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**Hybrid Multiplier Event: We-Collab Project**

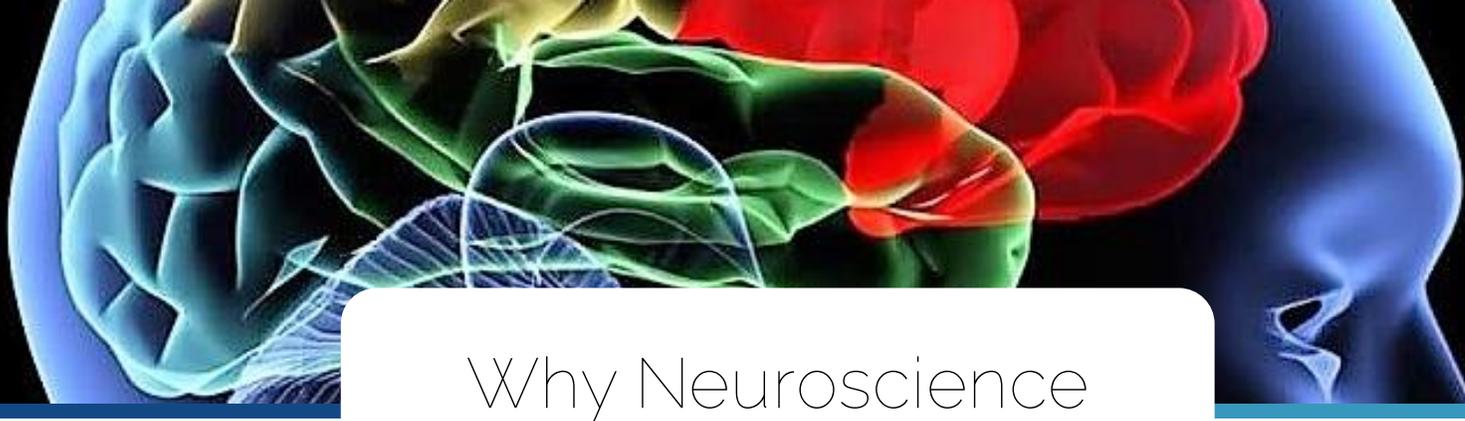
*National Technical University Of Athens*

# Training Methods for Learning Analytics



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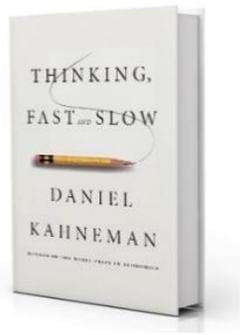
# Why Neuroscience

*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*

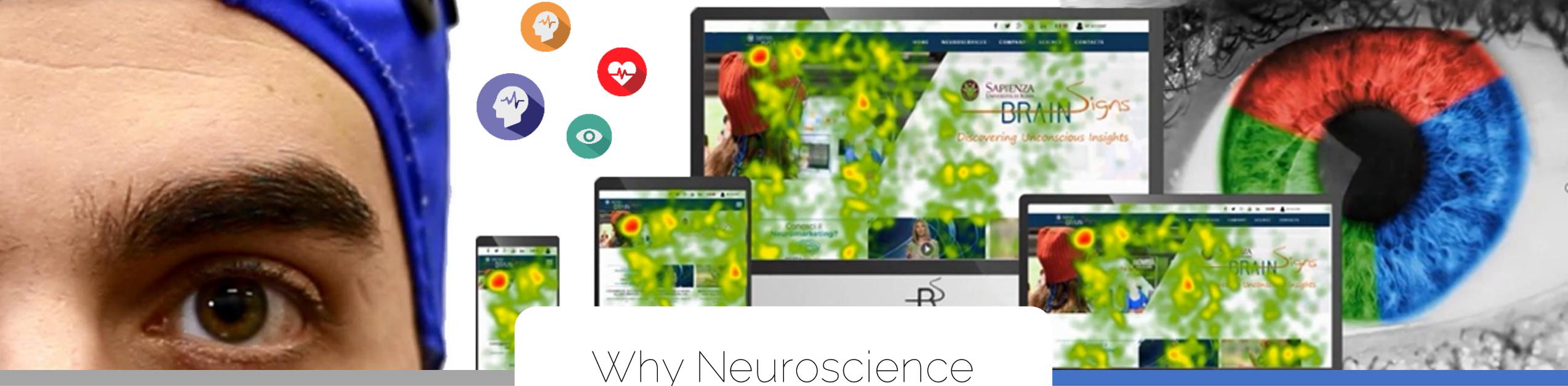
*Consumers don't think how they feel. They don't say what they think, and they don't do what they say.*  
David Ogilvy, 1950



