WE-COLLAB

Co-funded by the Erasmus+ Programme of the European Union

Hybrid Multiplier Event: We-Collab Project

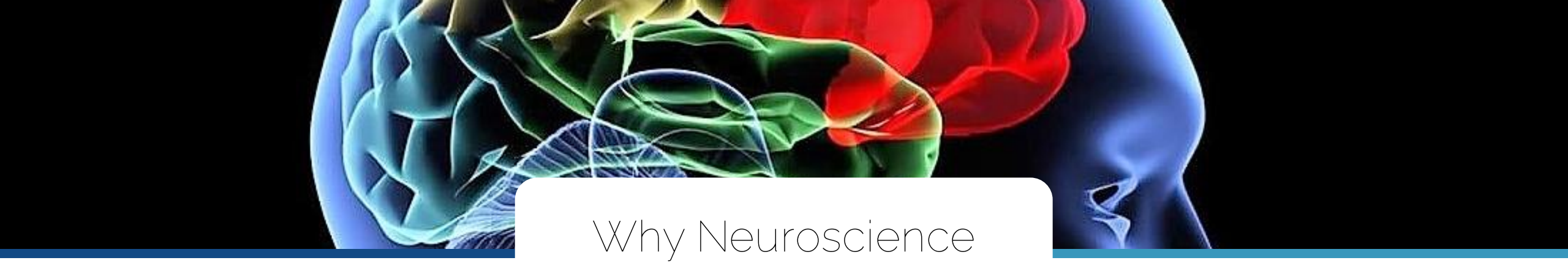
National Technical University Of Athens

Training Methods for Learning Analytics

SAPIENZA UNIVERSITÀ DI ROMA

BRAINSigns

Gianluca Di Flumeri, PhD
gianluca.diflumeri@brainsigns.com

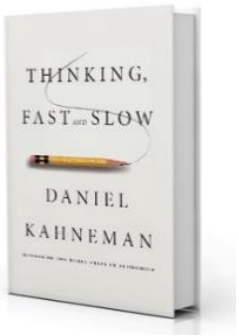


Why Neuroscience

The question is therefore not whether, but rather when and how, neuroscience will shape our future.
Martha J. Farah, TRENDS in Cognitive Sciences Vol.9 No.1 January 2005

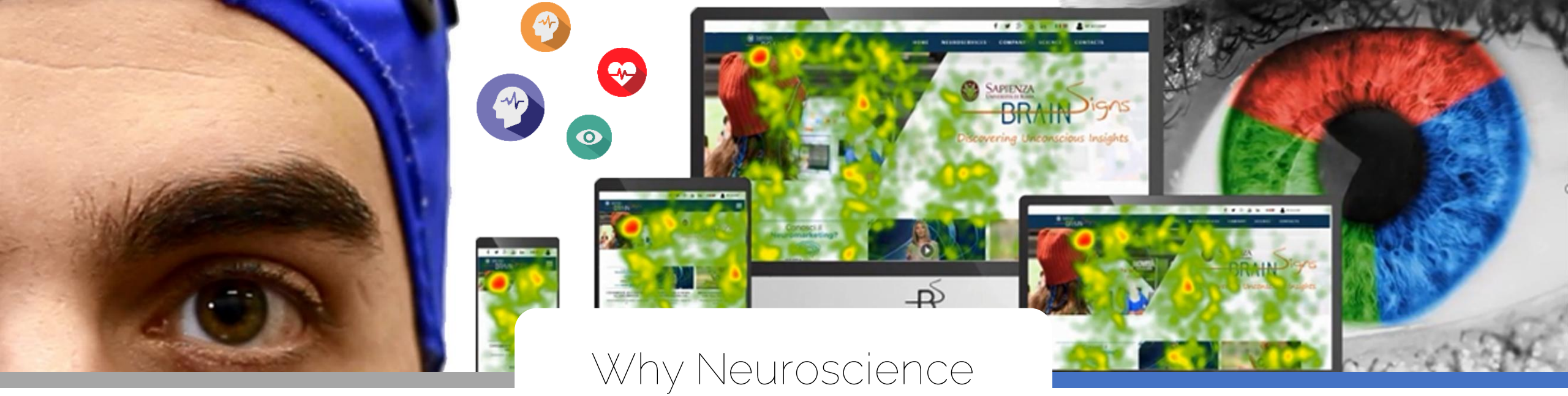
«Emotion probably assists reasoning … certain levels of emotion processing probably point us to the sector of decision-making space where our reason can operate most effectively».
Damasio, neuroscientist, «The feeling of what happens», 1999

Consumers don't think how they feel. They don't say what they think, and they don't do what they say.
David Ogilvy, 1950



SYSTEM 1
- Fast/automatic/easy
- Performs familiar or practiced routines
- Fine for small talk
- Undemanding
- Can perform while tired, sick or stressed
- Impressions/intuitions/feelings
- Susceptible to errors

SYSTEM 2
- Slow/effortful/hard
- Necessary for novel decisions or routines
- Useful for harder questions
- Tiring/draining
- Impaired by fatigue, illness or stress
- Logic/analysis/reflection
- Can override errors through careful thought



Why Neuroscience

Measuring physiological reactions with reliable neurometric indicators is an innovative, interesting and effective approach.

Is it possible to measure student's unconscious mental phenomena while attending a class in terms of attention, emotion, interest and cognitive effort?

The integration of neuroscientific techniques with traditional learning analytics provides useful indications to optimize communication, educational contents and organization of material to improve learning effectiveness.

