Affective Sciences
SWISS NATIONAL CENTER OF COMPETENCE IN RESEARCH

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SWISS NATIONAL SCIENCE FOUNDATION

UNIVERSITÉ DE GENÈVE

NCCR Affective Sciences

Prof. Klaus Scherer

September 1, 2008 - Riederalp

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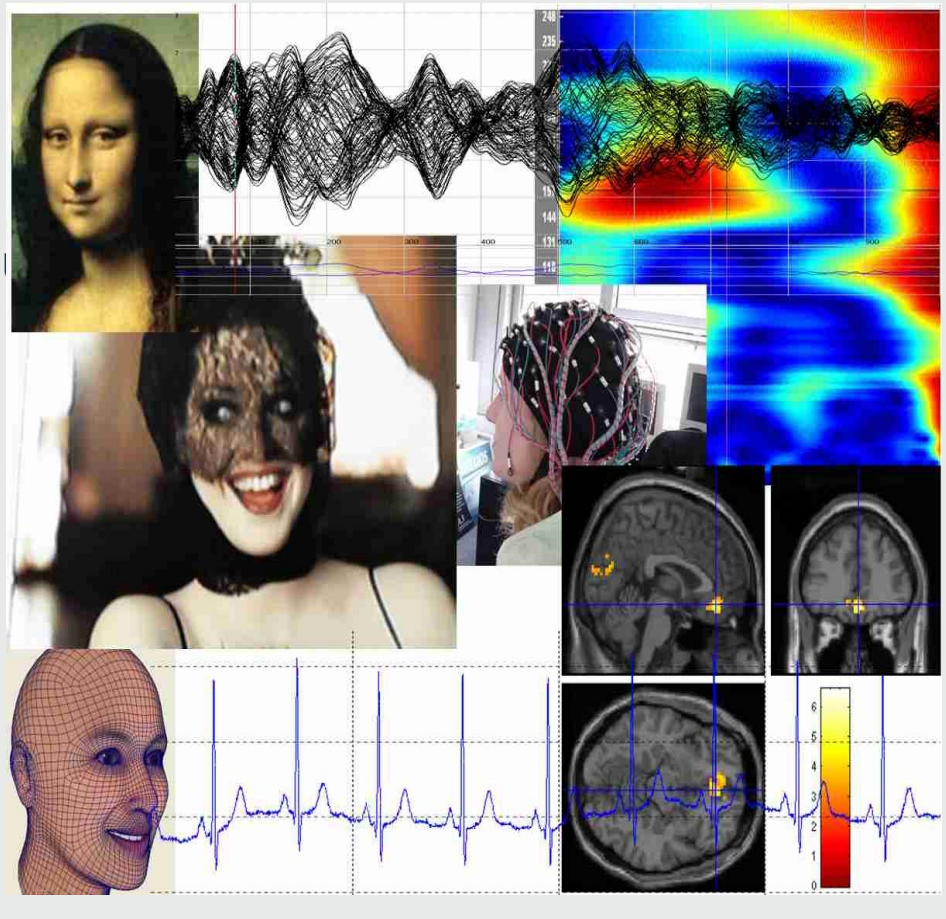
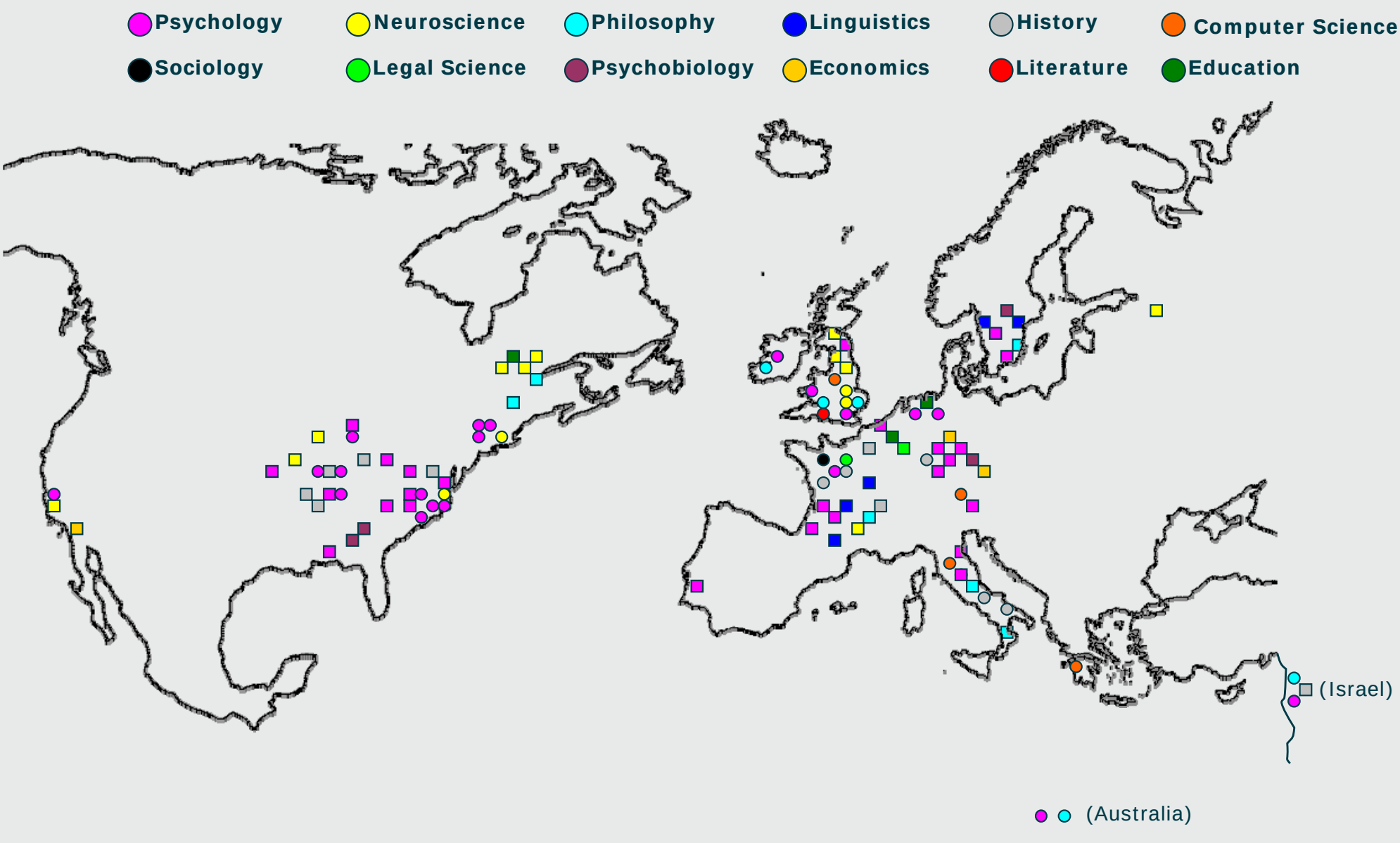


1. The NCCR in brief

- One of Switzerland's 20 National Centres of Competence in Research (NCCRs)
- First interdisciplinary research centre in the world dedicated to the study of emotions and their effects on individual behavior and society at large
- Host institution: UNIGE
- Launched September 1, 2005
- 10 research teams
- 5 Universities (GE,FR,NE,BE,ZH)

1.1. The Swiss Network

1.2. The international network



2. An emerging discipline

- The “affective revolution”: emotions play a key part in decision making and behavior
- The affective sciences combine the following disciplines: psychology, philosophy, economics, political science, law, criminology, psychiatry, neuroscience, education, sociology, ethology, literature, history and anthropology.
- Of interest to scholars – but also to political and economic leaders

3. Research topics and objectives

3 overarching research topics

- How are emotions triggered?
- How are emotions regulated?
- How do emotions affect life in society?

3 objectives

- Scientific research
- Application of research findings in public and private sectors
- Training a new generation of researchers

4. The essential synergy : interdisciplanirity

- Common research theme : the affect
- Participation of the most relevant disciplines
- Multiple analysis levels
- Transversal integration of perspectives
- Unification of concept, methods and instruments
- Collaborations with important research and training centers at the international level

5. Funding of the NCCR

- SNSF (renewable 3 times): 10 million CHF
- University of Geneva, over 4 years: 2.25 million CHF
- Indirect participation of associated universities over 4 years: 84 million CHF
- External partners: 400,000 CHF

Total over 4 years: 21 million CHF

6. Positions funded

SNSF-funded positions		Positions funded by the universities	
Project leaders	0	Project leaders	20
Postdocs	18	Postdocs	16
PhD students	24	PhD students	20
Total	42	Total	56

7. Structure of the NCCR

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Director: Klaus Scherer
Deputy Directors: Kevin Mulligan & Martial Van der Linden

Scientific coordinator:
David Sander

Management
Administration: Daniela Sauge, Audrey Souchard
Computer and Internet Resources: Didier Grandjean
Communication , E&T: Pablo Achard
Communication & Knowledge Transfer: Carole Varone
Advancement of women: S. Kaiser et M. Schmid Mast

Steering board : Klaus Scherer, Kevin Mulligan, Martial Van der Linden, David Sander, Meinrad Perrez

RESEARCH

Emotion elicitation and perception

- **Appraisal and motivation** – Scherer/Gendolla
- **Response patterning** – Scherer/Kaiser
- **Neural architecture** – Vuilleumier/Landis