- 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*



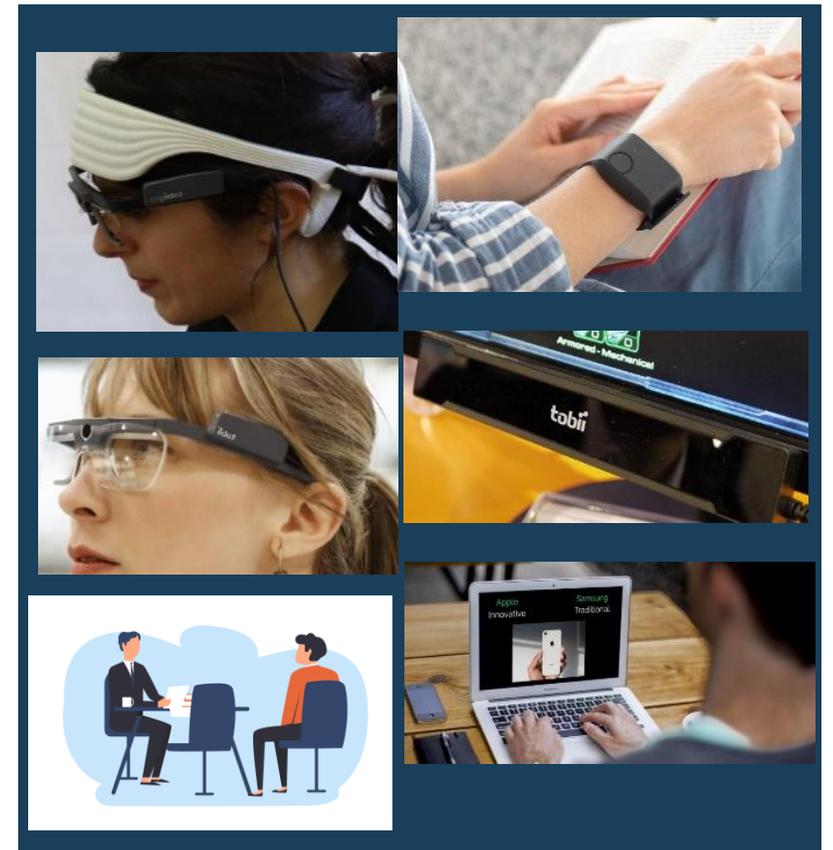
*Implicit Reaction  
Time Test (IRT)*



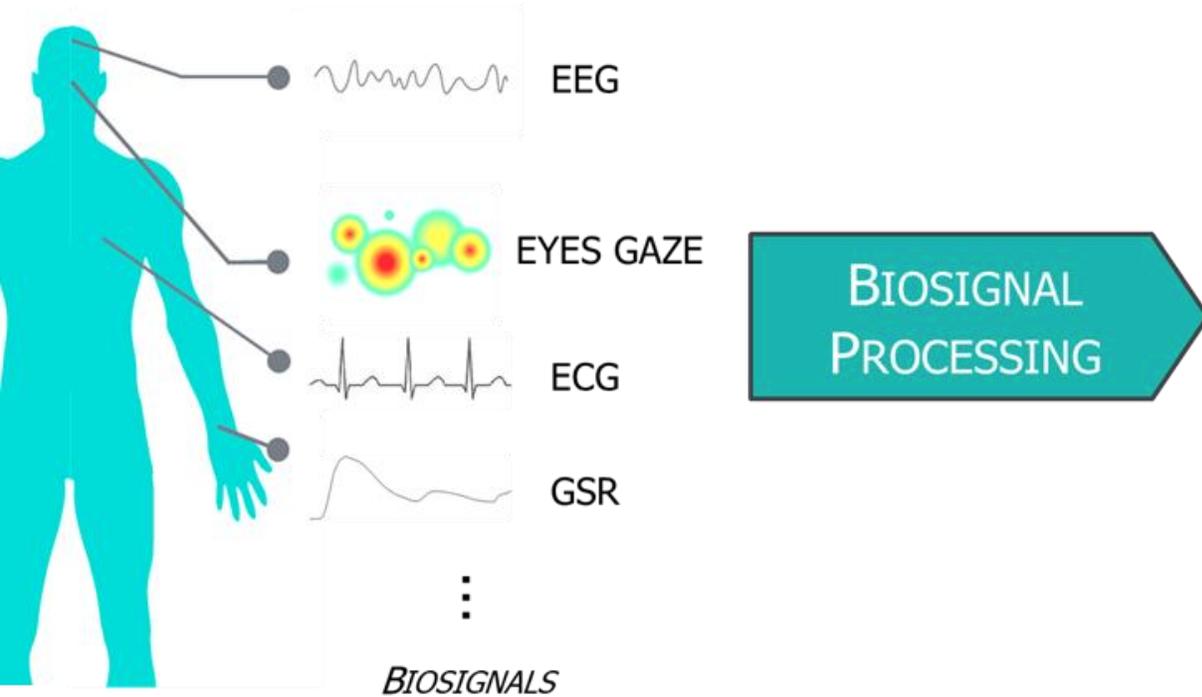
*Qualitative  
interview*



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.