Neuroscience Technologies

Electroencephalography (EEG)

Electrocardiography (ECG)

Galvanic Skin Response (GSR)

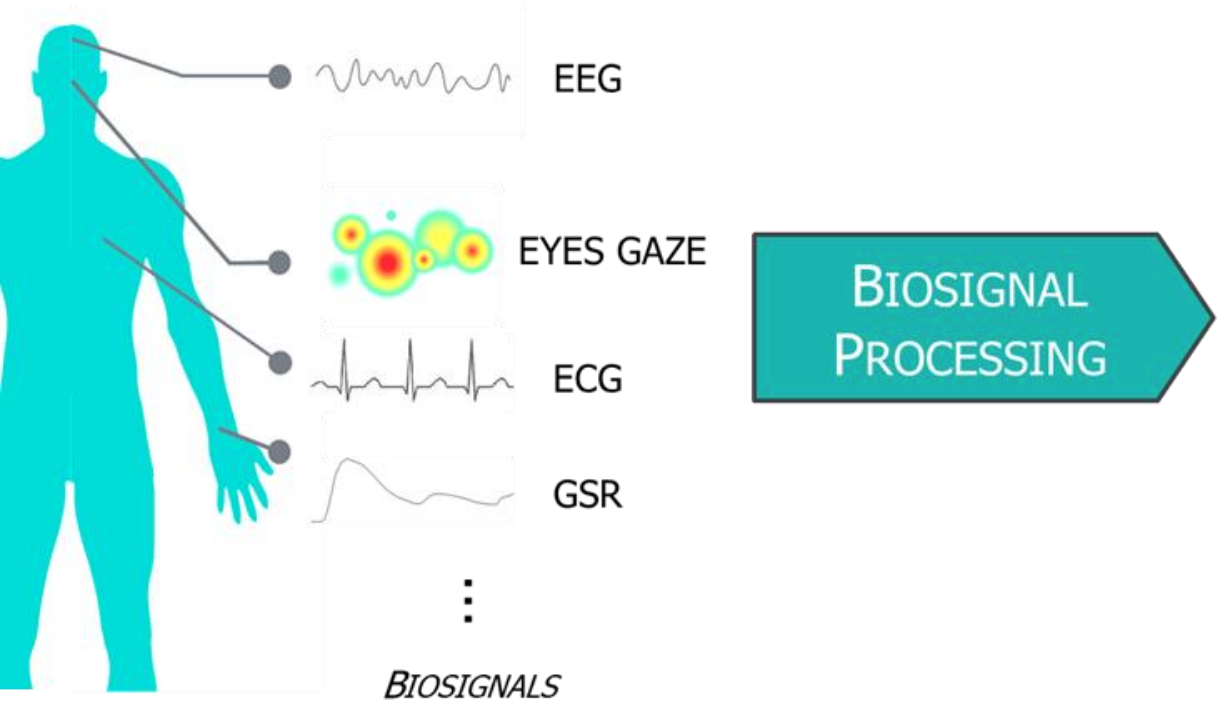
Eye-tracking

Implicit Reaction Time Test (IRT)

Qualitative interview

The skills of Brainsigns in the application of neuroscientific technologies are well known thanks to a wide number of scientific articles published in the most authoritative international scientific journals.

Neuroscientific approach



Cognitive Neuroscience applied to operational environments

Research objectives & tools

The experiment was organized during the training week at Copenhagen Business School with the aim of showcasing the potential of deploying a neuroscientific approach to evaluate students' cognitive and emotional experience with respect to different educational contents.

- 2 videos, consisting of a ppt presentation and a voice-over, regarding the same matter but of different length, namely LONG and SHORT, have been tested.

Research objectives & tools

Mindtooth Touch

Headset for recording brain electrical activity (EEG)

Shimmer3 GSR+

Wristband for recording heart activity (PPG) and skin sweating (EDA)

BrainSignsReader

BrainSigns software for synchronously recording biosignals from different devices.

Experimental design

5 participants (students)

- 3 males
- 2 females

Copenhagen Business School

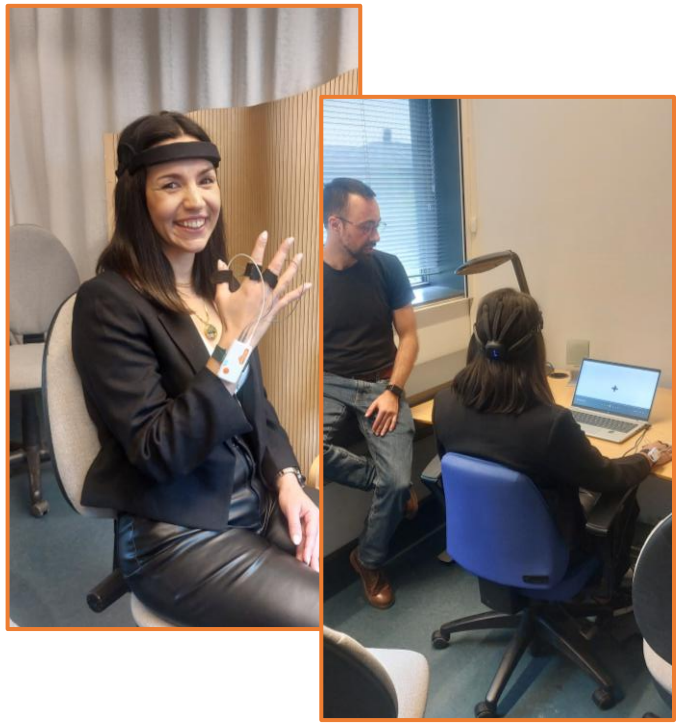
09/05/2024

2 VIDEOS:

- Same topic: Politeness and communication
- Same teacher
- Different length: LONG = 11’ 30’’ & SHORT = 5’ 20’’

