647	*-0.630	*-0.620	*-0.653	-0.58
3 Set	*-0.710	*-0.753	*-0.796	*-0.690	*-0.779		*-0.666	*-0.737	*-0.774	*-0.643	*-0.758

Table 4. Pearson r correlation coefficients between the degree of liking and the **beta1/bera2 relative ratio** a) and between the normalized degree of liking and the beta1/bera2 relative ratio b). * p<0.05

CONCLUSION

1. The relative theta activity and relative beta1/beta2 ratio can be used for advertisement pre-assessment.
2. We showed that the use of actual and normalized ads like-dislike scale didn't change the overall results. To evaluate the like degree it is sufficient to record the EEG activity only from the central cortical area (Cz), which will speed up the research procedure, as well as reduce the experimental stress and discomfort.
3. Different EEG frequency bands are more appropriate to evaluate the male (beta1/beta2 ratio) and female (relative theta) like or dislike response to TV commercials.
4. The commercials that have a relaxing effect and do not require full alertness and active concentration create a better emotional response in viewers. This, however, does not mean that these commercials and details from them will be better remembered.

PRACTICAL USE

- One thing is to evaluate the real commercial and another thing is to evaluate just an idea or animatics.
- The “standard” indicators do not apply to animatics.
- The different animatics have almost the same EEG fingerprint.
- They didn’t differ across the separate EEG frequency bands.
- In this case, the most appropriate approach is to use the audio track and to evaluate the EEG frequency dynamic along the animatics. A well-known effect is the decrease of EEG alpha frequency spectral power with attention increase, i.e. we observe the most prominent alpha band decrease during the moments inside the animatics which attract the attention the most.



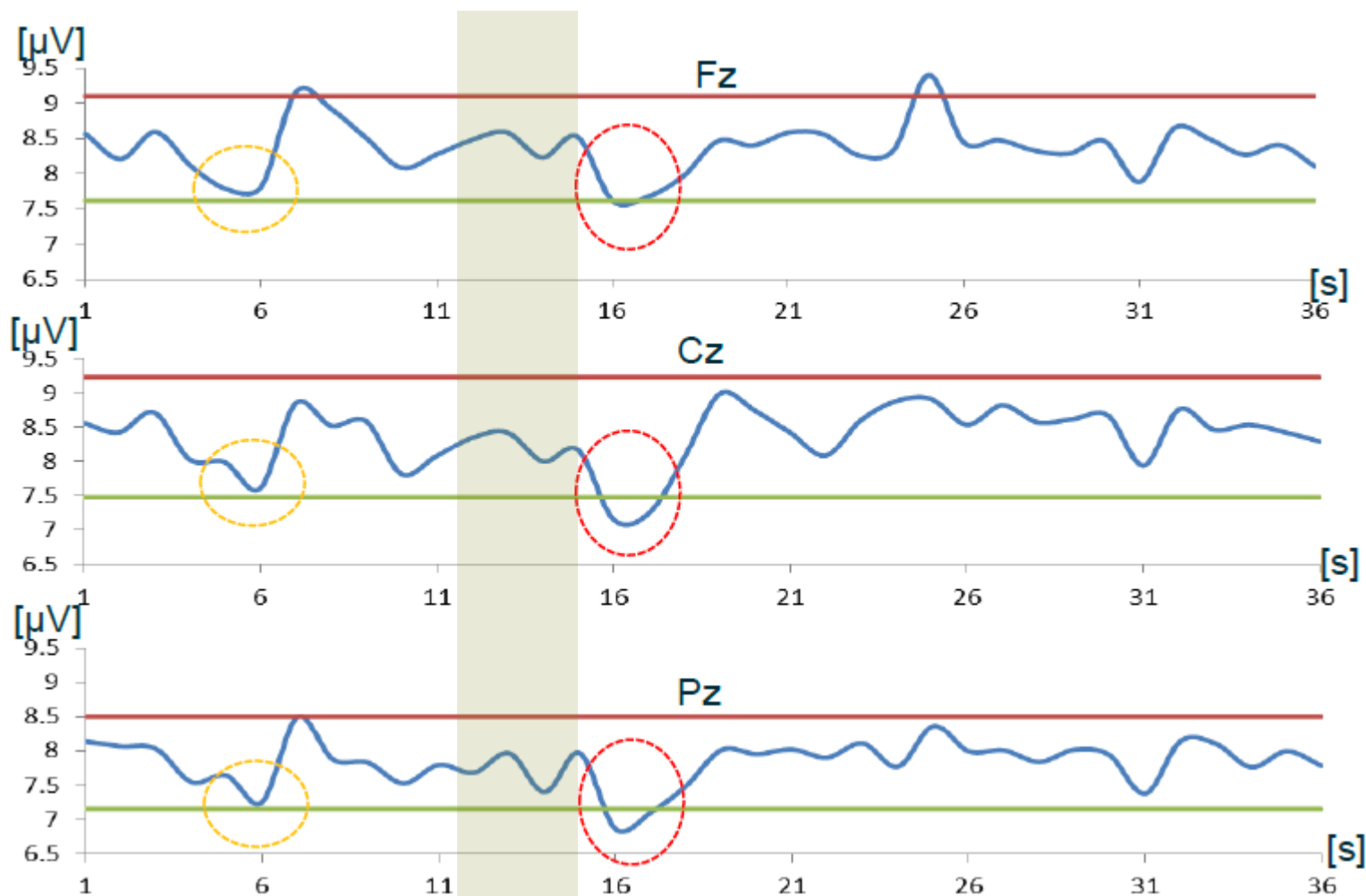
After an unsuccessful attempt to distinguish the animations, we adopted a strategy to find the most catchy moment in one particular animation.