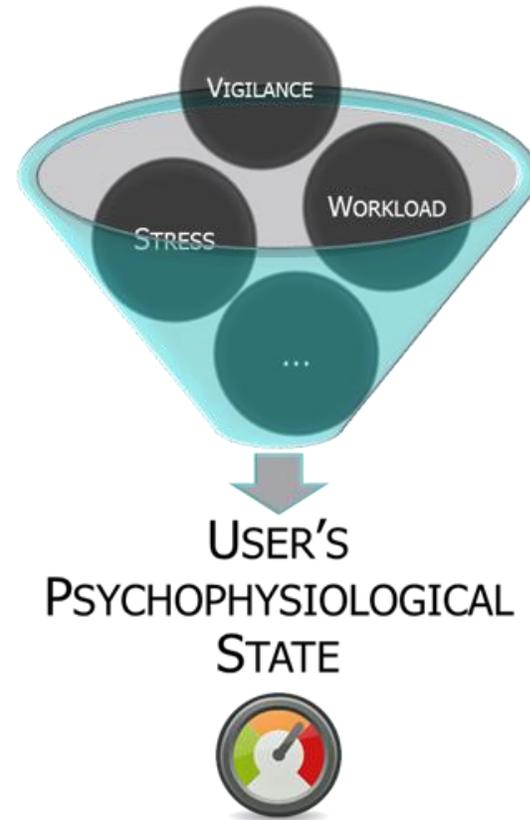


# Neuroscientific approach



**Cognitive Neuroscience  
applied to operational environments**

**NEUROMETRICS  
OF SPECIFIC MENTAL STATES**



**CROSS - DOMAIN**



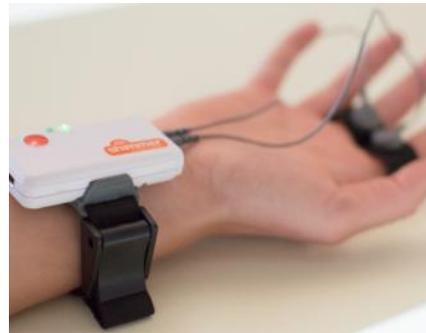
The experiment was organized during the training week at Copenhagen Business School with the aim of showcasing the potential of deploying a neuroscientific approach to evaluate students' cognitive and emotional experience with respect to different educational contents.

- 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.



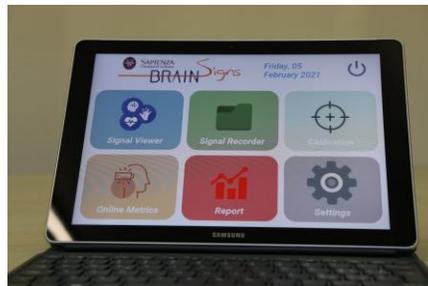
## Mindtooth Touch

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



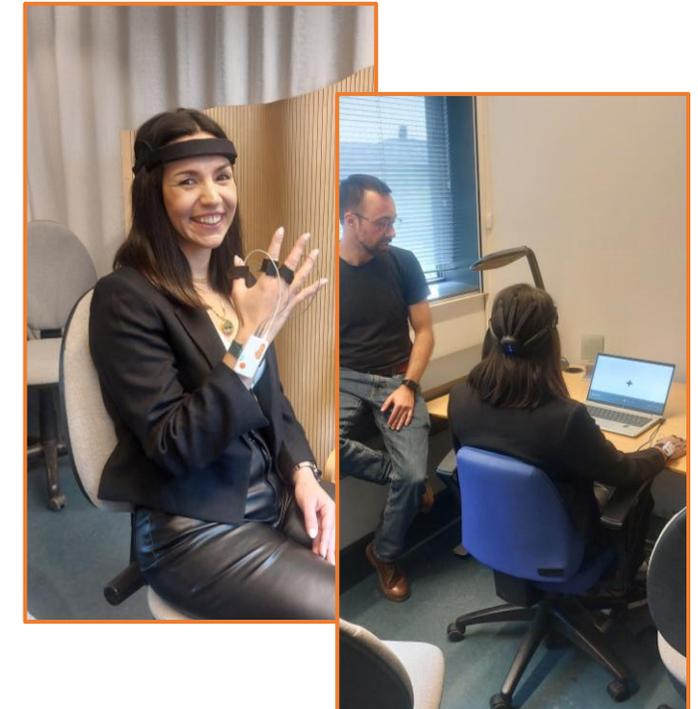
Copenhagen  
Business School



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

11 [min]

1 2 3 4 5 6 7 8 9 10 11

Dimensions of face face warts  
Negative face  
Positive face  
Face-threatening acts  
FTA: On record vs. Off record strategies  
Outline  
The concept of 'face'  
Face-threatening & face-saving acts  
Facework  
Strategies for performing FTAs  
Performing or not performing the FTA  
Off-record (indirect)  
On-record positive vs. negative politeness  
On-record negative politeness  
Politeness Theory task  
Politeness Theory task (two)  
English HELP  
Intro to PT as seen by Brown & Levinson  
Dimensions of face face warts  
Face-threatening & face-saving acts  
Factors that determine the choice of strategy  
Strategies for performing FTAs  
On-record (direct)  
Off-record (indirect)  
On-record positive politeness  
On-record negative politeness  
Politeness Theory task