Emotion regulation

- **Regulation and family** – Perrez/Reicherts
- **Work and emotions** – Semmer/Tchan
- **Regulation and executive functions** – Van der Linden

Social functions of emotion

- **Norm compliance** – Fehr
- **Values and Norms** – Mulligan
- **Emotions and Law** – Flückiger /Robert/Roth
- **Myths and rites** – Borgeaud

Focus

- **Empathy & prosocial behaviour in the lifespan** – Labouvie-Vief/Singer
- **Antisocial and impulsive Behaviour** – Van der Linden/Eliez
- **Self-reflexive Emotions**-Mulligan/Gendolla
- **Language and culture** –Borgeaud/Scherer
- **Aesthetic emotions** –Lombardo/Scherer
- **Apparaisal processes in decision** – Fehr/Wranik
- **Gender differences** – Kaiser/Schmid-Mast

METHODS

8. Areas of application

HEALTH

WORK

FAMILY

VIOLENCE

LAW

ECONOMICS

ARTS

9. Initial research results

- Number of publications so far: 114
- Software development
- Questionnaire and tool development for psychological analysis
- Database creation
- Awards and distinctions: 4

10. Knowledge transfer

Knowledge transfer to the academic community

- Organization and participation to conferences and workshops
- Teaching affective sciences at different levels
- Implementation of tools for diagnostics, tests, evaluations…
- Sharing of databases

Knowledge transfer to public and private sectors

- Joint funding of research
- Consulting
- Colloquia
- Continuing education
- Publication for broad audiences
- Museums, TV, radio, special events (Nuit de la science)

11. Our partners

Health : Health and Social Welfare, Geneva

Work : professional training MAS in HR management

Family : Public Health Directorate, Fribourg

Violence : Public School Health Department, Geneva

Industry : Firmenich Inc.

Arts : Geneva museums

Associations : Swiss Household Panel; IFOTES

12. Education and training

Graduate school

- 3 years
- Teach interdisciplinary skills
- 24 PhD students
- Summer school, workshops, international conferences, rotation around laboratories, targeted funding

Postdoctoral school

- 1-2 years
- Promote excellence in research
- 25 postdoctoral fellows
- Visits to international laboratories, guest professors, supervised teaching assignments

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Contacts

National Centre of Competence in Research (NCCR)
in Affective Sciences

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1205 Geneva, Switzerland

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Director : Klaus Scherer, klaus.scherer@unige.ch

Scientific Coordinator : David Sander, david.sander@unige.ch

Communication, E&T : Pablo Achard, pablo.achard@unige.ch

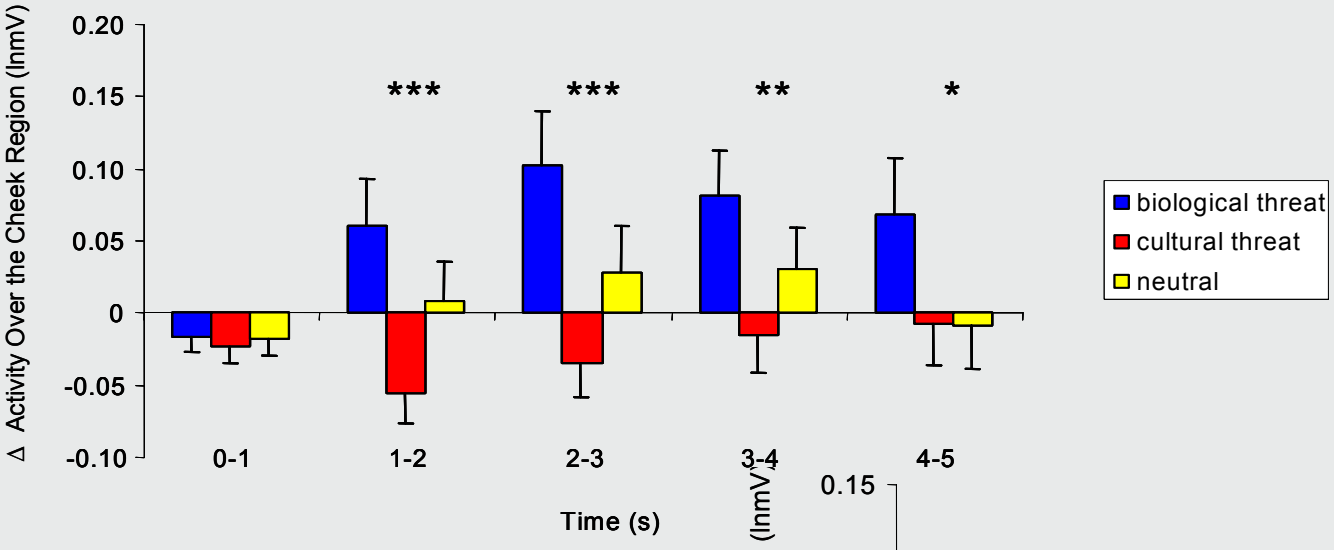
Knowledge Transfer: Carole Varone, carole.varone@unige.ch

Links for collaborations with IM2

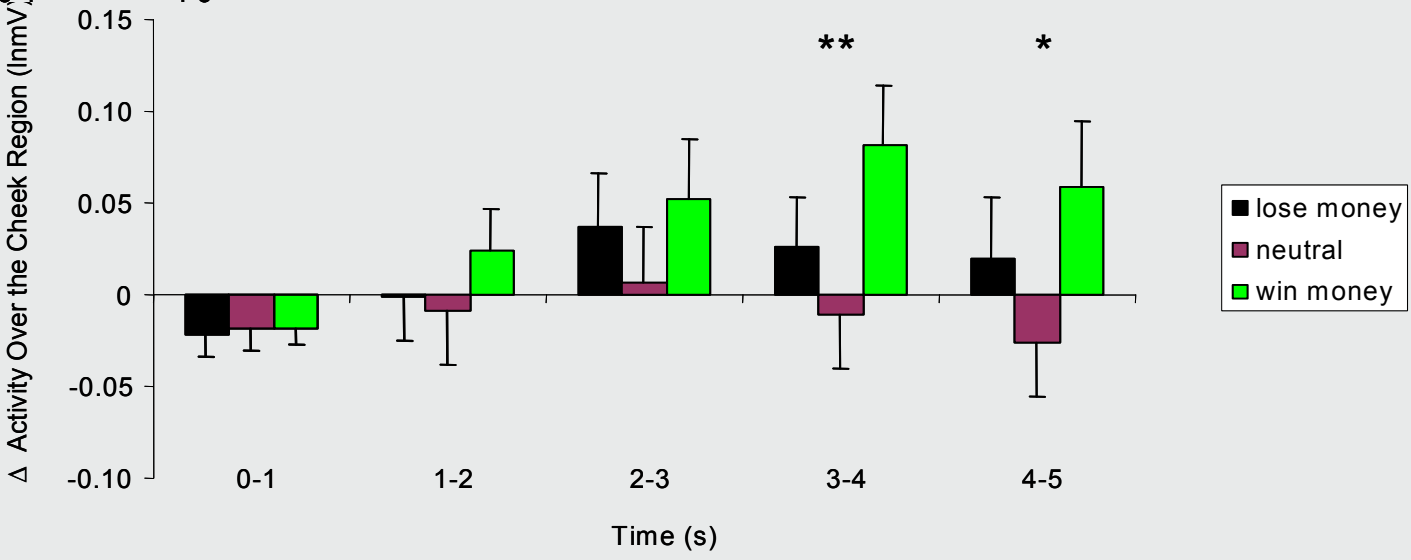
Appraisal sequence: Onset of facial muscles in a win/lose viewing task

Muscle Activity Over the Cheek Region (M. zygomaticus)

1-5s after stimulus onset: significant effect of *Goal Relevance* - biological threat > neutral objects > cultural threat



3-5s after stimulus onset: Significant effect of *Goal Conduciveness:* win > lose > neutral



