Mapping the Development of Facial Expression Recognition

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Affective Sciences
SWISS NATIONAL CENTER OF COMPETENCE IN RESEARCH

- Study 1:
  Rodger, H., Vizioli, L., Ouyang, X., & Caldara, R. (in press)
  Mapping the development of facial expression recognition, *Developmental Science*

- Study 2 :
  Quantifying signal and intensity thresholds for facial expression recognition during development

- Study 3 :
  Isolating information use for facial expression recognition during development: a gaze-contingent eye movement study

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Study 1: Aim

- To investigate the continued development of facial expression recognition from 5 years to adulthood for all 6 'basic' emotions + neutral expression

- Why?
  - Surprisingly few studies of FER in early childhood (from age 5 upwards)
  - Review (Herba & Philips, 2004) citing need for studies of continued development into adolescence and adulthood
  - New method > further light existing findings

Study 1: Method

Stimuli

- All 6 'basic' emotions + a neutral expression
- 36 adult identities (252 images), KDEF database (Lundqvist,Flykt, & Öhman, 1998)
- Cropped & aligned on eyes & mouth
- Luminance + contrast normalized

Fear   Anger
Disgust   Happy
Sad   Surprised
Neutral

Study 1: Method

Participants

N=160: 8 age groups, 20 per group

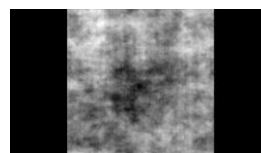|	
5-6	13-14
7-8	15-16
9-10	17-18
11-12	Adults

Study 1: Method

Signal Detection

- Adaptive, sensitive measure of recognition threshold for emotional expression

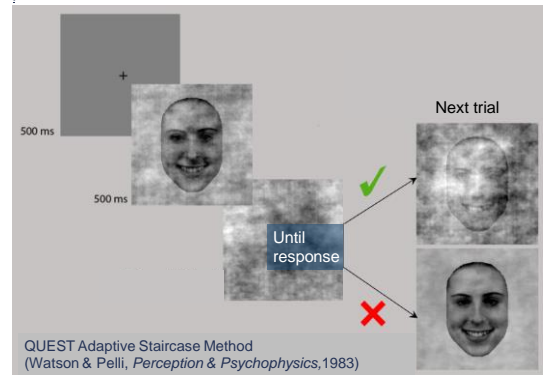- How much signal do you need to categorize an expression across development?

Signal Strength increasing 0-100%

Study 1: Method

QUEST threshold seeking algorithmn > Psychtoolbox MATLAB

- Developmental study >
    Adaptive staircase method>
        Greater efficiency obtaining threshold

QUEST Adaptive Staircase Method
(Watson & Pelli, *Perception & Psychophysics,*1983)

Study 1: Method

QUEST threshold seeking algorithmn

- N trials > stepwise search for threshold
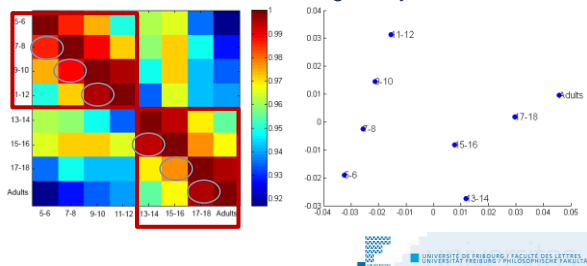- Threshold = 75% of trials correct at signal strength X

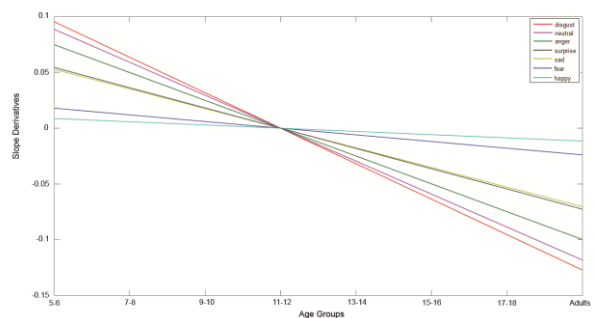Example trial sequence, 1 observer, 1 emotion