## SHORT

English HELP  
Dimensions of face face warts  
Face-threatening & face-saving acts  
Performing or not performing the FTA  
Off-record (indirect)  
Outline  
Dimensions of face face warts  
Strategies for performing FTAs  
FTA: On record vs. Off record strategies  
On-record positive vs. negative politeness  
The concept of 'face'  
Face-threatening & face-saving acts  
On-record (direct)  
On-record positive politeness  
On-record negative politeness



**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.



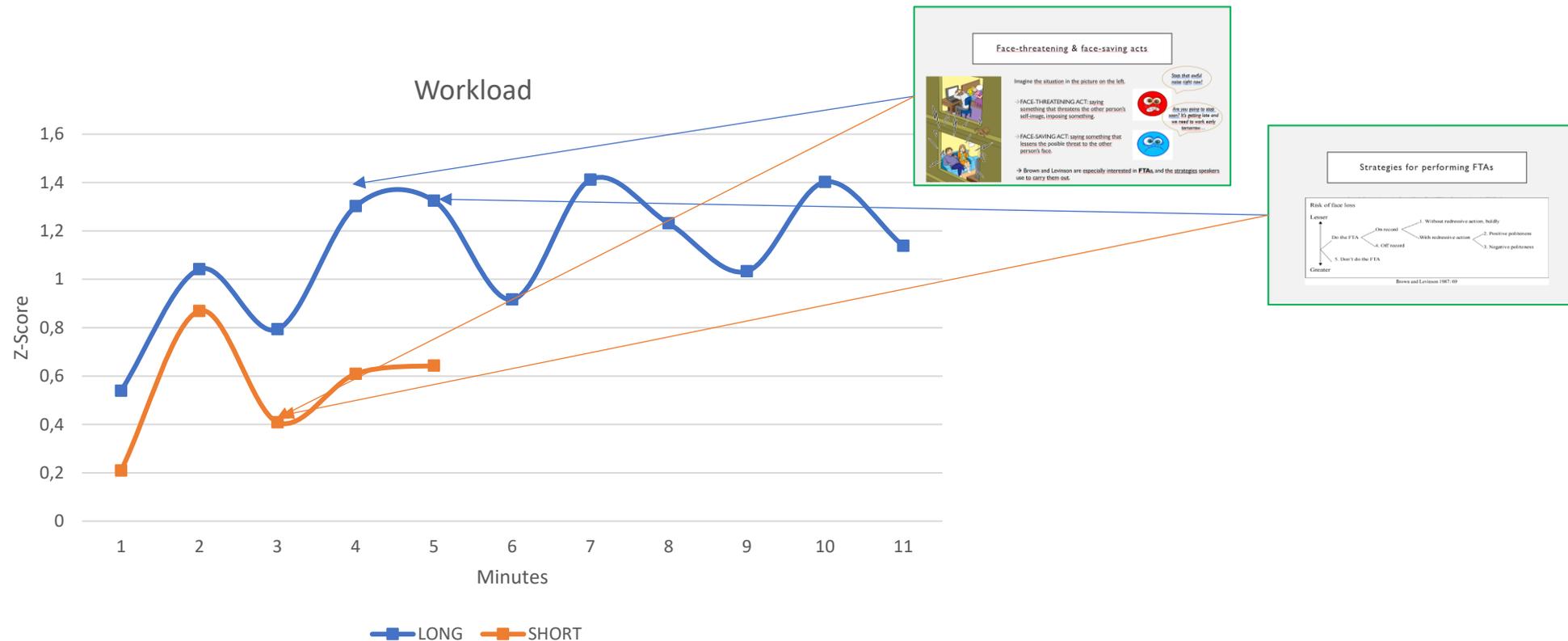
**Emotion** combines the information about the valence, i.e., the quality, and the arousal, i.e., the intensity, of the user’s emotional state into a synthetic indicator.