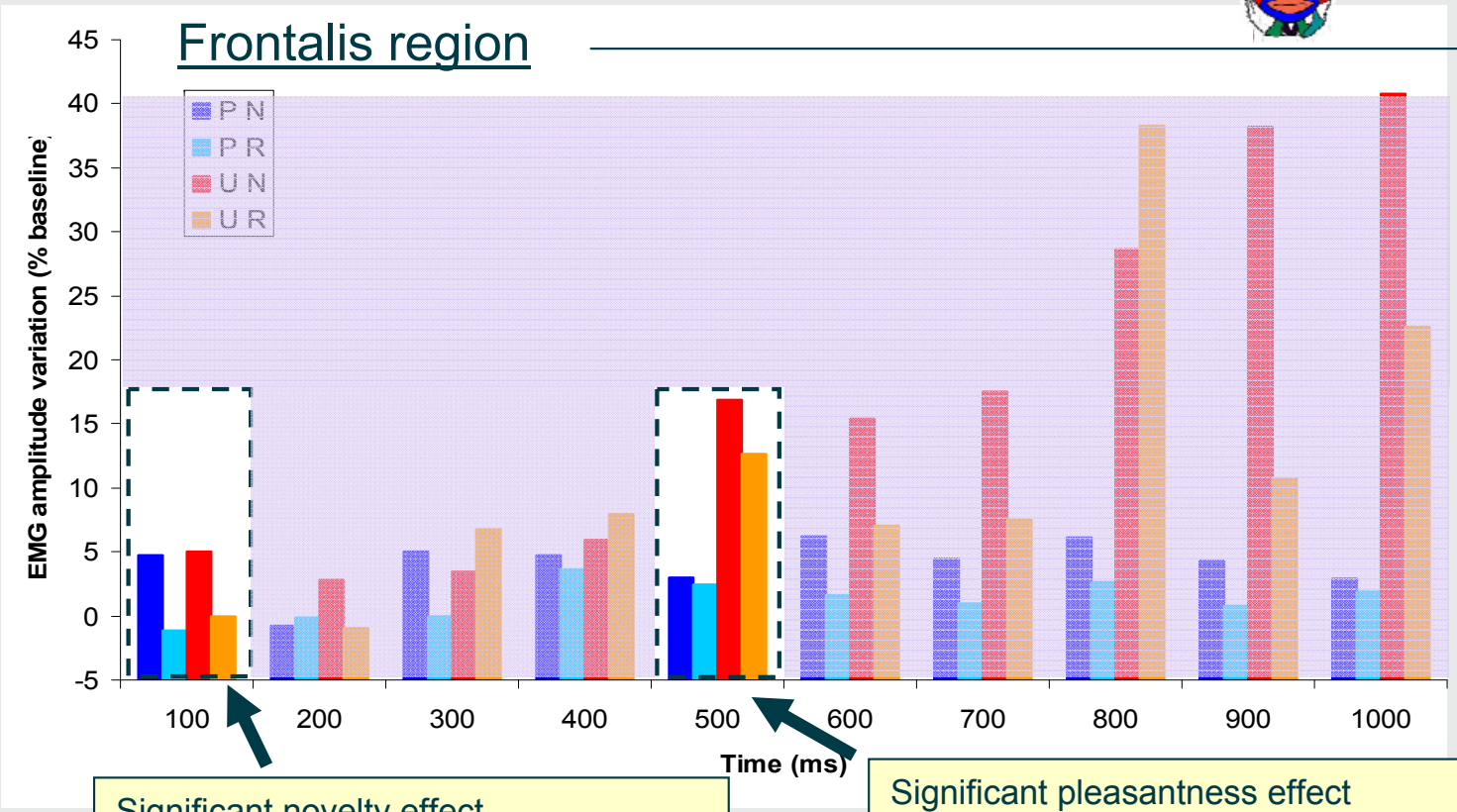
Aue, T., Flykt, A., & Scherer, K.R. (2007). First evidence for differential and sequential efferent effects of goal relevance and goal conduciveness appraisal. *Biological Psychology, 74,* 347–357.

Frontalis activity in response to target odors

P = pleasant odors
U = unpleasant odors
N = novel (never presented before)
R = repeated (presented once before)

Frontalis

Frontalis region



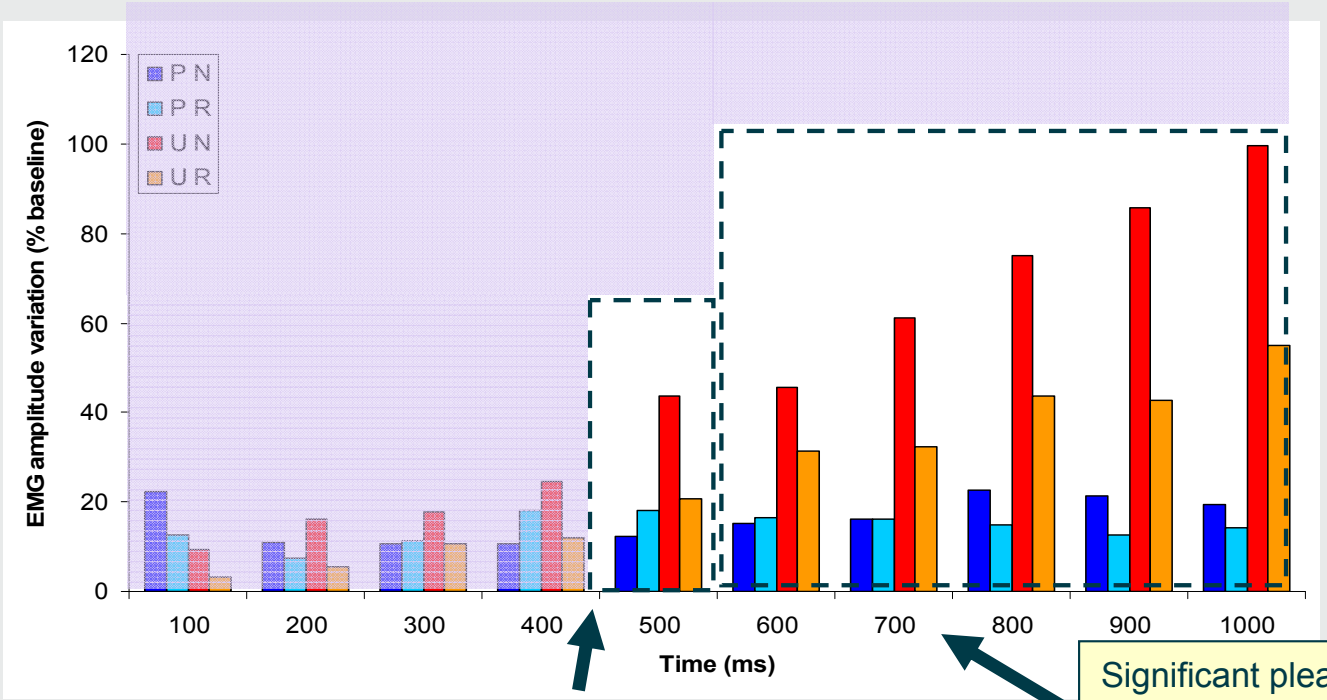
Significant novelty effect
$F(1,17)=11.25$; $p = 0.003$; $\eta^2 = 0.88$

Significant pleasantness effect
$F(1,17)=5.53$; $p = 0.031$; $\eta^2 = 0.6$

Corrugator activity in response to target odors

P = pleasant odors
U = unpleasant odors
N = novel (never presented before)
R = repeated (presented once before)

Corrugator

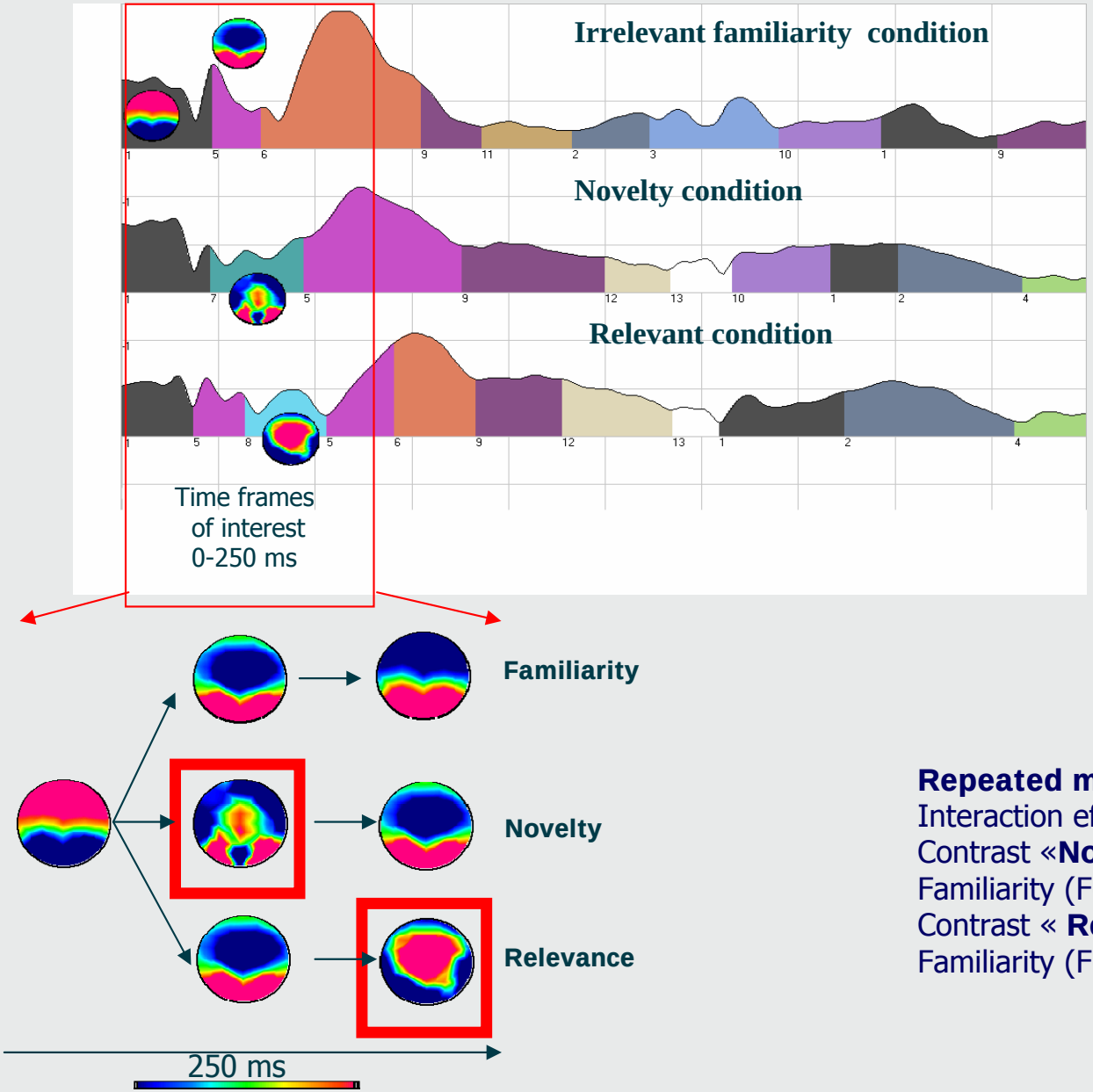


Significant novelty * pleasantness interaction
F(1,17)=7.18; p = 0.015; η^2 = 0.71

Significant pleasantness effects
600: F(1,17)=4.46; p = 0.049; η^2 = 0.51
700: F(1,17)=5.64; p = 0.045; η^2 = 0.53
800: F(1,17)=6.84; p = 0.018; η^2 = 0.69
900: F(1,17)=5.53; p = 0.017; η^2 = 0.7
1000: F(1,17)=5.53; p = 0.005; η^2 = 0.85

Delplanque, S. et al. (under revision). Sequential Unfolding of Novelty and Pleasantness Appraisals of Odors: Evidence From Facial Electromyography and Autonomic Reactions.

