



The pros and cons of FACS in the study of facial behaviour

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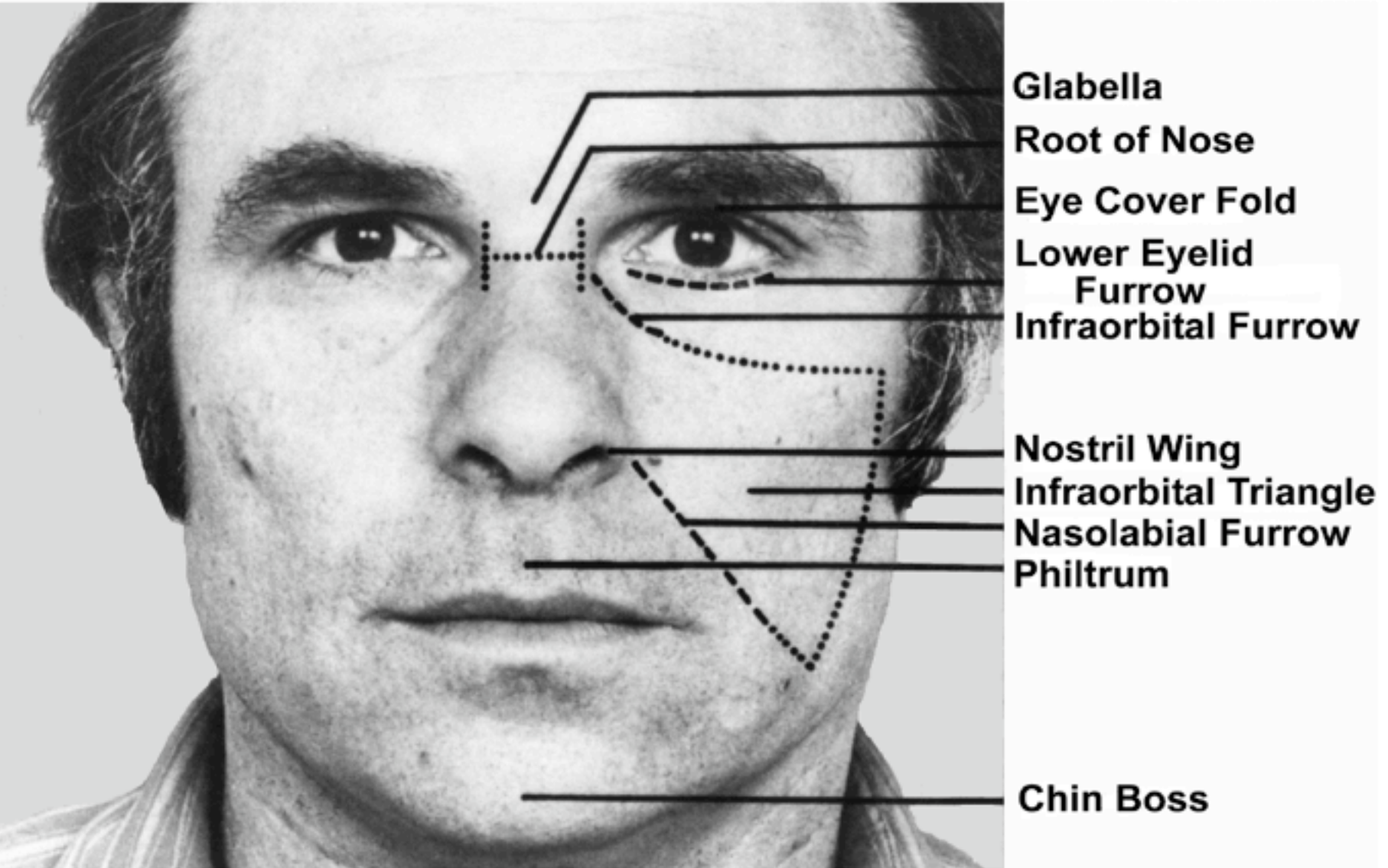


What is FACS?