*\*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

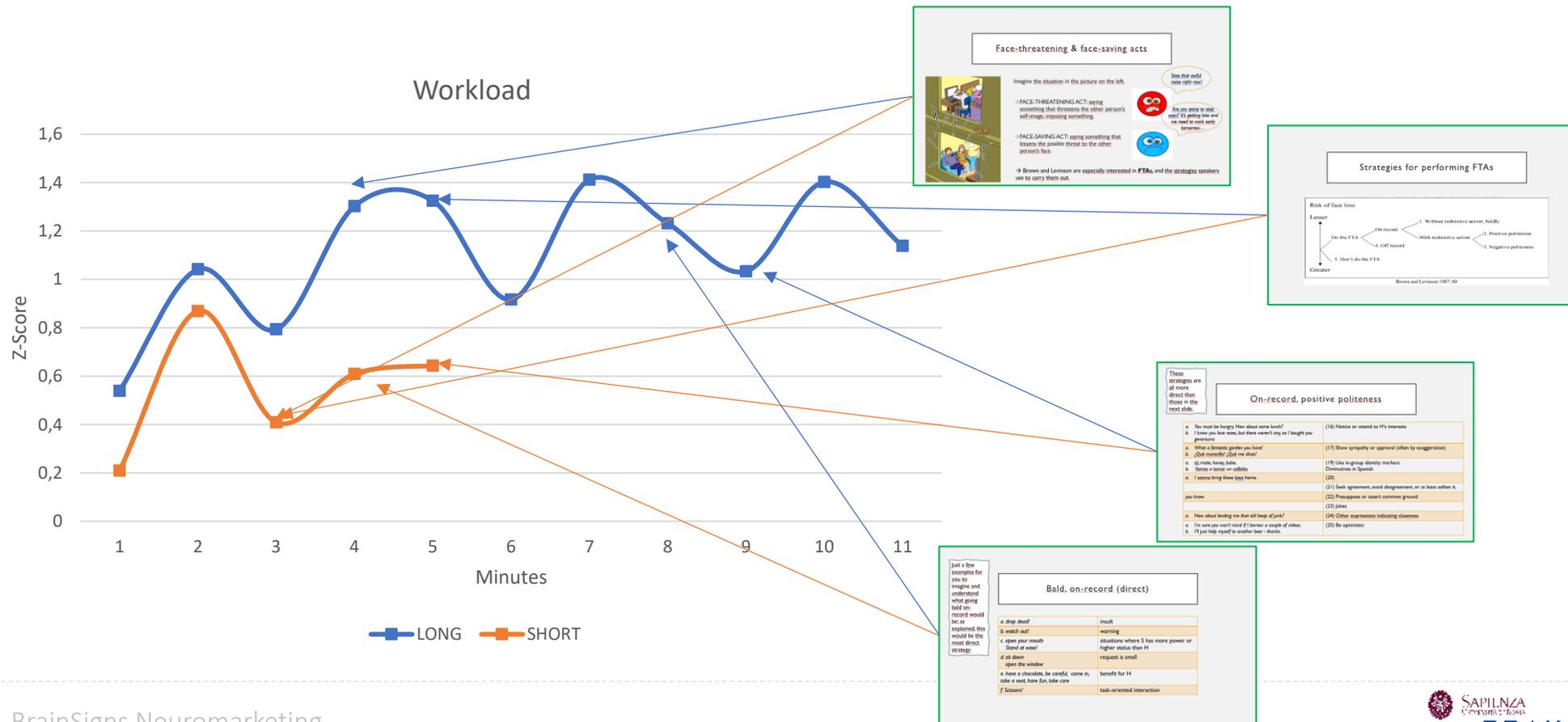
## MENTAL WORKLOAD

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.



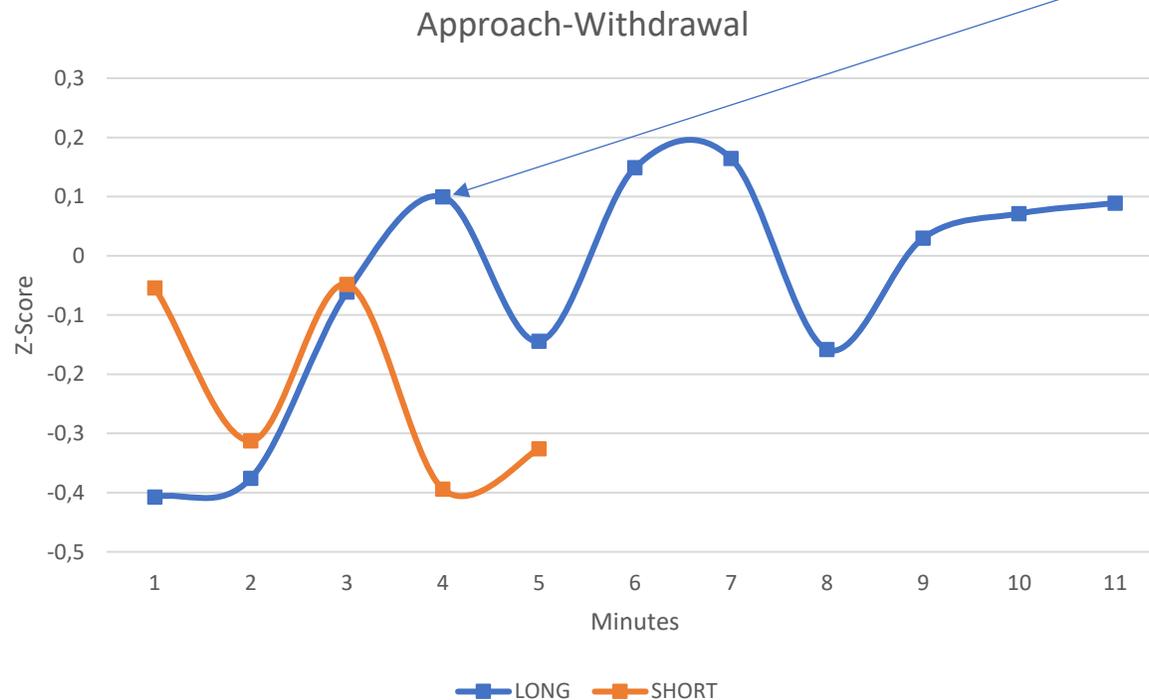
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## APPROACH-WITHDRAWAL

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.