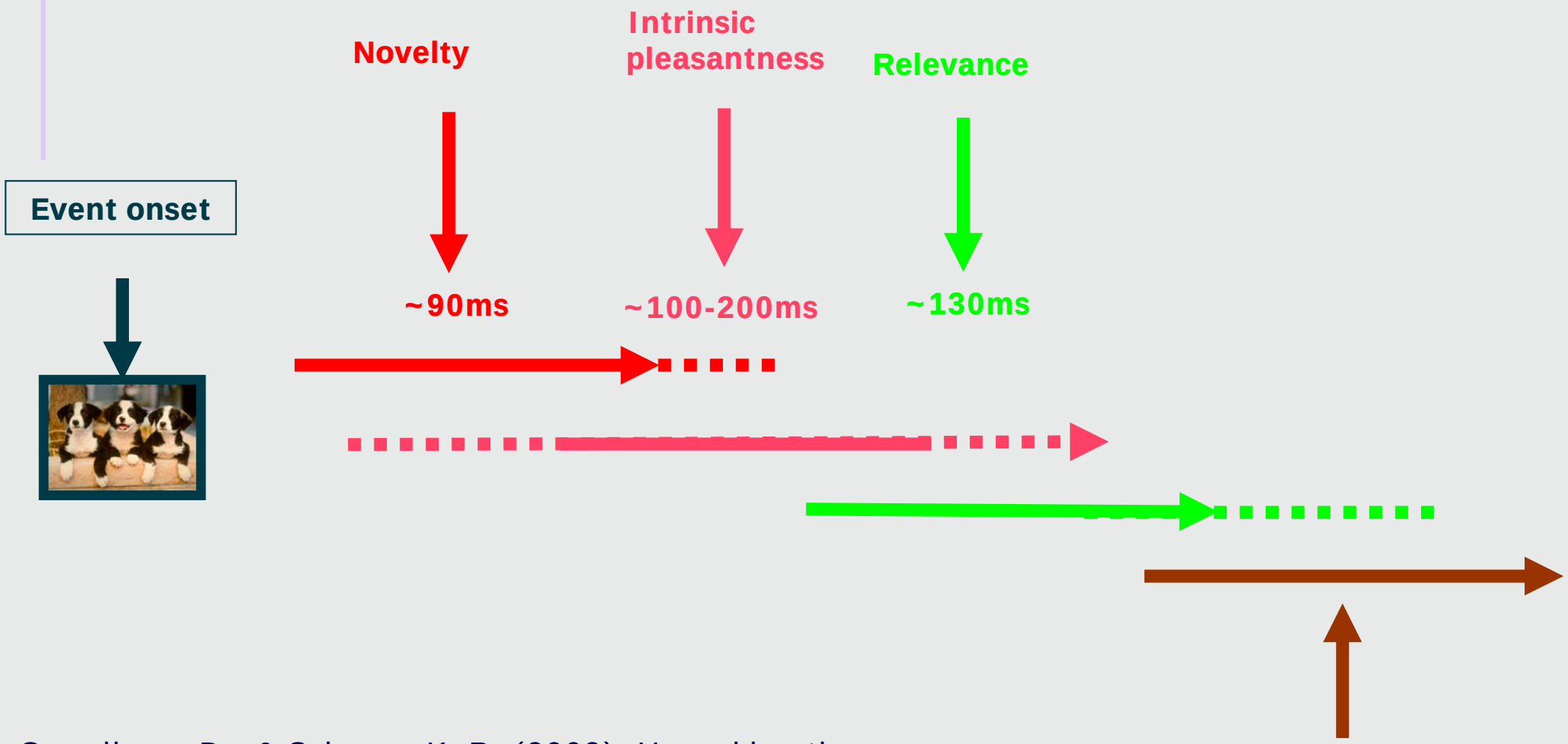
Experiment 1: Topographical analyses



Repeated measures Anova:
Interaction effect Maps X Conditions ($p<0.05$),
Contrast «**Novelty map** » for Novelty vs Relevance and Familiarity ($F(1,13) = 8,97$, $p<.05$, $\eta 2=.41$).
Contrast « **Relevance map** » for Relevance vs Novelty and Familiarity ($F(1,13) = 5,13$, $p<.05$, $\eta 2=.28$).

Mental chronography of appraisal: Summary

Appraisal sequence



Grandjean, D., & Scherer, K. R. (2008). Unpacking the cognitive architecture of emotion processes. *Emotion, 8(3),* 341–351.

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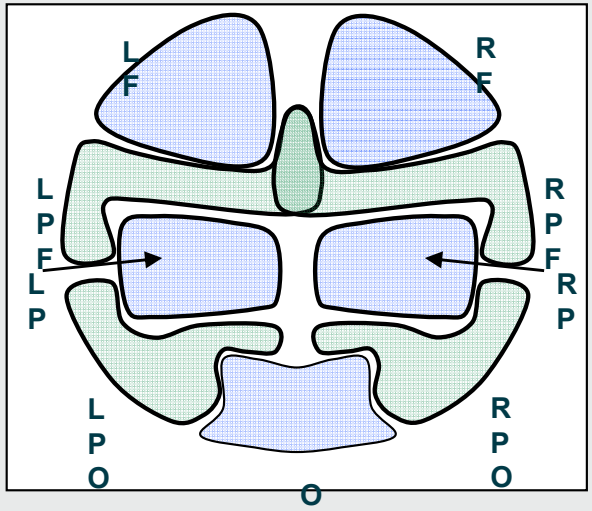
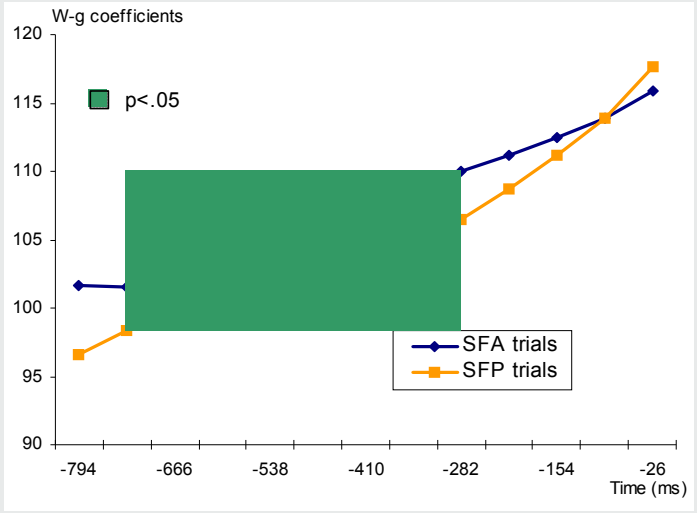
Brain oscillation and the emergence of conscious feeling

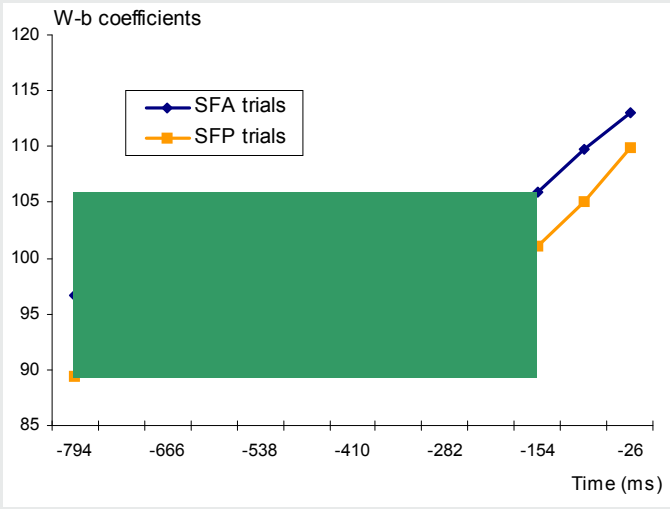
not feel affect



Significant changes in neural oscillatory activity between reactions to pictures for which participants report to have consciously experienced positive or negative affect and periods where they did not feel an affect.

feel affect

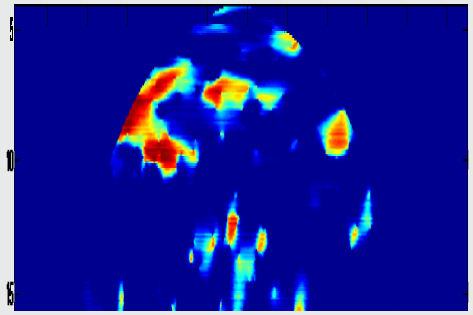




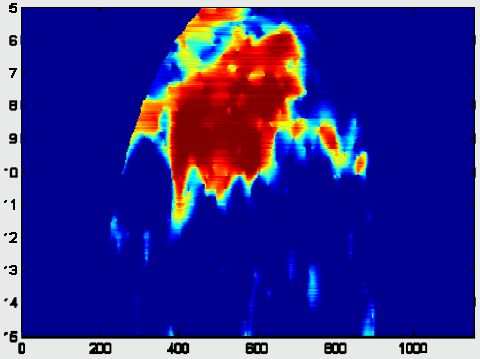
Dan Glauser, E.S., & Scherer, K.R. (2008) Neuronal processes involved in subjective feeling emergence: oscillatory activity during an emotional monitoring task. Brain Topography, 20, 224-231.