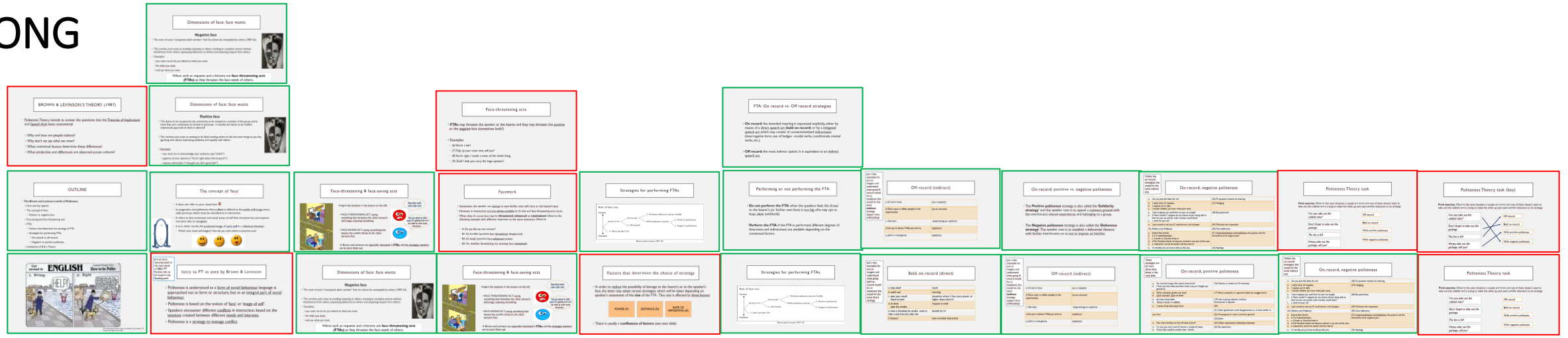
➢ BASELINE: 76” beginning, 86” end

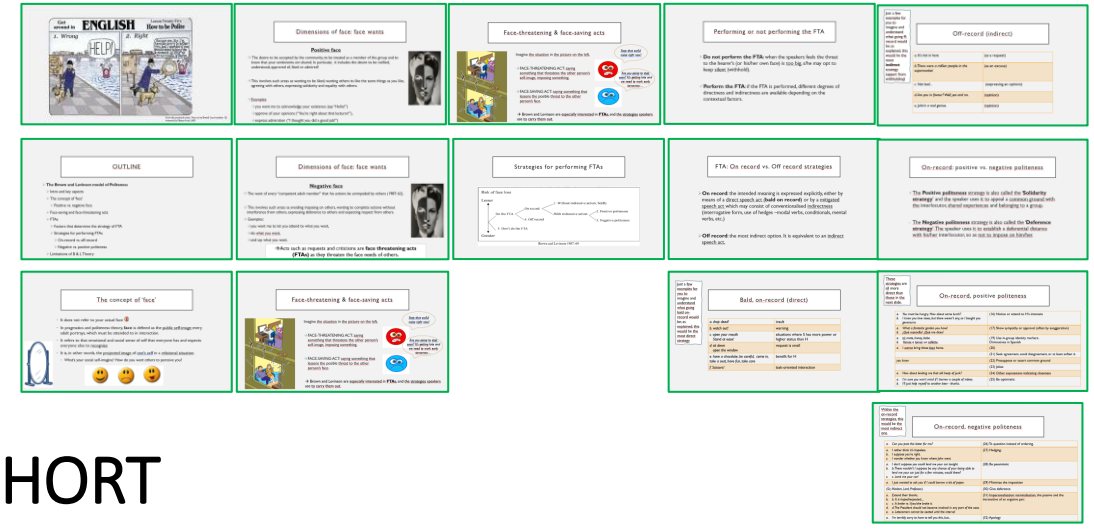
➢ FINAL QUESTIONNAIRE of 10 questions



Experimental design

LONG





SHORT

Neurometrics

Mental Workload is the amount of cognitive resources “allocated” on the main tasks.

Approach-Withdrawal, being the balance between the behavioral inhibition and approach systems, is a measure of the positive or negative user’s motivation.

Visual attention is a measure of the sustained focus.

Emotion combines the information about the valence, i.e., the quality, and the arousal, i.e., the intensity, of the user’s emotional state into a synthetic indicator.