### Facework

- Sometimes, the speaker can choose to save his/her own self's face or the hearer's face.
- However, in interaction, it is not always possible to do this and face threatening acts occur.
- When they do occur, face may be **threatened, enhanced** or **maintained**. Observe the following example with different responses to the same utterance. Observe:
- A: Do you like my new sweater?
- B1: It's horrible! (positive face threatened, disapproval)
- B2: It's lovely! (positive face enhanced, praise)
- B3: Yes. (neither threatening nor praising, face maintained)

### Face-threatening acts

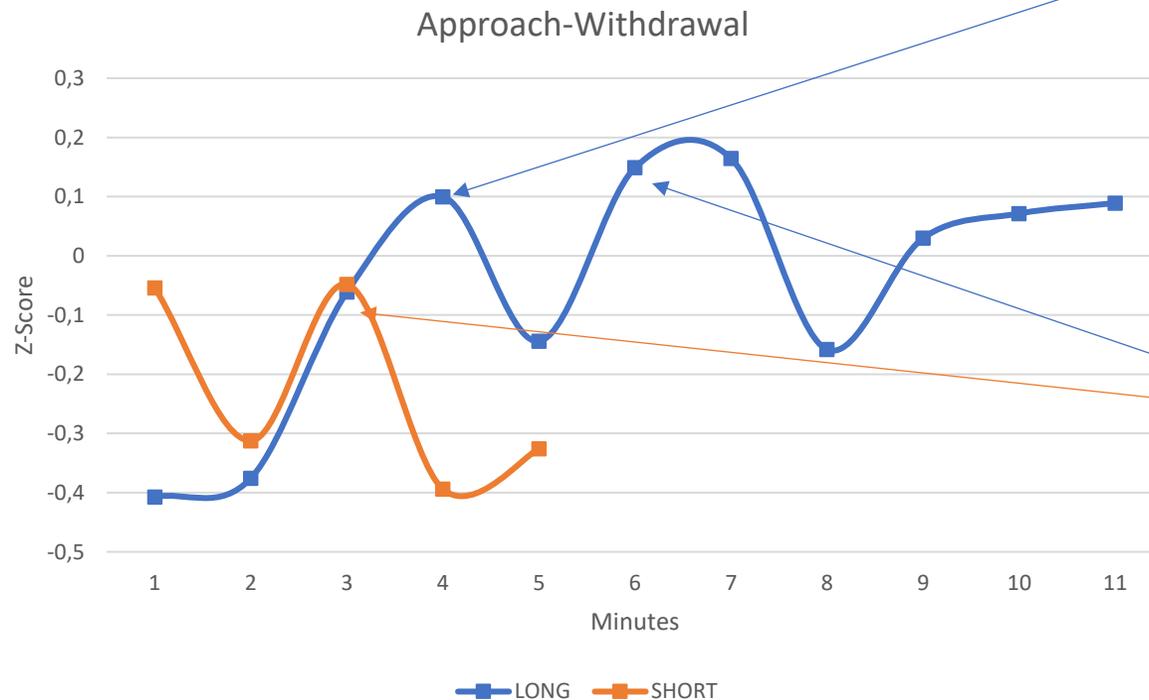
→ FTAs may threaten the speaker or the hearer, and they may threaten the positive or the negative face (sometimes both!)

→ Examples:

- (6) You're a liar!
- (7) Tidy up your room now, will you?
- (8) You're right, I made a mess of the whole thing.
- (9) Shall I help you carry the bags upstairs?

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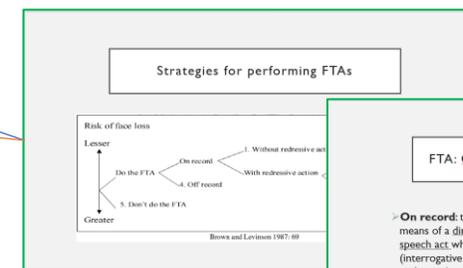
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### FTA: On record vs. Off record strategies