Coupling between amygdala and orbito-frontal cortex

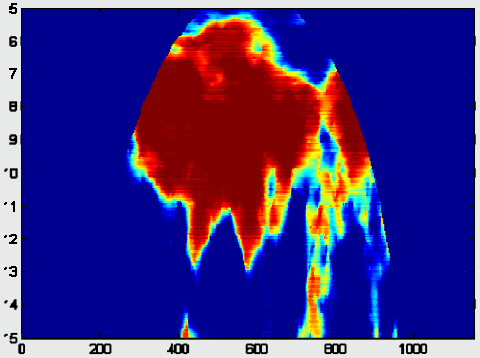
Synthetic sound



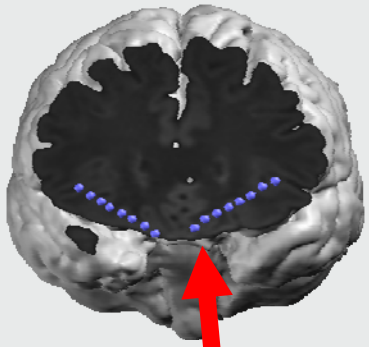
Neutral utterance



Anger utterance



Orbitofrontal cortex



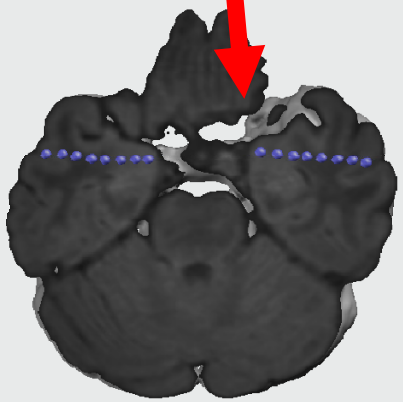
RightOFC

Left OFC

Phase coupling

Amygdala

Left Amy



Right Amy

Phase coupling demonstrates an increase of synchronization between amygdala and OFC related to the perception of voices and particularly angry voices. This makes the assumption of separate "roads" somewhat questionable.

Grandjean et al., in prep.

The emergence of conscious emotional feeling: Synchronization and neuronal connectivity

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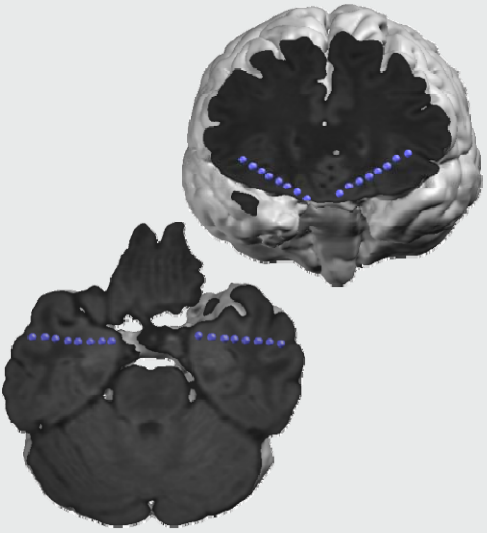
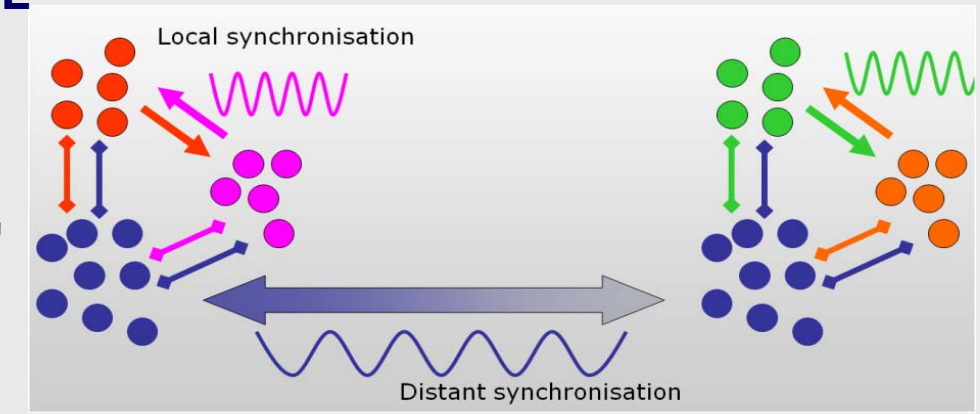
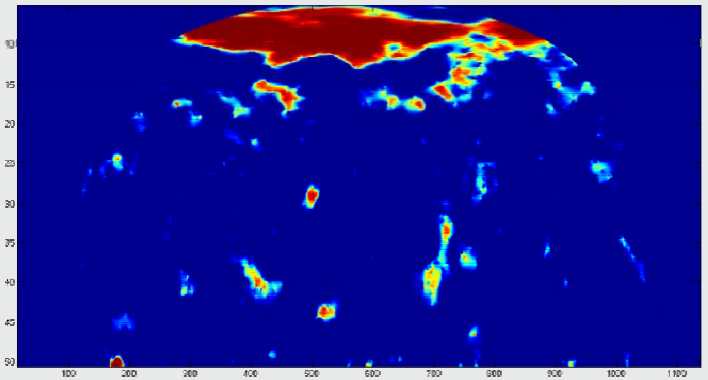
NEURONAL LEVEL

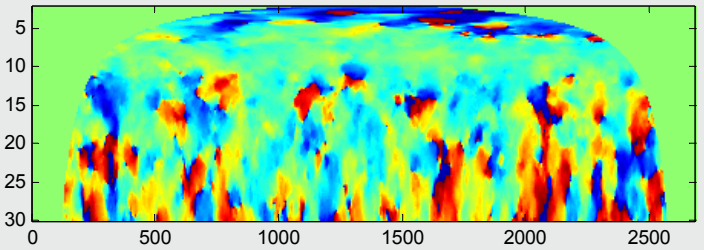




Phase synchronizations

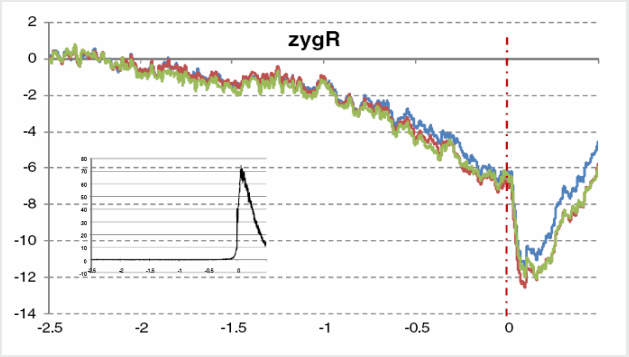


Phase lags



PERIPHERAL LEVEL

Peripheral measures: i.e. EMG, SCR



Coupling of neuronal synchronization and peripheral measures in the emergence of consciousness

Grandjean, D., Sander, D., Scherer, K. R. (2008). Conscious emotional experience emerges as a function of multilevel, appraisal-driven response synchronization. *Consciousness and Cognition, 17*(2), 484-495.

Facial expressions are driven by appraisal

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Munich actor corpus

Co-occurrences for most frequent AUs

	AU1	AU2	AU4	AU5	AU6	AU10	AU12	AU25	AU26
AU1	**98.00**	92.41	71.43	61.76	29.79	31.43	34.04	48.44	46.81
AU2	73.00	**79.00**	41.43	47.06	19.15	11.43	36.17	35.94	46.84
AU4	50.00	29.00	**70.00**	35.29	25.53	45.71	0.00	35.94	50.00
AU5	21.00	16.00	12.00	**34.00**	8.82	2.94	14.71	20.40	14.71
AU6	14.00	9.00	12.00	3.00	**47.00**	25.71	57.45	34.29	53.19
AU10	11.00	4.00	16.00	1.00	9.00	**35.00**	0.00	40.00	42.86
AU12	16.00	17.00	0.00	5.00	27.00	0.00	**47.00**	17.02	17.02
AU25	31.00	23.00	23.00	5.00	12.00	14.00	8.00	**64.00**	0.00
AU26	44.00	37.00	35.00	20.00	25.00	15.00	30.00	0.00	**94.00**

Scherer, K. R.& , Ellgring, H. (2007). Are facial expressions of emotion produced by categorical affect programs or dynamically driven by appraisal? *Emotion, 7(1),* 113-130.