- Comprehensive standardized system to code each observable facial movement
- Comprised of 62 Action Units (numbered from 1 to 66) measured in 5 levels of intensity (A to E)
- Region: upper face AUs, lower face AUs, head and eye position/movements, miscellaneous AUs

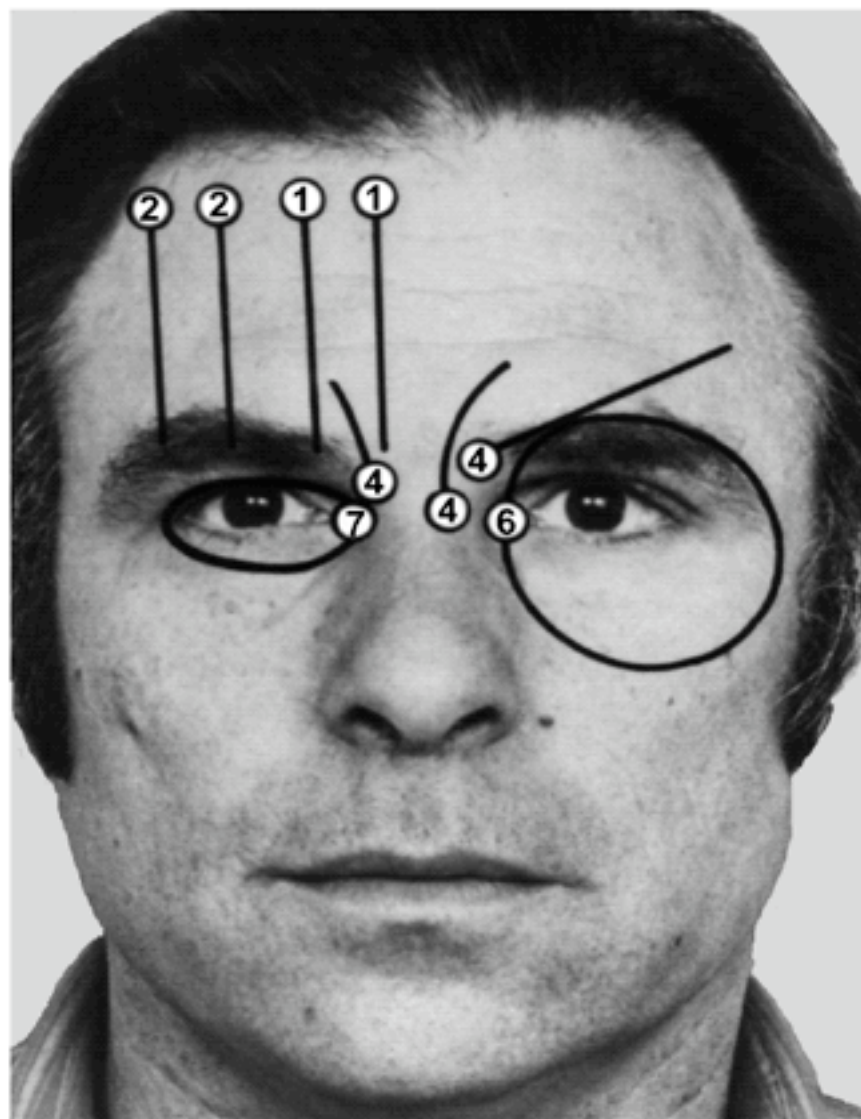
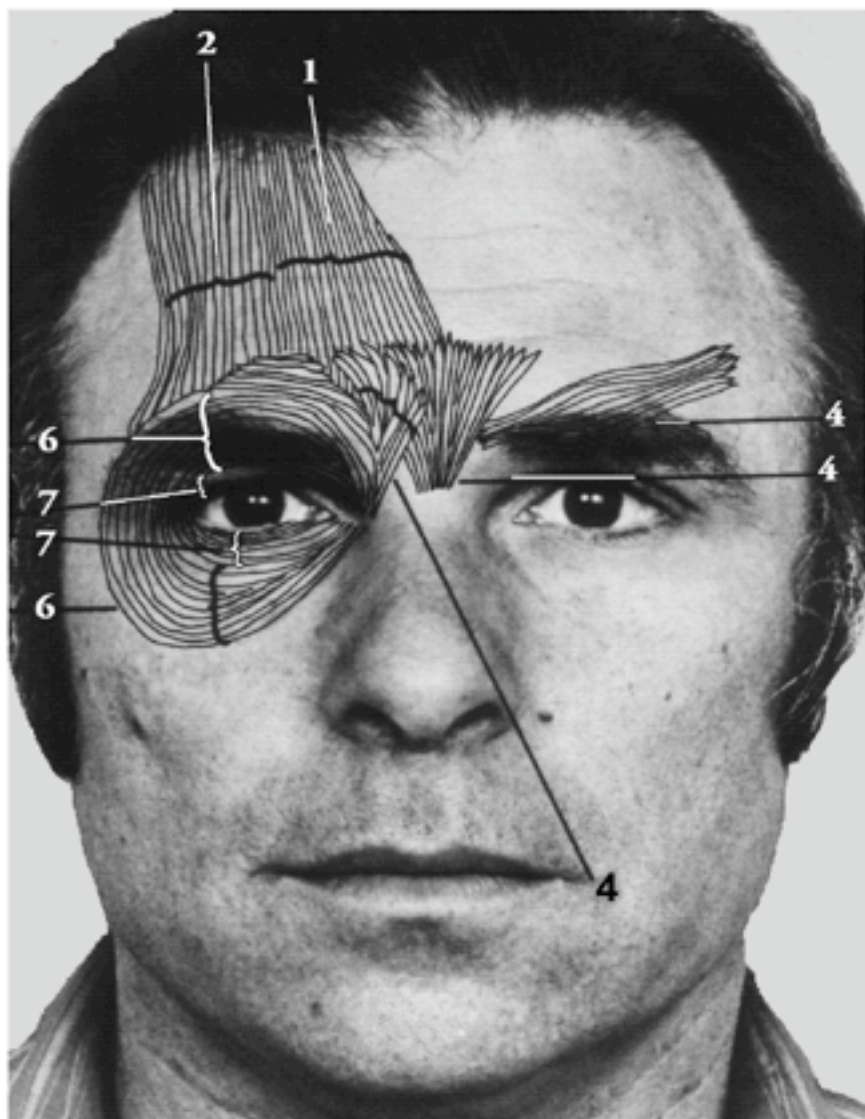
FACS uses facial landmarks (Ekman *et al.* 2002)

