Voluntary control of crying

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Introduction

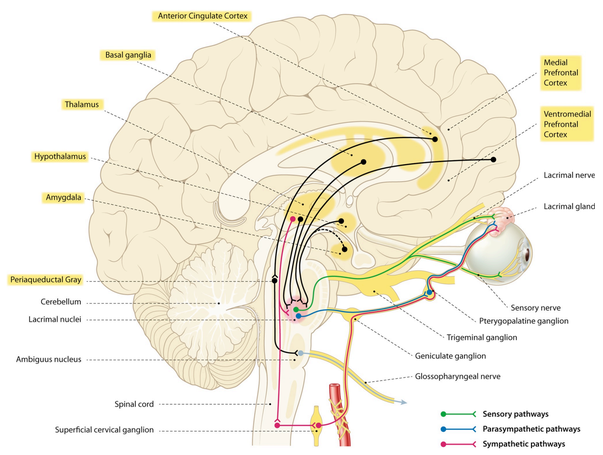
Crying is normally considered as an automatic behaviour, under Autonomic Nervous System control

But actors can, and do, cry voluntarily. How?

What mechanisms allow *de novo* voluntary control?

Can voluntary crying clarify the relation between thoughts ('mental actions') and behaviours?

Bylsma et al (2019) Clin Auton Res. 2019 Feb; 29(1): 63–73.



Research programme

1. Subjective Study: how do professional actors make themselves cry?
2. Machine Learning Study: does ML technique detect people's crying? If so, any features?
3. Perceptual Studies: how does crying communicate with viewers?
4. Longitudinal behavioural study: how do people learn to make themselves cry?
5. Neuroimaging Study: what are the underlying neural mechanisms?

Subjective Study–Methods

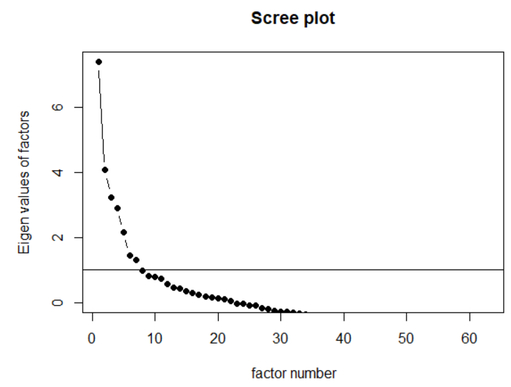
Questionnaire research pipeline

Long-form Questionnaire Testing → Item Reduction Analysis → Extraction of Factors → Short-form Questionnaire (c. 15 items)

Exploratory factor analysis (varimax rotation)

What latent factors underlie voluntary control of crying?

What are the different sources of variability in how people say they cry?



Subjective Study–Results

1. Exploratory factor analysis shows 5 factors and explains 33.5% of the variance of the data across individuals. 6%-9%

Top 3 questions & factor loadings

Factor 1 Offset control (variance explained 9.0%)

Q1. I find it easy to stop crying. (0.78)
Q2. I always feel in control of when the crying stops. (0.73)
Q3. It is easy for me to stop crying and return immediately to the state I was in before. (0.67)

Factor 2 Mental focus (6.8%)

Q59. I hold a specific thought in my mind in order to make myself cry. (0.70)
Q9. I need to think emotional thoughts to start crying. (0.67)
Q7. I try to maintain focus on just one thing in order to get myself to cry. (0.63)

Factor 3 Self-efficacy/metacognitive assessment of ability (6.1%)

Q10. I can switch very quickly from whatever I am doing to crying. (0.76)
Q44. I find it easy to make myself cry. (0.67)
Q42. I can start to cry without a lot of preparation. (0.62)

Factor 4 Sociocultural contextual triggers (5.9%)

Q11. I have to be immersed in the scene I am acting to start crying. (0.70)
Q35. I have to be able to relate to the scene in order to cry. (0.63)
Q65. My acting partner makes a big difference to how easy it is to make myself cry. (0.56)