Action unit data: Upper face

	Hot anger	Cold anger	Panic fear	Anxiety	Despair	Sadness	Disgust	Contempt	Shame	Boredom	Interest	Elated joy	Happiness	Pride
Inner brow raiser AU1	0.31	0.31	>> 0.94 [a]	0.63	>> 0.88 [a]	> 0.56	0.25		0.38	0.25	0.56	0.44	> 0.31	0.31
Outer brow raiser AU2	0.44	0.38	>> 0.69 [a]	0.38	0.44	0.31			0.31	0.25	0.63 [a]	0.44	> 0.38	0.31
Brow lowerer AU4	>> 0.25	> 0.31	> 0.69 [b]	> 0.56	>> 0.94 [a]	> 0.63 [c]	> 0.56	0.13	0.25					
Upper lid raiser AU5	> 0.31		> 0.50 [a]	> 0.19	0.25				0.13		0.38	> 0.19	>	
Cheek raiser AU6	0.13				0.44 [b]		0.38 [c]					> 0.63 [b]	> 0.81 [a]	0.38 [c]
Lid tightener AU7	>	> 0.19	>>	>	>>	>	>	0.50 [a]						
Nose wrinkler AU9	0.13						> 0.13							
Lids droop AU41						> 0.25 [a]				0.31 [a]				

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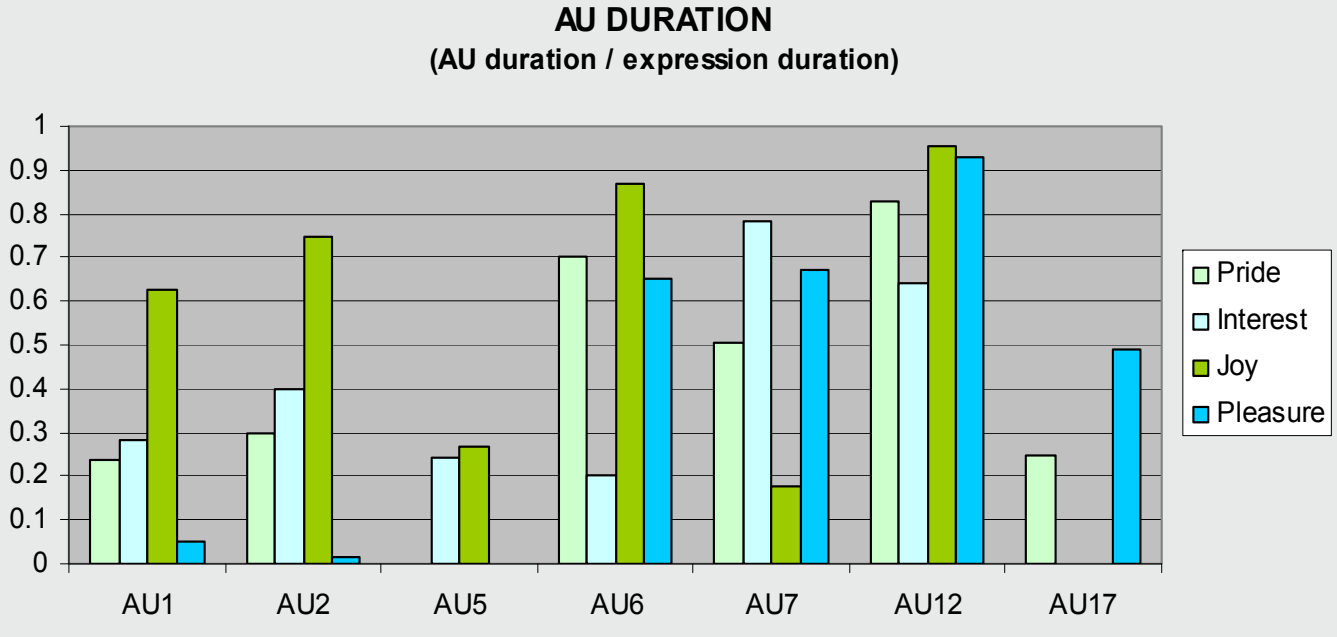
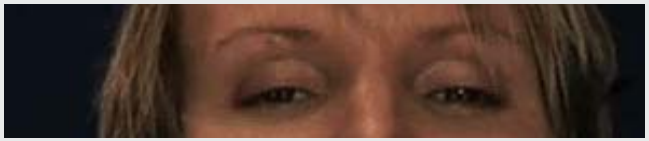
Facial expression of positive emotions seem also driven by appraisal results

INTEREST –JOY – PRIDE – PLEASURE

These emotions are not clearly associated with emotion-specific facial configurations. Rather, facial expressions can be differentiated according to the underlying appraisal checks.



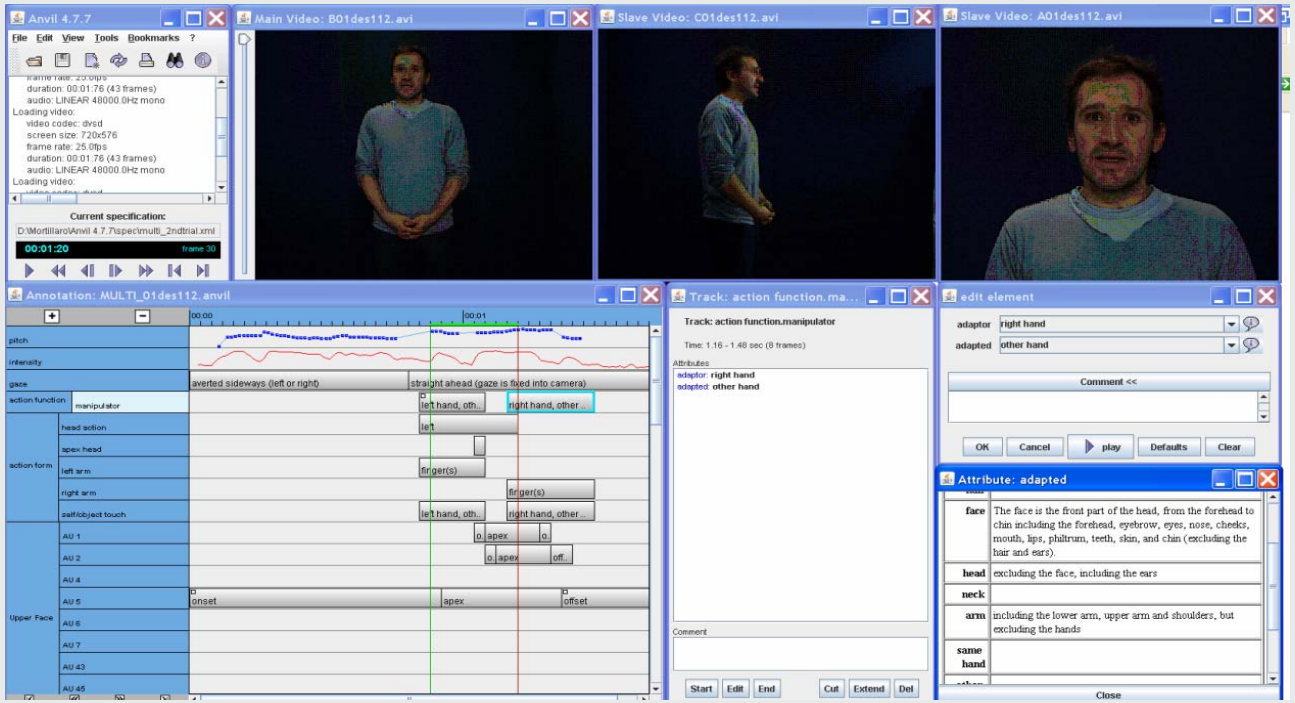
NOT SUDDEN → SUDDEN



Mortillaro, M., Mehu, M., & Scherer, K. R. (in prep). The facial expression of four positive emotions: The suitability of an appraisal approach.

GEMEP – Multimodal expression of emotion

Geneva Multimodal Emotional Portrayals



1260 portrayals: rating study → CORE-SET (150)

- **FACS coding**
- **Vocal analysis**
- **Coding of gestures and body movements**

Dynamic coding and analysis of coherence or synchronization between channels

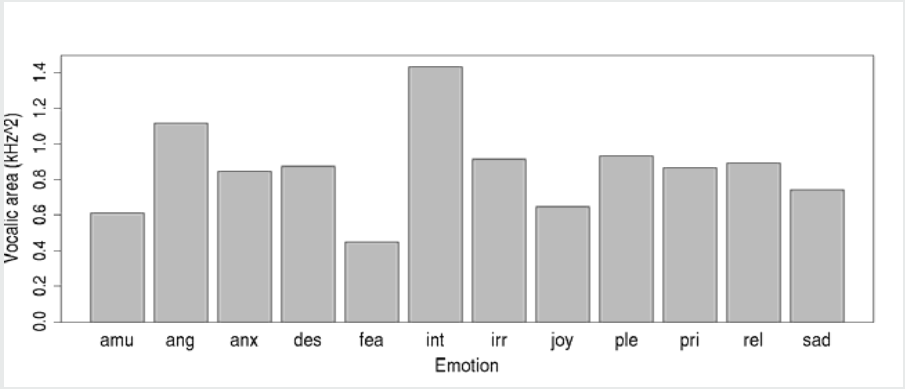
Banziger, T. & Scherer, K.R. (2007). Using actor portrayals to systematically study multimodal emotion expression: the GEMEP corpus. In A.Paiva, R. Prada, R.W. Picard (Eds.): Affective Computing and Intelligent Interaction. LNCS, 4738, pp. 476-487. Berlin/New York: Springer.