Figure 1-1: Names and locations of facial areas and parts.



FACS is based on facial anatomy (Ekman *et al.* 2002)

Figure 2-1. Muscles underlying upper face Action Units.



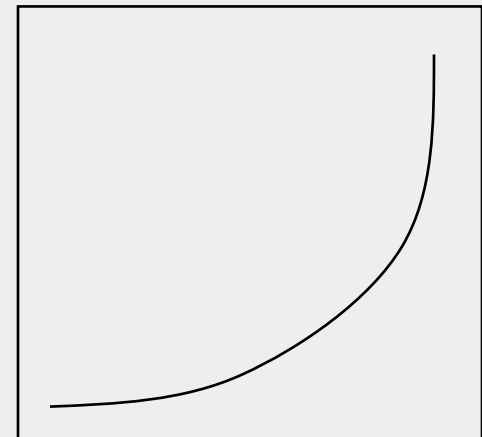
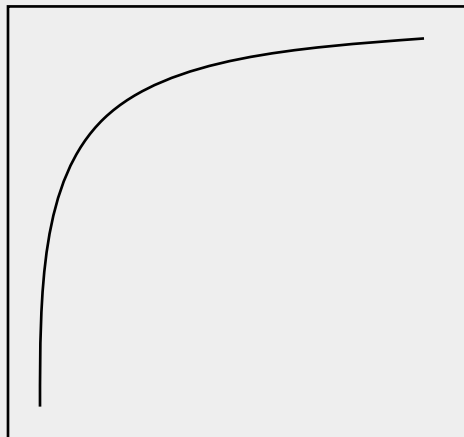
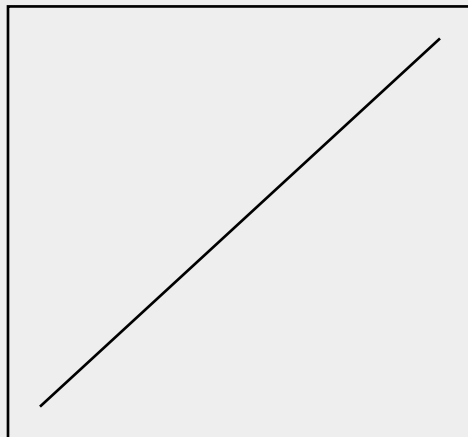
62 Action Units (Ekman *et al.* 2002)