I gave 3000 thousand Euro for a cooking curse!

ALPHA SYNCHRONIZATION/DESYNCHRONIZATION



We recommended to clients to put a logo or add to the sentence behalf of the bank.



After all, the customer decided to remove the most catchy moment, being afraid that it “outshines” the orientation response at the beginning and at the end of the advert.

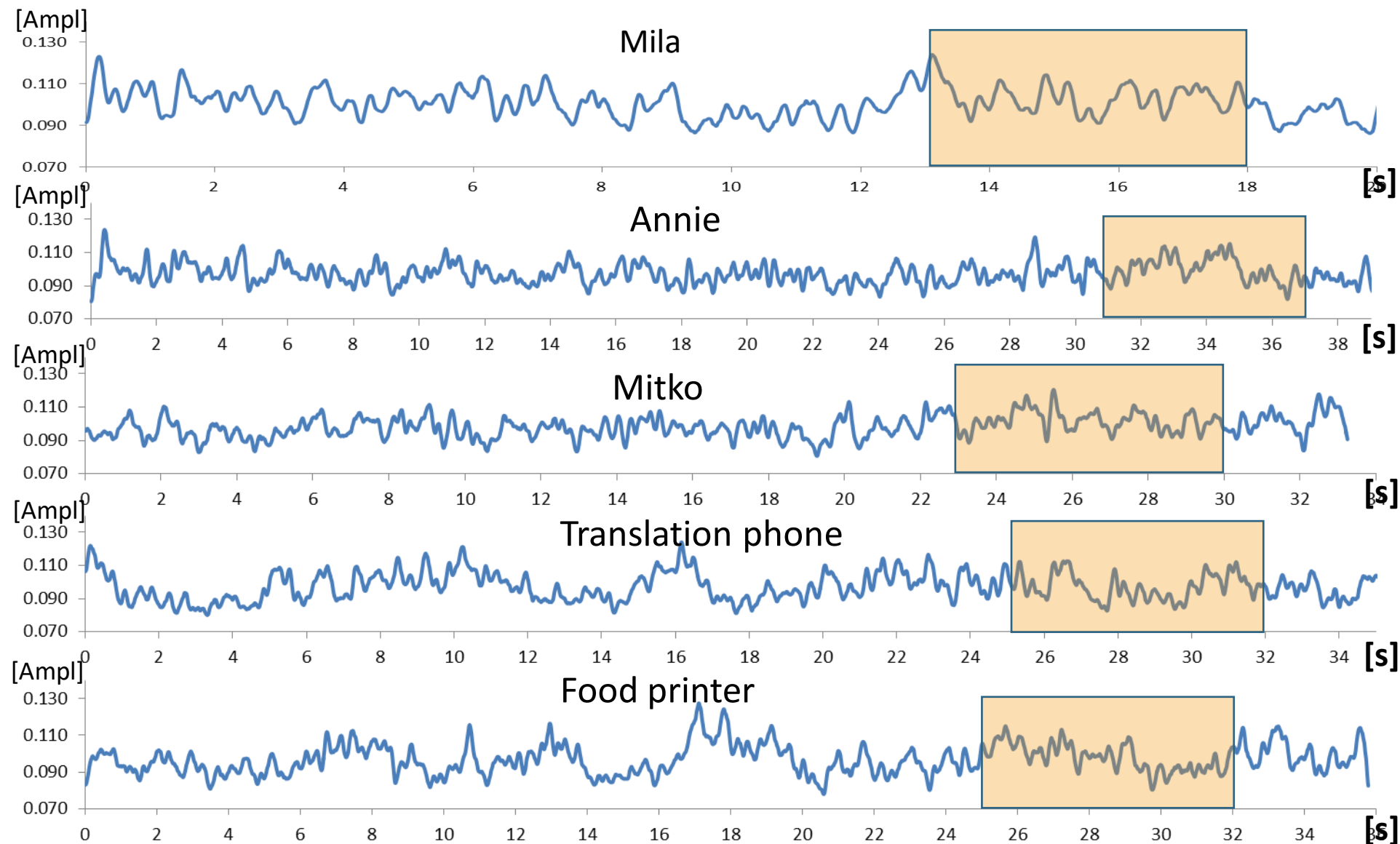




SOS-KINDERDORF PROJECT

- In this project the client had five fully complete ads and wanted to know which ad will encourage the people to donate.
- We adopted the strategy to explore the EEG only in the time intervals of "prompting" - "Give 10 Euro for the education of Bulgarian children in need".