Castellano, G., Mortillaro, M., Camurri, A., Volpe, G, & Scherer, K.R. (in press). Automated analysis of body movement in emotionally expressive piano performances. Music Perception.

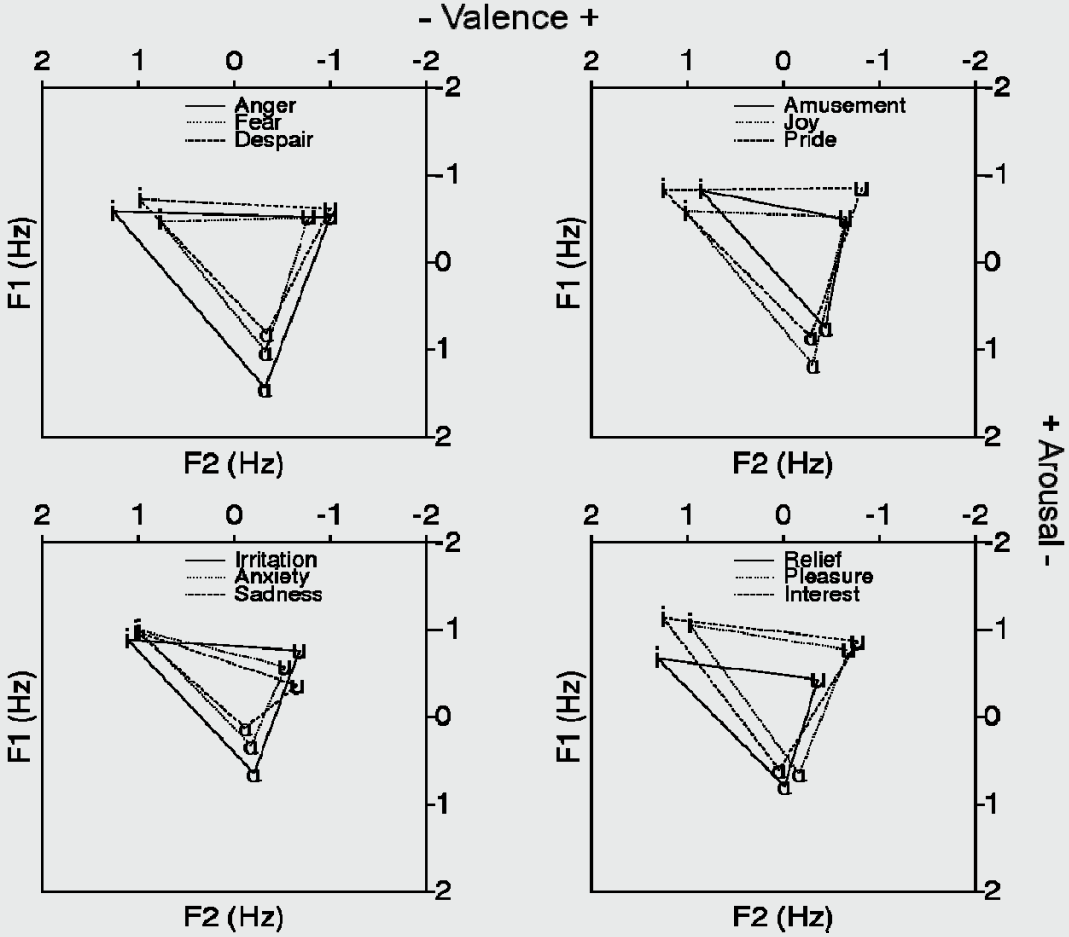
Goudbeek

Emotion effects on voice quality and articulation

We plotted the first and second formants of the vowels i, a, and u of utterances in the GEMEP corpus.



As predicted by the CPM, emotions differ in the size of their vocalic triangle: emotions with a high potency (anger, interest) have a larger vocalic triangle



Goudbeek, M., Goldman, J-P., and Scherer, K.R. (in press). Emotions and articulatory precision. Proceedings of Interspeech 2008. Brisbane, Australia.

Thermal measurement of facial muscle activity

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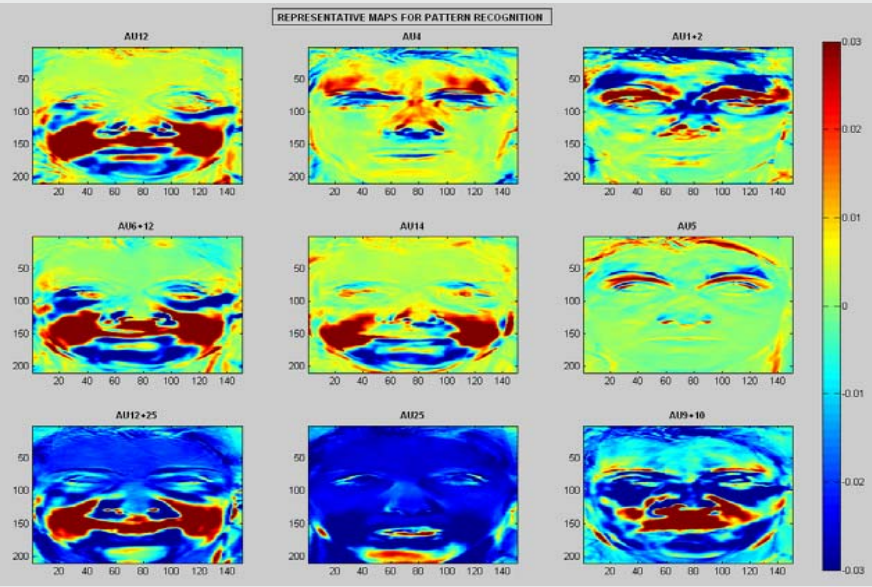
4 FACS experts
9 different AUs
2 speeds
3 intensities

Thermographic camera
FLIR SC3000

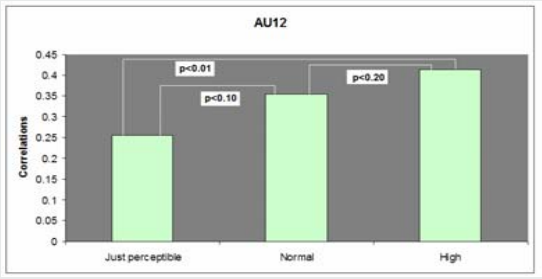
3 approaches
-PCA
-Anatomical ROI temperature changes
-Anatomical ROI thermal motion

Action Units discrimination

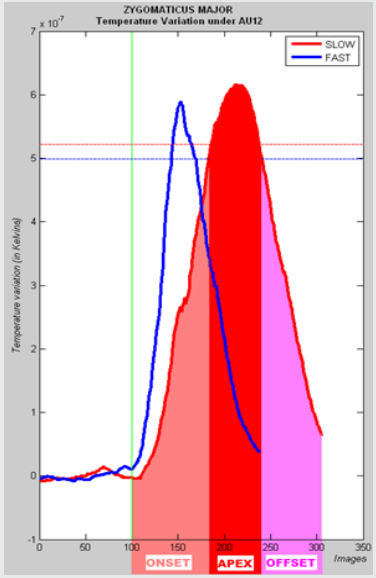


Predicted AUs → / Simulated AUs ↓	AU12	AU6+12	AU12+25	AU14	AU25	AU9+10	AU4	AU1+2	AU5
AU12	27.3	**33.3**	9.1	30.3	0	0	0	0	0
AU6+12	**33.3**	27.3	18.2	9.1	0	3	0	9.1	0
AU12+25	20.7	3.4	**69**	0	3.4	0	3.4	0	0
AU14	21.2	0	9.1	**66.7**	3	0	0	0	0
AU25	0	0	0	0	**70**	23.3	6.7	0	0
AU9+10	0	9.4	6.3	0	0	**75**	6.3	3.1	0
AU4	2.6	2.6	2.6	2.6	2.6	5.1	**61.5**	15.4	5.1
AU1+2	4.2	4.2	8.3	4.2	6.3	8.3	8.3	**43.8**	12.5
AU5	0	0	0	3.7	14.8	7.4	18.5	11.1	**44.4**

Thermal Sensitiviy to Intensities



Thermal Sensitivity to Kinetics
Apex determination



Jarlier, S., Grandjean, D., N'Diaye, K., Delplanque, S., Sander, D., Vuilleumier, P., & Scherer, K.R. (in prep.) Thermal imaging of facial expressions: investigating thermal correlates of Facial Action Units activities.