Upper Face AUs			Lower Face AUs		
AU	Name	Starting on	AU	Name	Starting on
1	Inner Brow Raise	page 20	9	Nose Wrinkle	
2	Outer Brow Raise	page 22	10	Upper Lip Raiser	
4	Brow Lowerer	page 17	11	Nasolabial Furrow Deepener	
5	Upper Lid Raise	page 24	12	Lip Corner Puller	
6	Cheek Raise	page 31	13	Sharp Lip Puller	
7	Lids Tight	page 28	14	Dimpler	
43	Eye Closure	page 36	15	Lip Corner Depressor	
45	Blink	page 39	16	Lower Lip Depress	
46	Wink	page 40	17	Chin Raiser	
70	Brows Not Visible		18	Lip Pucker	
71	Eyes Not Visible		20	Lip Stretch	
Head Positions			22	Lip Funneler	
51	Turn Left		23	Lip Tightener	
52	Turn Right		24	Lip Presser	
53	Head Up		28	Lips Suck	
54	Head Down		72	Lower Face Not Visible	
55	Tilt Left		Miscellaneous AUs		
56	Tilt Right		8	Lips Toward Each Other	
57	Forward		19	Tongue Show	
58	Back		21	Neck Tightener	
Eye Positions			29	Jaw Thrust	
61	Eyes Left		30	Jaw Sideways	
62	Eyes Right		31	Jaw Clencher	
63	Eyes Up		32	Bite	
64	Eyes Down		33	Blow	
65	Walleye		34	Puff	
66	Crosseye		35	Cheek Suck	
Lip Parting and Jaw Opening			36	Tongue Bulge	
25	Lips Part		37	Lip Wipe	
26	Jaw Drop		38	Nostril Dilate	
27	Mouth Stretch		39	Nostril Compress	



- Universal language to address facial behaviour
- Allows detailed analysis of facial expression events
- FACS is a-theoretical >> does not assume that action units are produced by emotion/cognitive processes
- FACS is free of interpretation

- Limited to facial expression events
 - Difficult to code the dynamics of movements in a precise way
- e.g. AU onsets/offsets could take different trajectories



- Interaction between lower face AUs and speech
- Descriptions of AU combinations are limited
- Measurement of intensity is not precise
(e.g. hard to see the upper limit of an AU)



Why and how do WE use FACS ?

- To understand the unfolding of facial expression during emotional episodes
Code the GEMEP database (using FACS in ANVIL)
- Each Action Unit is coded separately
- Onset – Apex – Offset
- Intensity of Apex (a-b-c) – Asymmetry

GEneva Multimodal Emotional Portrayals (GEMEP)

Joie



ANVIL (Kipp, 2004)

The screenshot displays the ANVIL software interface with three main windows:

- Anvil 4.7.7**: A menu bar (File, Edit, View, Tools, Bookmarks) and a status area with the following text:
Welcome to Anvil 4.7.7
Open file A01joi114.anvil
XML validation successful
Open ANVIL file: /Users/Marc/GEMEP/data/A
Loading video:
video codec: Cinepak
screen size: 720x576
frame rate: 25.0fps
duration: 00:01:80 (44 frames)
audio: LINEAR 48000.0Hz stereo
A "Current specification:" field contains the path: ns/anvil45-package/. /spec/FACSlast.xml
A progress bar shows 00:00:24 at frame 6.
- Main Video: A01joi114_c.avi**: A video player showing a man with a wide, toothy smile.
- Track: Upper Face.AU 1**: A track editor showing:
Track: Upper Face.AU 1
Time: 00:00:04 - 00:00:52 (12 frames)
Attributes:
Timing: apex
Intensity: C
Position: 1
Buttons: Start, Edit, Cut, Extend