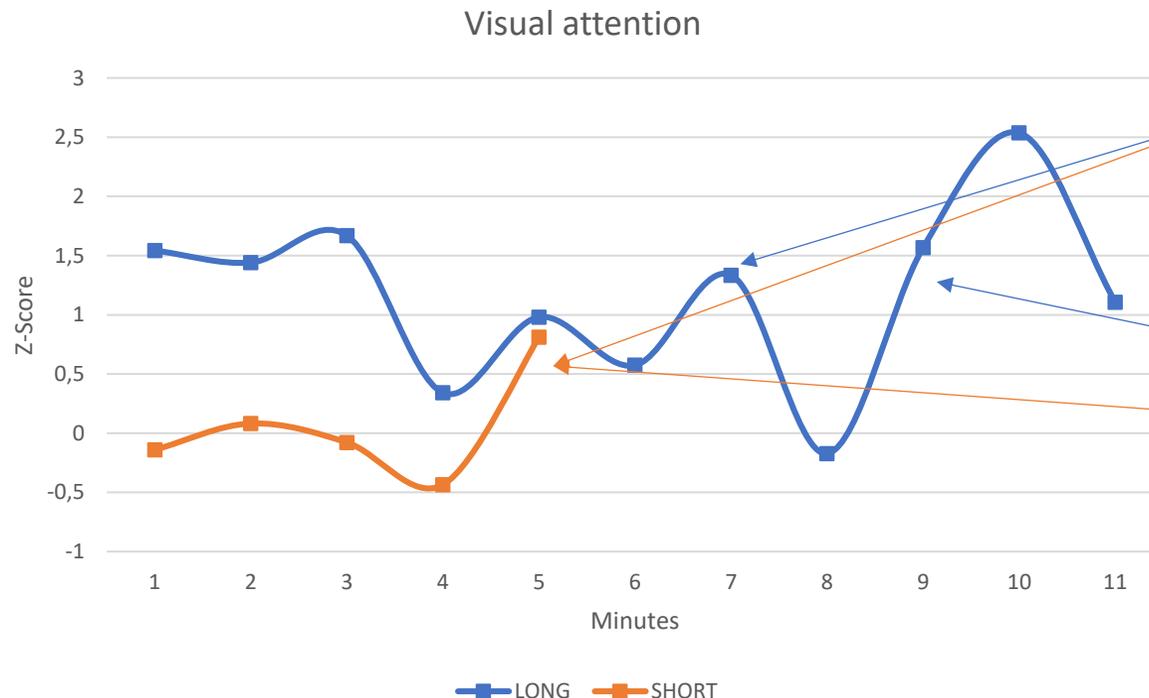
- **On record:** the intended meaning is expressed explicitly, either by means of a direct speech act (**bald on record**) or by a mitigated speech act which may consist of conventionalised indirectness (interrogative form, use of hedges –modal verbs, conditionals, mental verbs, etc.)
- **Off record:** the most indirect option. It is equivalent to an indirect speech act.

## 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.



Just a few examples for you to imagine and understand what going bald on-record would be as explained, this would be the most direct strategy

Bald, on-record (direct)	
a. drop dead!	insult
b. watch out!	warning
c. open your mouth	situations where S has more power or higher status than H
d. sit down	request is small
e. have a chocolate, be careful, come in, take a seat, have fun, take care	benefit for H
f. Scissors!	task-oriented interaction

Within the on-record strategies, this would be the most indirect one.

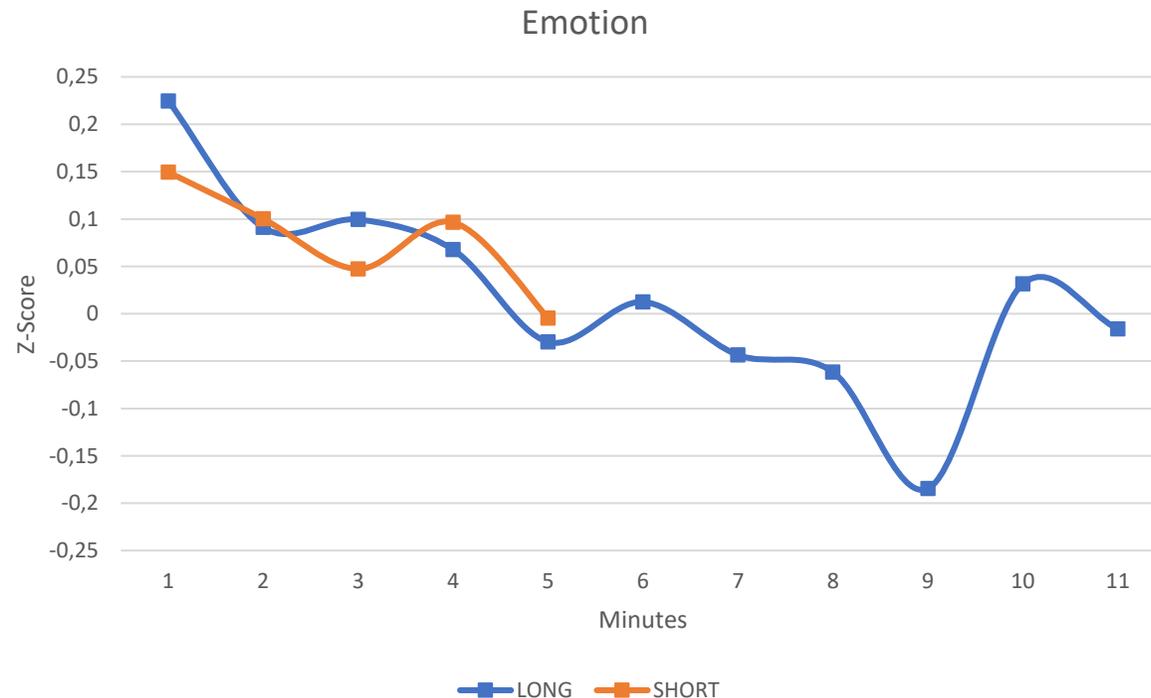
On-record, negative politeness	
a. Can you post this letter for me?	(26) To question instead of ordering
a. I rather think it's hopeless.	(27) Hedging
b. I suppose you're right.	
c. I wonder whether you know where John went.	
a. I don't suppose you could lend me your car tonight.	(28) Be pessimistic
b. There wouldn't happen to be any chance of your being able to lend me your car just for a few minutes, would there?	
c. Lend me your car!	
a. I just wanted to ask you if I could borrow a bit of paper.	(29) Minimize the imposition
(St. Madam, Lord, Professor)	(30) Give deference
a. Extend their thanks.	(31) Impersonalisation: nominalisation, the passive and the intensive of an argutive pair
b. It is indispensable.	
c. It broke vs. I/you/like broke it.	
d. The President should not become involved in any part of the case.	
e. Settlements cannot be reached until the internet.	
a. I'm terribly sorry to have to tell you this, but...	(32) Apology