Analyzing effects of desynchronisation on perception: Dynamic control of synthetic facial expressions

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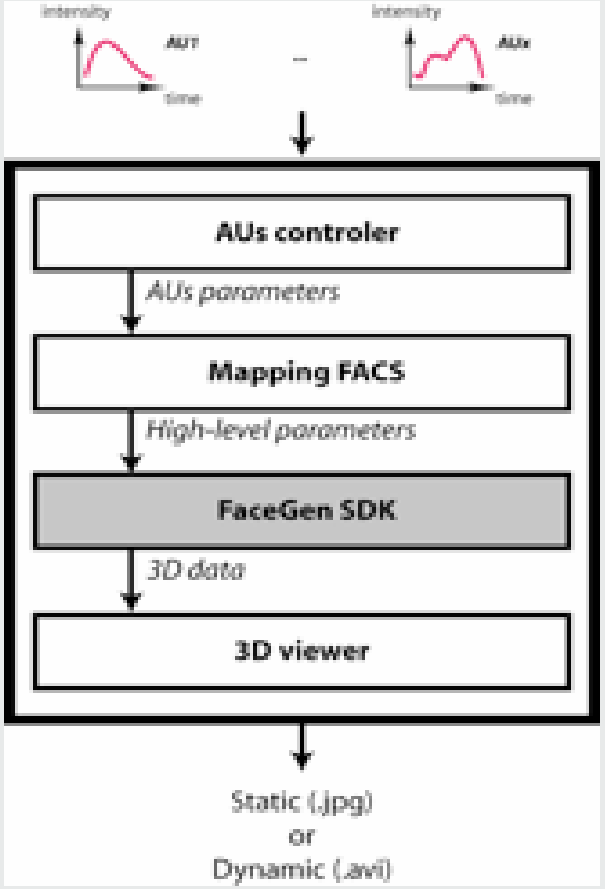

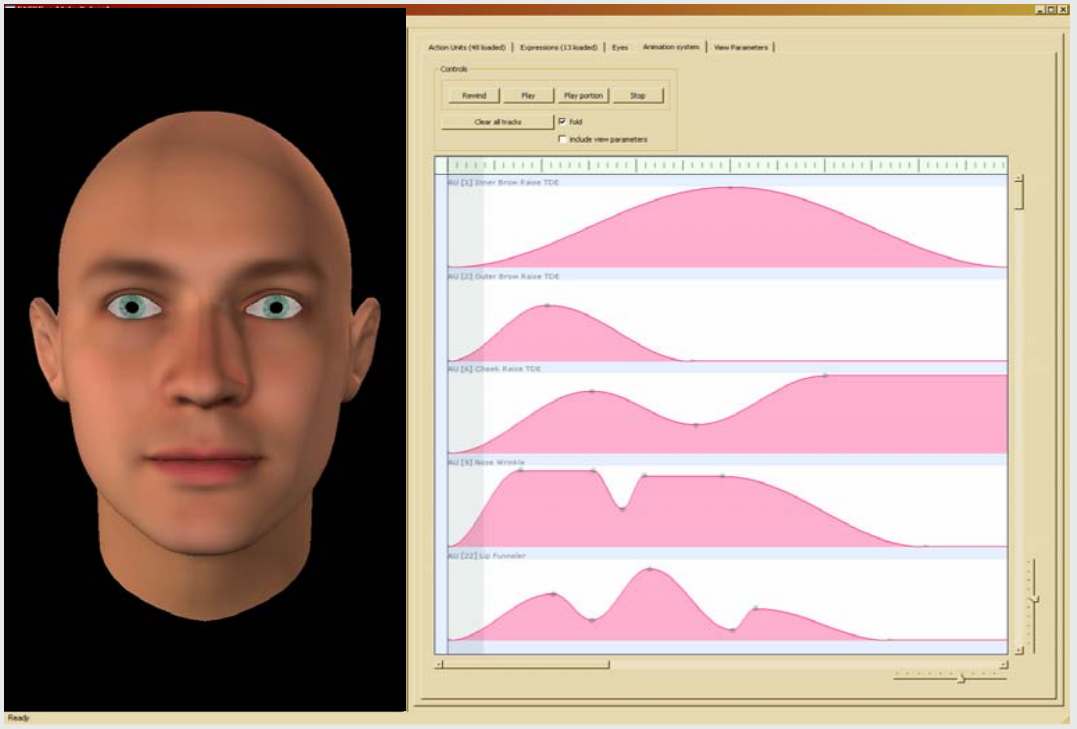

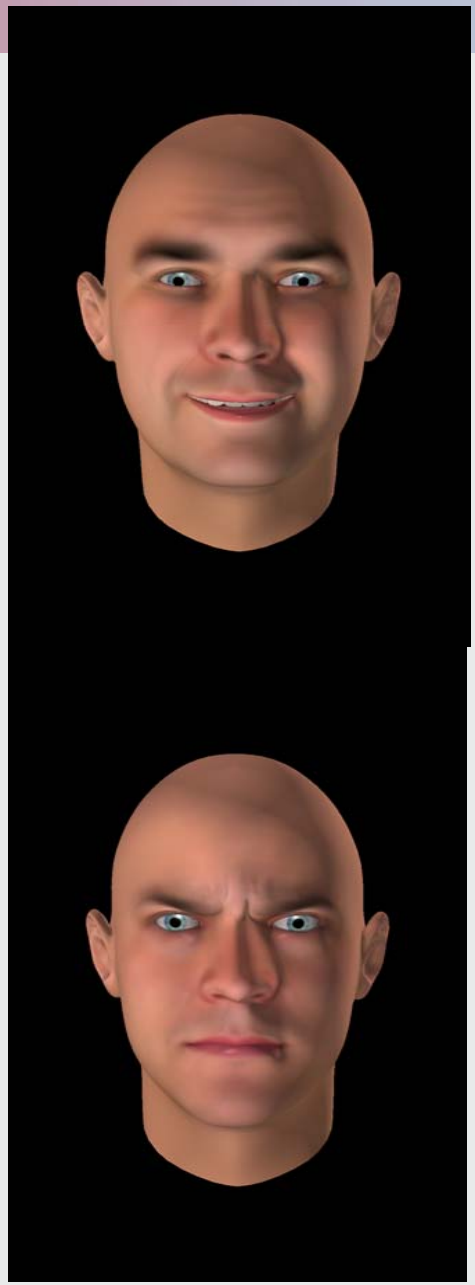

Roesch, E.B., Tamarit. L., Reveret, L. Grandjean, D. Sander, D., Scherer, K.R. (in prep.) FACSGen: A tool to dynamically model synthetic emotional expressions, based on facial action units.

Emotion and soccer

- Can one predict the result of
- a penalty based on the nonverbal
- behavior of the player?

The presentation of emotion in everyday life

Authenticity in emotion research

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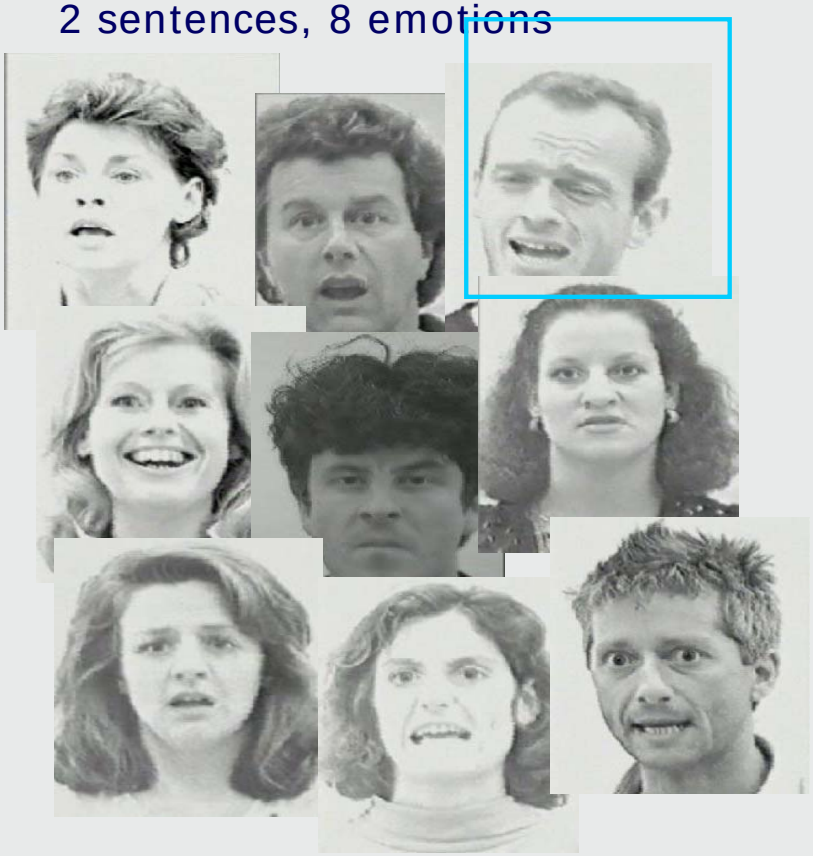
Munich corpus portrayals
9 actors/speakers
2 sentences, 8 emotions



Unnatural, unrealistic, counterfeit, artificial, fake, not believable, feigned, unreliable

Natural, realistic, authentic, genuine, real, believable, sincere, trustworthy

Conceptual clarification

- natural unnatural → behavior, situation
- realistic unrealistic → behavior, situation
- authentic counterfeit → original? copy?
- genuine artificial → original? copy?
- real fake → original? copy?
- believable not believable → observer judgment
- sincere feigned → actor intention
- trustworthy unreliable → observer judgment

Three perspectives

- behavior perspective
- actor perspective
- observer perspective