**all the metrics have been individually normalized with respect to the baseline, therefore the ‘0 level’ corresponds to the level of that metric during the baseline itself (fixing cross, no contents)*

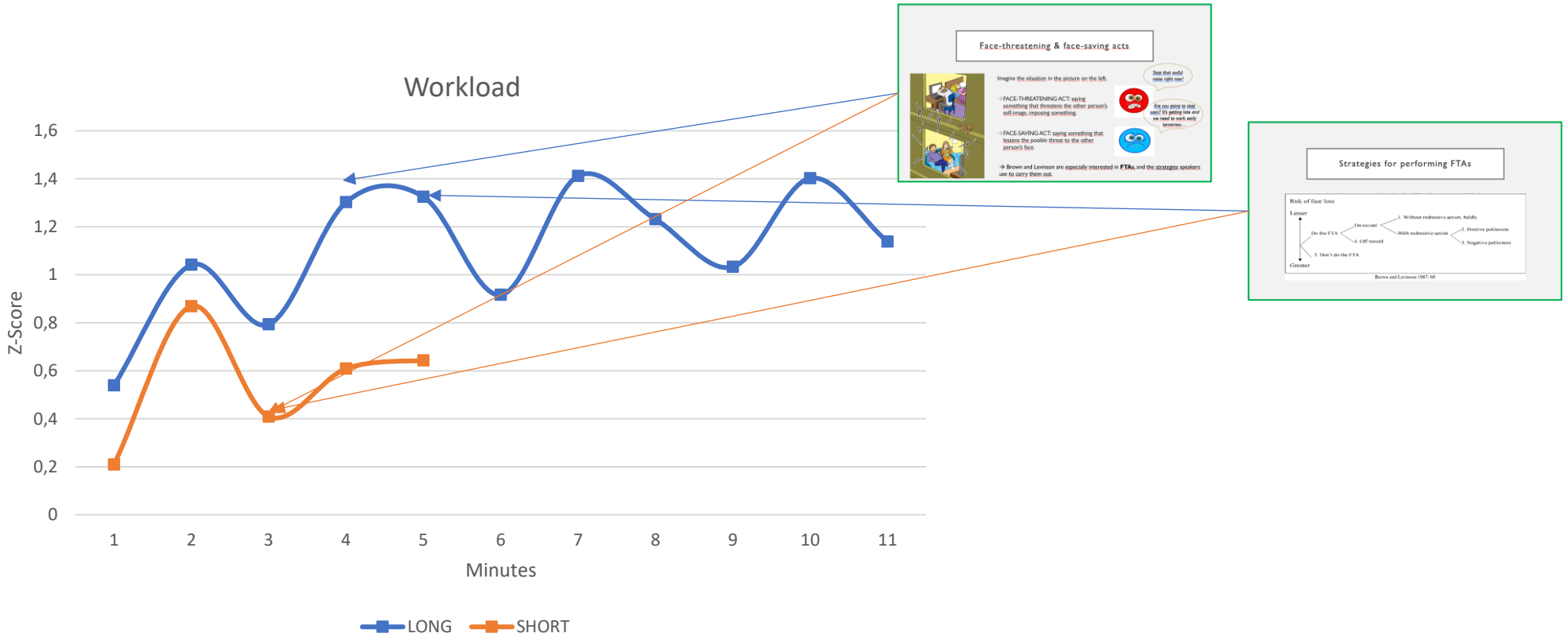
RESULTS

Results – Neurometrics over time

MENTAL WORKLOAD

In both the cases the participants were mentally “active” (positive values → higher than baseline)

Similar trend in the first three minutes, then the LONG video results more mentally demanding.