At the bottom, an **Annotation: A01joi114.anvil** window shows a timeline from 00:00 to 00:02. A table below the timeline lists annotations for "AD 50" and "Upper Face":

Category	Annotation	Start	End	Attributes
AD 50	AU 1	0. apex	offset	onset, apex, offset
	AU 2	onset	apex	offset, onset, apex, offset
	AU 4			onset, ap..
	AU 5			
Upper Face	AU 6	apex		
	AU 7			

auID	start	end	duration	Timing	Intensity	Position	Asymmetry
AU1	0	0.68	0.68	onset		1	
AU1	0.68	1.48	0.8	apex	B	1	L1
AU1	1.48	2.16	0.68	offset		1	
AU2	0.04	0.52	0.48	onset		1	
AU2	0.52	1	0.48	apex	B	1	L
AU2	1	1.32	0.32	offset		1	
AU4	0	0.96	0.96	onset		1	
AU4	0.96	1.76	0.8	apex	B	1	
AU4	1.76	2.16	0.4	offset		1	
AU7	0.12	0.72	0.6	onset		1	
AU7	0.72	1	0.28	apex	B	1	R1
AU7	1	1.68	0.68	offset		1	
AU10	0.6	0.8	0.2	onset		1	
AU10	0.8	0.84	0.04	apex	A	1	
AU10	0.84	1.04	0.2	offset		1	
AU10	1.16	1.24	0.08	onset		2	
AU10	1.24	1.32	0.08	apex	A	2	
AU10	1.32	1.48	0.16	offset		2	
AU12	0.28	0.4	0.12	onset		1	
AU12	0.4	0.44	0.04	apex	B	1	
AU12	0.44	0.6	0.16	offset		1	
AU12	0.68	0.76	0.08	onset		2	
AU12	0.76	0.88	0.12	apex	B	2	
AU12	0.88	1	0.12	offset		2	
AU12	1.16	1.28	0.12	onset		3	
AU12	1.28	1.44	0.16	apex	B	3	
AU12	1.44	1.56	0.12	offset		3	
AU16	1.64	1.68	0.04	onset	A	1	
AU16	1.68	1.72	0.04	offset		1	
AU17	0.52	0.56	0.04	onset	A	1	
AU17	0.56	0.6	0.04	offset		1	
AU17	1.08	1.12	0.04	onset	B	2	
AU17	1.12	1.16	0.04	offset		2	
AU17	1.48	1.52	0.04	onset		3	
AU17	1.52	1.56	0.04	apex	A	3	
AU17	1.56	1.6	0.04	offset		3	
AU18	0.12	0.2	0.08	onset		1	
AU18	0.2	0.24	0.04	apex	A	1	
AU18	0.24	0.32	0.08	offset		1	
AU20	0.72	0.76	0.04	onset		1	
AU20	0.76	0.84	0.08	apex	A	1	
AU20	0.84	0.92	0.08	offset		1	
AU24	0.52	0.56	0.04	onset	A	1	
AU24	0.56	0.6	0.04	offset		1	
AU24	1.08	1.12	0.04	onset	A	2	
AU24	1.12	1.16	0.04	offset		2	
M57	0.12	0.92	0.8	onset		1	
M57	0.92	1.32	0.4	apex		1	
M57	1.32	1.68	0.36	offset		1	
AD50	0.12	1.76	1.64				



- Frequency and duration of elements (onset - apex - offset)
- Basic linear statistics (GLM)



Would automation help address the

- Limited to facial expression events
YES - automation could allow continuous recording of Aus
- Difficult to code the dynamics of movements in a precise way
- Measurement of intensity is not precise
YES - automation could allow a more detailed measurement of dynamics and intensity



Would automation help resolve these

- Interaction between lower face AUs and speech
Not sure how automation could deal with this
- Action Unit combinations
YES - simple rules could be implemented that systematically detect all AU combinations



Thanks for your attention !