## 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...

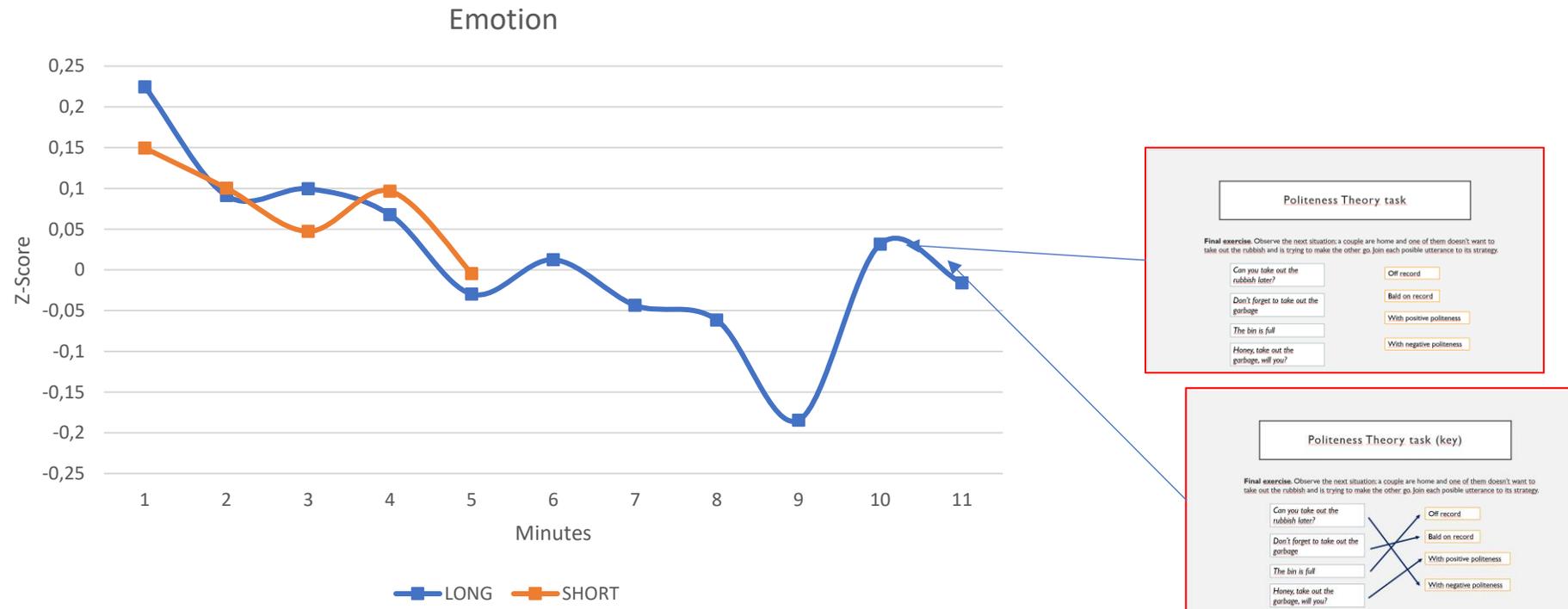


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Highest values at the beginning could be linked to initial curiosity and “activation”.

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



- ✓ 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!

## 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**

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