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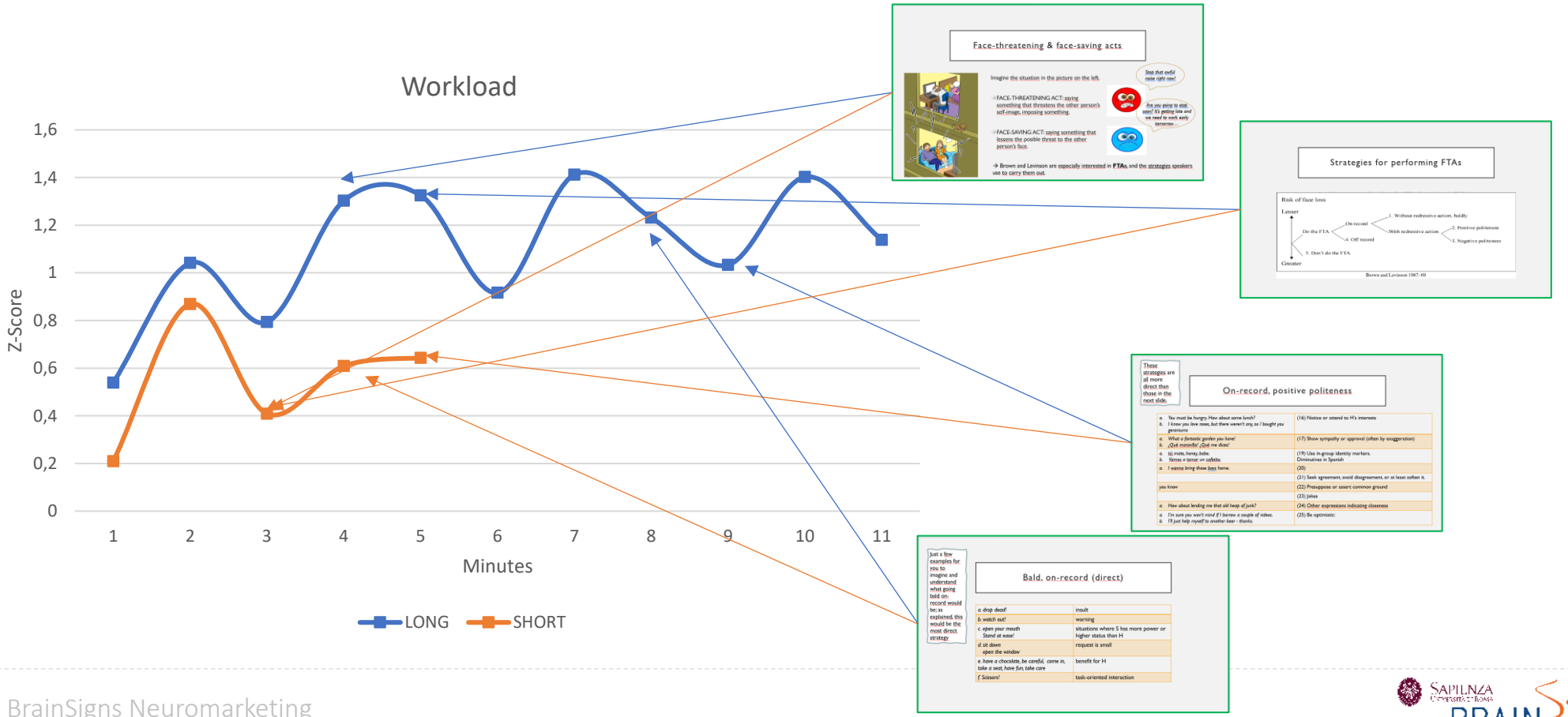
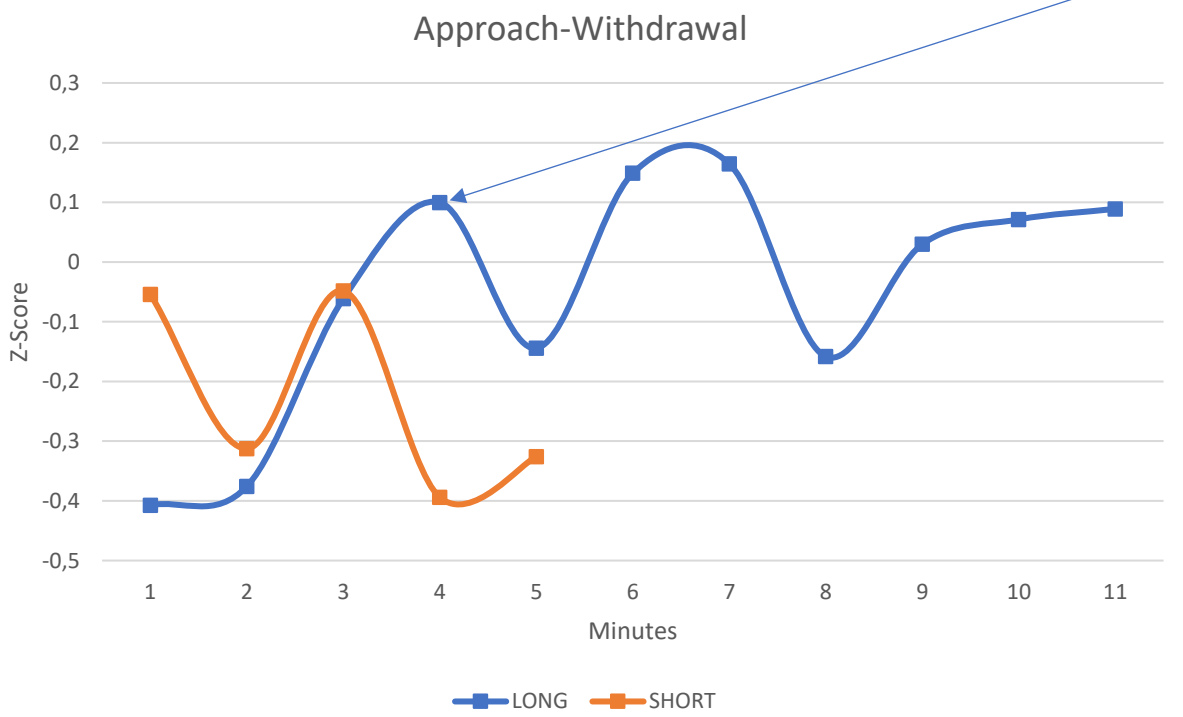
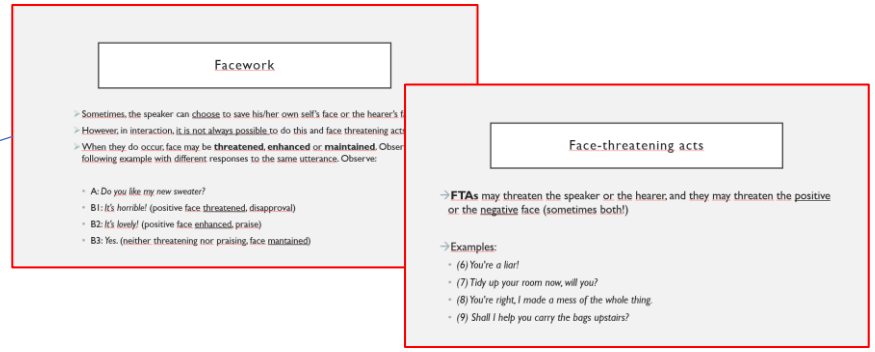


Results – Neurometrics over time

APPROACH-WITHDRAWAL

At the beginning maybe the users were not highly motivated (few negative values), with a similar trend in the first three minutes, then the LONG video was able to induce more interest until its conclusion, maybe also thanks to the new slides.