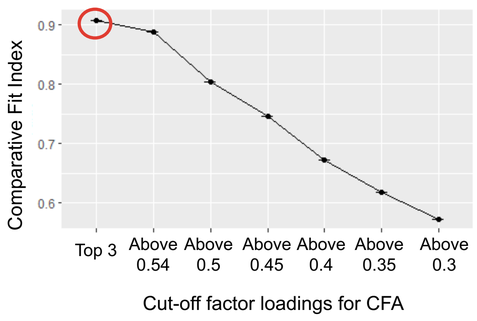
Factor 5 Somatic control (5.7%)

Q61. I use the muscles around my eyes to make myself cry. (0.54)
Q64. I make myself cry by making specific facial expressions. (0.57)
Q66. Changing my breathing helps me to start crying. (0.56)

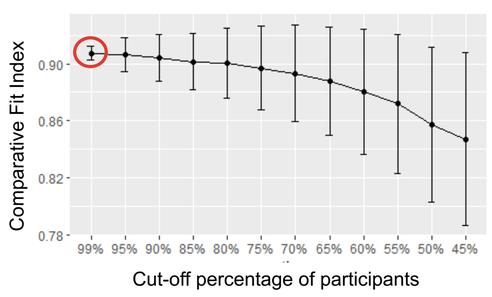
2. Confirmatory factor analysis - Robustness/stability of factor structure

Does the factor solution broadly remain the same

a) when we remove low-loading factor items?
>> A structure with moderately-loading items shows a good CFI



b) when we randomly remove X% of participants?
>> YES

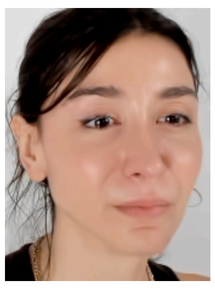


Machine Learning Study

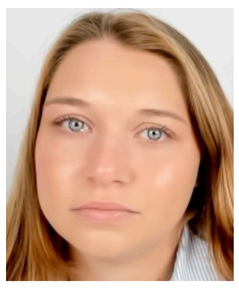
- We recorded performers' crying on the cue in the lab (N=23). Each time frame on the video was labelled as either 1) neutral face or 3) watery eyes/tears dropping.
- The deep neural network (DNN) was trained separately on recordings of each actor. The classification accuracy depends on the **actor-specific type of crying**.
- The DNN model detects the person's crying if they are the actors who use a whole face to cry. The DNN model fails to detect crying if these actors do not change their facial expressions.
- We reconstructed heatmaps of crying from the trained DNN model. The important features to detect crying are 1) eyes, 2) lips, 3) nose, 4) eyebrows and 5) face shape.

Type of crying

Face

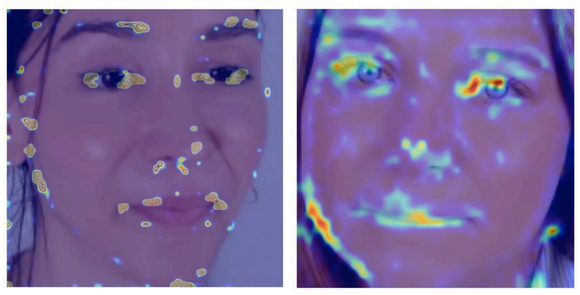


Eyes-only



Heatmaps of crying detection

Which features are linked to crying?



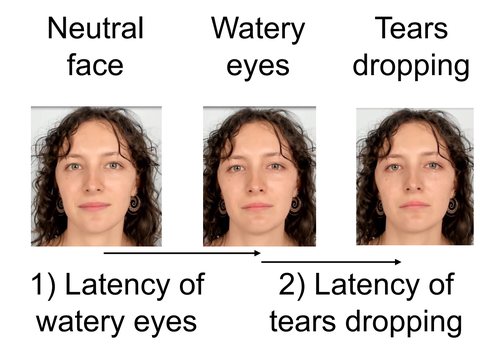
Next steps – Perceptual Study

13 actors contributed both crying videos and self-report questionnaire

1s extracts from these videos are extracted and presented to c. 30 naïve observers

Labelling

0. Not crying (Neutral face)
1. Watery eyes
2. Tears falling



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