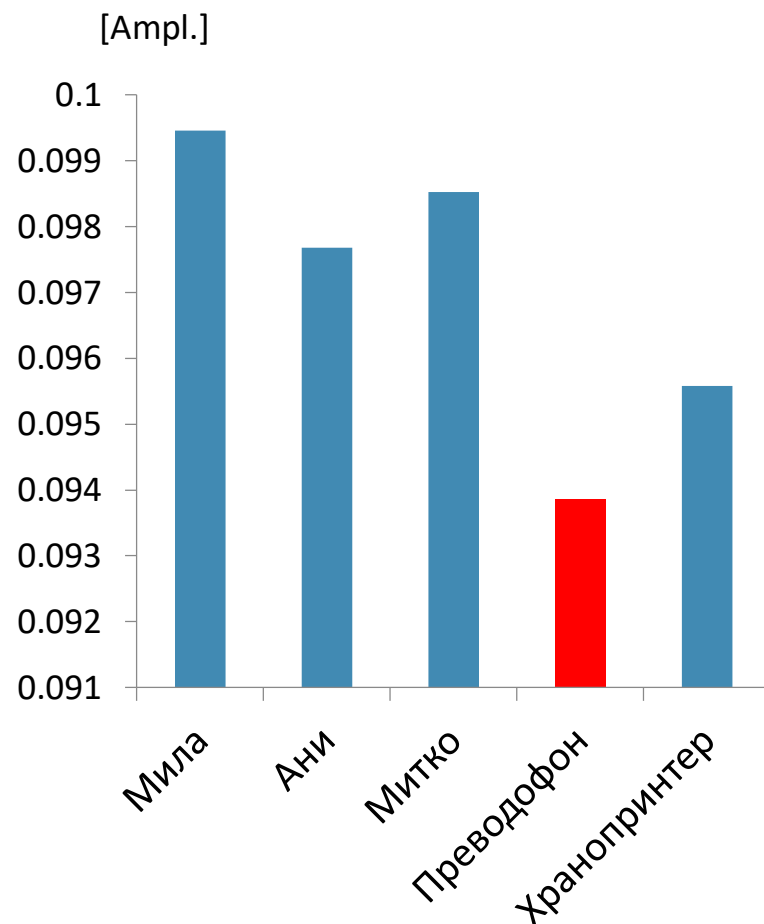
SOS-KINDERDORF PROJECT



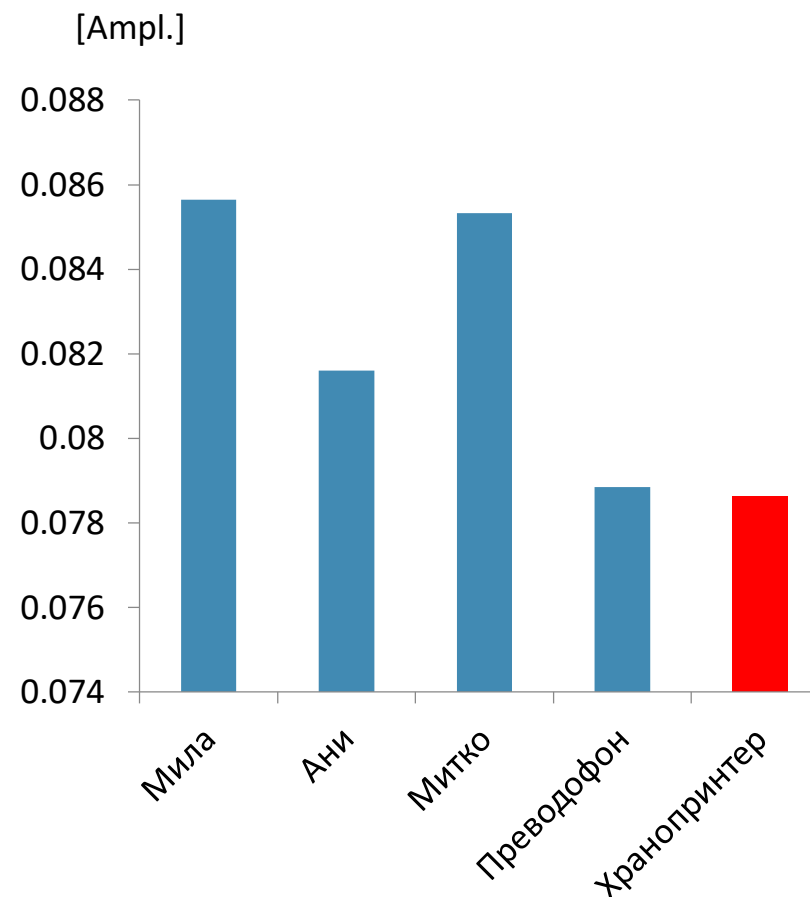
Mean alpha frequency synchronization/ synchronization during the ads.

SOS-KINDERDORF PROJECT

Average level of EEG alpha activity in the final sentence of the 5 ads



Minimal level of EEG alpha activity in the final sentence of the 5 ads



The attention of the viewers was attracted most by the final sentence of the ads "Food printer" and "Translation phone" compared to those of "Annie," "Mitko" and "Mila".

THE QUESTION REMAINS OPEN

Which EEG parameter (set of parameters) will directly predict the advert which would lead to sales increase?

Thank
you

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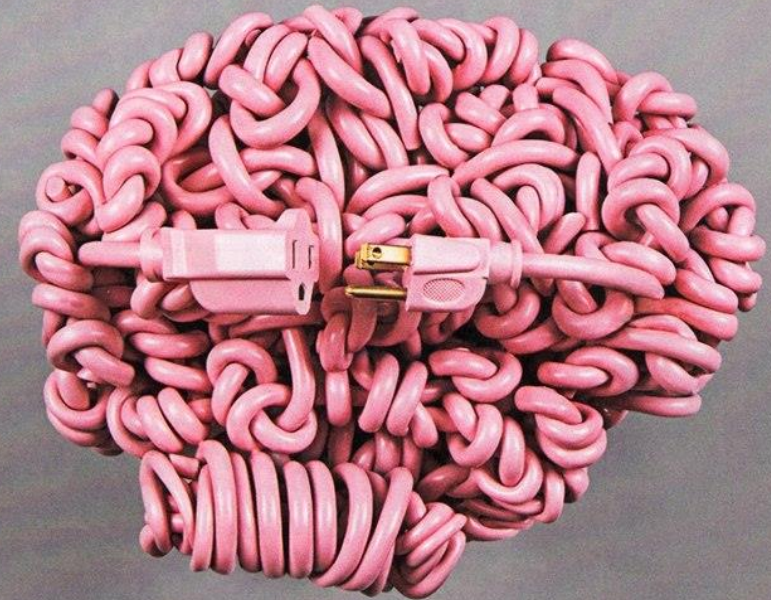
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невромаркетинг

станимир андонов

стилиян георгиев



Questions and Answers