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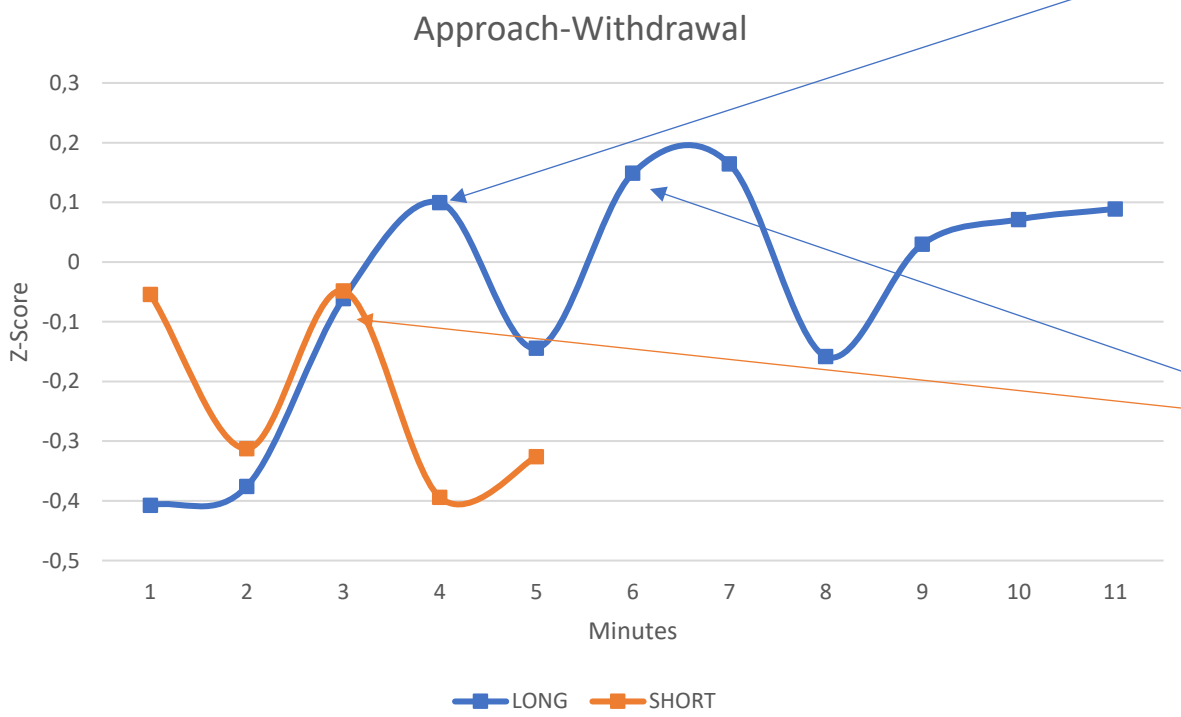
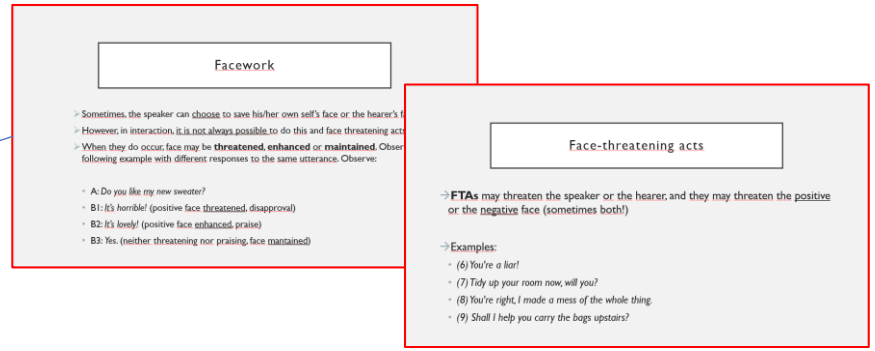
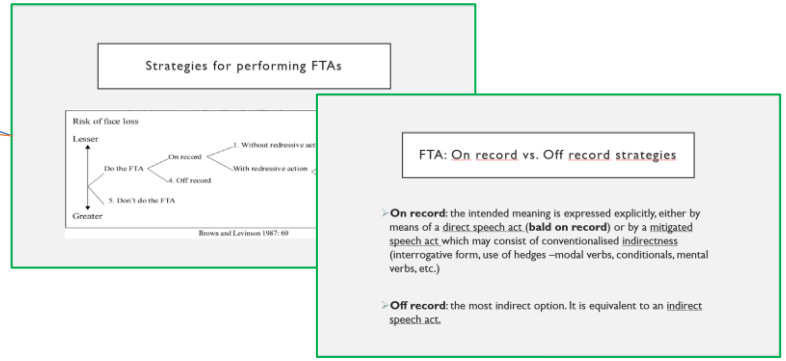