Study 1: Results

- Similarity of recognition thresholds across development
- & Multidimensional Scaling Analysis

Study 1: Results

Linear Models:
Recognition thresholds across development

Study 1: Conclusions

- 1st fine-grained mapping of the development of facial expression recognition 6 basic emotions + neutral

- Unique trajectories
  ∧Steep improvement > disgust, neutral, anger
  ∧Gradual > surprise, sadness
  ∧stable> fear, happiness

Study 1: Conclusions

- Two main phases in the development of FER:
  - 5 - 12 years old
  - 13 years old - adulthood

- Novel tool measure impairments developmental clinical populations.

Study 2:
Quantifying signal and intensity thresholds for facial expression recognition during development

How much signal

or intensity   50% ———— 75% ———> 100%

is needed to categorize a facial expression of emotion across development?

30% surprise   +   70% neutral   =   30% **intensity** (or morph)

Study 2:
Quantifying signal and intensity thresholds for facial expression recognition during development

- Do older children recognize subtle expressions of emotion more easily?
- Why?
  ∧ Every day life – encounter more subtle expressions
  ∧ Established method in developmental literature: emotion morphs
  ∧ QUEST advantage: sensitivity vs. a priori large increments

Study 2:
Quantifying signal and intensity thresholds for facial expression recognition during development

Repeated measures
- Quantity of (1) signal and (2) Intensity
- QUEST threshold seeking algorithm

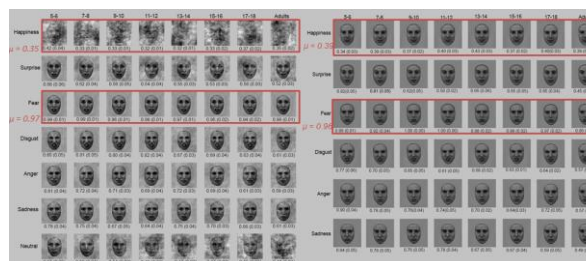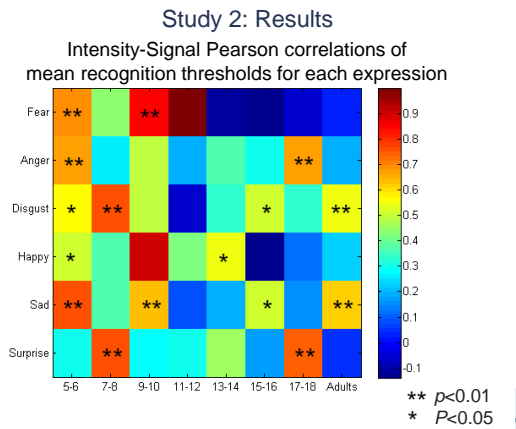Participants
- N=120: 8 age groups, 15 per group

5-6	13-14
7-8	15-16
9-10	17-18
11-12	Adults

Study 2: Mean recognition thresholds Signal & Intensity

Study 2: Results

Intensity-Signal Pearson correlations of
mean recognition thresholds for each expression

** p<0.01
* P<0.05

Study 3:
**Isolating information use for facial
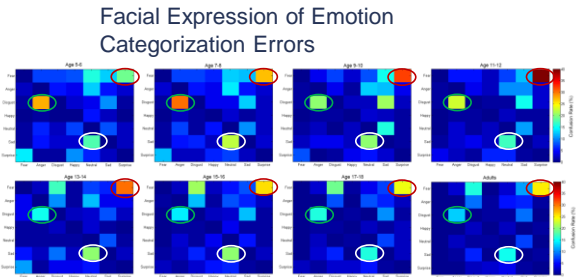expression recognition during development:
a gaze-contingent eye movement study**

Thank you!

Study 1: Results

Facial Expression of Emotion
Categorization Errors