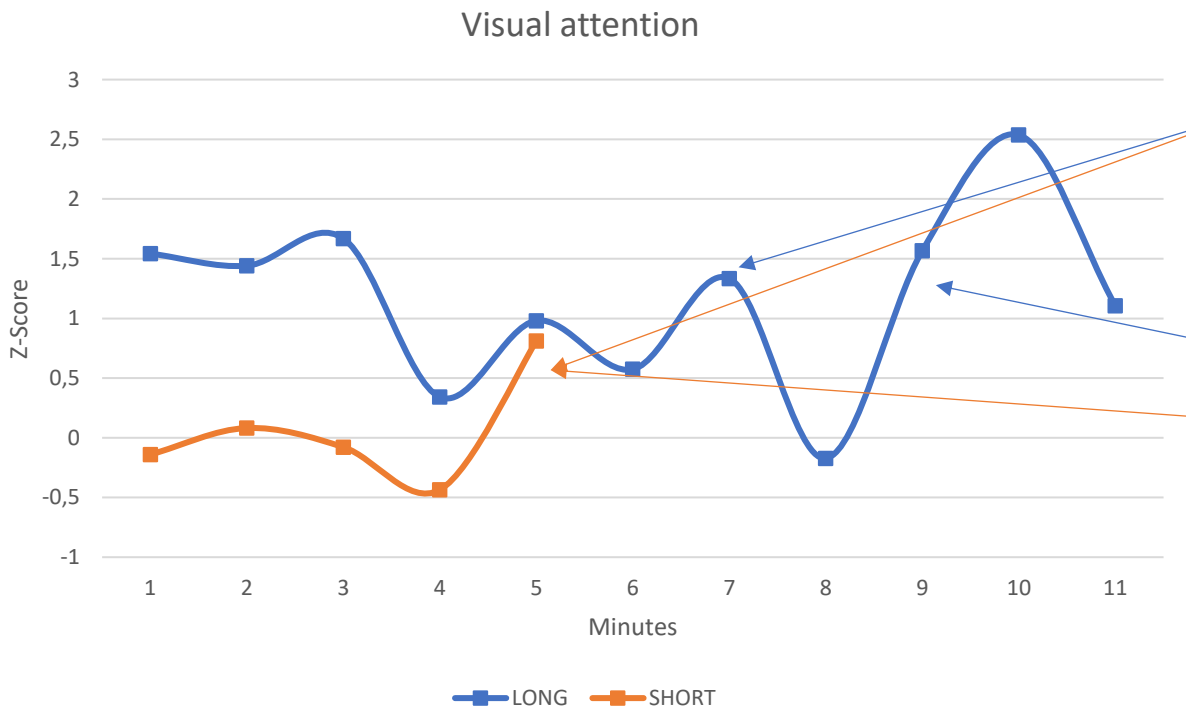
Results – Neurometrics over time

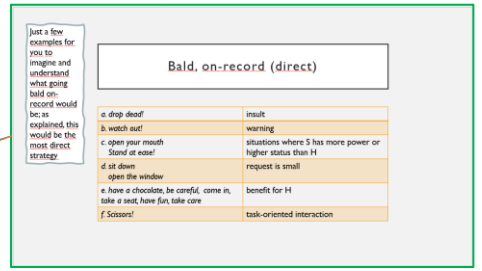
VISUAL ATTENTION

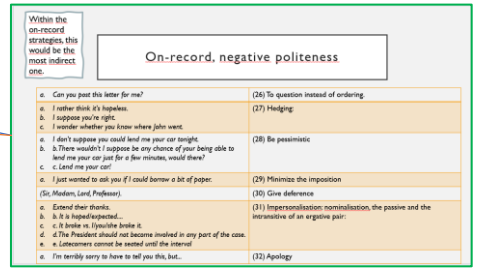
The LONG video seems to induce more attention especially at the beginning…

…but the LONG video contains 9 slides in the first 3 minutes, and with more text, while the SHORT video contains 8 slides, one of which is just a graph.

Tables seem to require more attention, independently from the video.







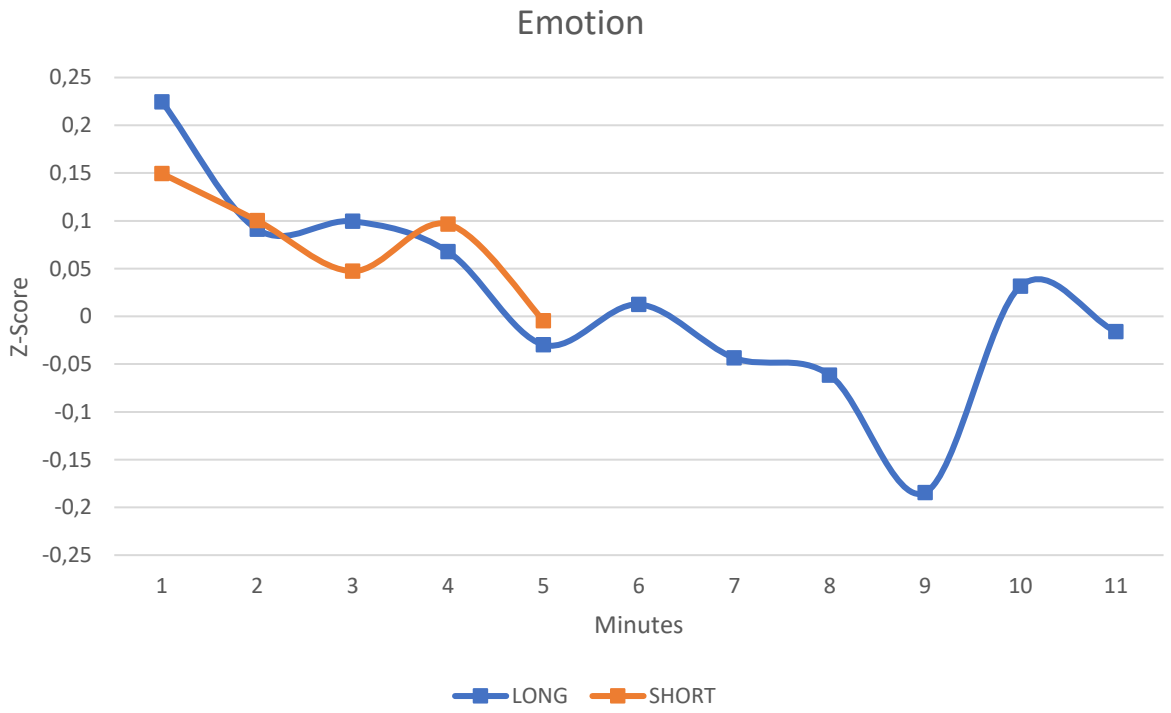
Results – Neurometrics over time

EMOTION

In terms of emotion, it does not appear any particular phenomenon characterising a specific video.

Highest values at the beginning could be linked to initial curiosity and “activation”.

Decreasing trend is linked to the physiological relaxation…



Results – Neurometrics over time

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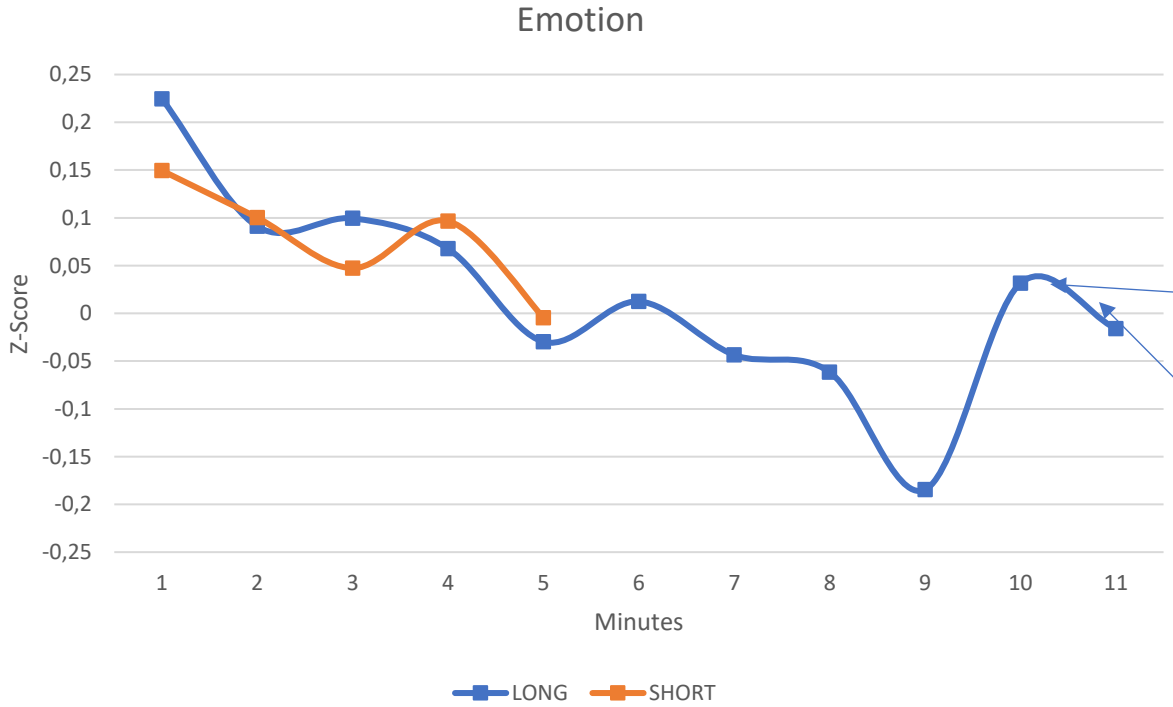
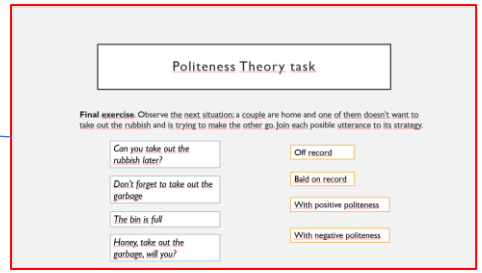
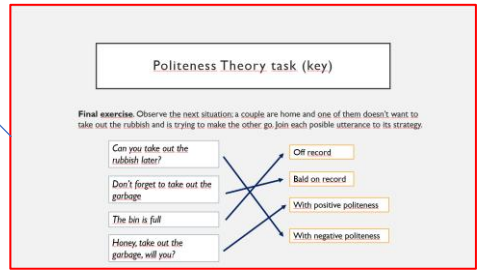
Decreasing trend is linked to the physiological relaxation… but the final exercise present only in the LONG video helped to “stimulate” again the users.







Insights

- ✓ More corrected answers were given after the LONG video.

- For almost all the neurometrics, except the visual attention, the behaviour in the first 3 minutes was similar (similar information), then the narrative impacted on the user's experience.
- In general, the LONG video, even by requiring more workload and attention, produced better performance → more effective narrative and harmony between topics?
- LONG video = more workload and attention, but also more appreciation
- Tables require less workload but more attention on both the videos.
- Duration is not necessarily a problem, even if there is a "boring" effect (emotion) → the key is the compromise between duration and amount of information
- Higher emotion and appreciation at the conclusion of the LONG video → Participatory examples help!

Conclusions

Neuroscience enable a student-centred educational model

It is possible to evaluate:

- ✓ User's experience
- ✓ Effect to the different contents
- ✓ Reactions to different narrative

Allowing to tailor the lessons and in general the courses to the students' abilities and capabilities

Discovering unconscious **Insights**

BrainSigns

Administrator Office:
Via Tirso n.14, 00198, Rome

info@brainsigns.com
www.BrainSigns.com