TRUE EMOTIONS:
KINEMATIC CHARACTERIZATION OF GENUINE AND SIMULATED FACIAL EXPRESSIONS

Elisa Straulino[1], Alessio Miolla[1], Cristina Scarpazza[1], Luisa Sartori[1,2]

[1]Dipartimento di Psicologia Generale, Università di Padova, Padua, Italy
[2]Padova Neuroscience Center, Università di Padova, Padua, Italy

INTRODUCTION

We often make facial expressions to convey an emotional message, but it does not mean that we sincerely feel this emotion. Sometimes, we pretend to express happiness, disgust or sadness as actors usually do. Available literature on genuine and simulated emotional facial expressions is, however, based only on qualitative indexes (Facial Action Coding System – FACS – developed by Ekman & Friesen, 1978). The aim of this study was to address this topic from a quantitative point of view, in order to provide a full spatial and temporal characterization of six basic emotional expressions: anger, fear, surprise, sadness, disgust and happiness and to implement a mathematical tool for distinguishing Genuine Emotions (GE) from Simulated Emotions (SE) via facial cues.

METHODS

Ten naïve participants were requested to watch videos which triggered spontaneous GEs. Then, they were asked to deliberately reproduce the same expressions without video support (SE). Twenty-two reflective hemispherical markers, each 3 mm in diameter, were used to acquire motion data (Figure 1).
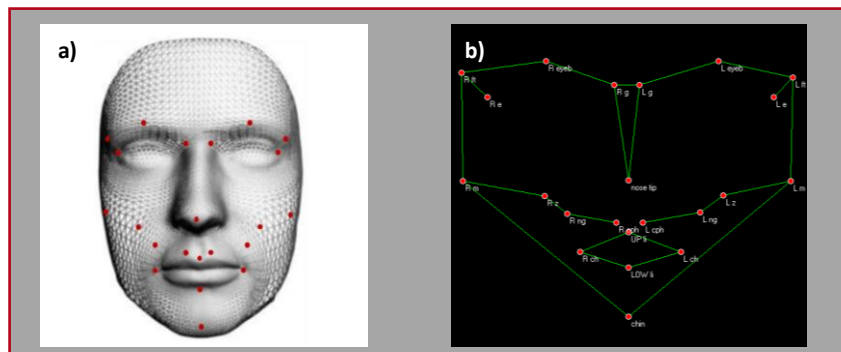

Figure 1. First Step: **a)** location of key points for the expressions of six basic emotions (2 middle eyebrown – right and left, 2 nasion – right and left, 2 frontotemporal – right and left, 2 exocanthion – right and left, 2 mandibular joint – right and left, 1 nosetip, 2 zygomaticus – right and left, 2 nasogenian – right and left, 2 crista philtri – right and left, 2 cheillon – right and left, 2 lip midpoint – upper and lower, 1 chin); **b)** development of the kinematic model with acronyms.

For both GE and SE, kinematic profiles of facial movements were recorded by means of six infra-red cameras using a 3-D motion analysis system (Figure 2).
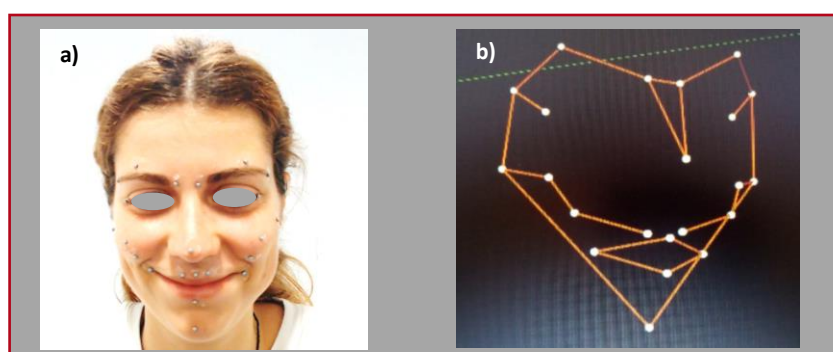

Figure 2. Second Step for the reconstruction of kinematic profiles: **a)** Infrared reflective markers' placement; **b)** 3-D reconstruction for kinematic analysis.

PRELIMINARY RESULTS

We found a range of cues characterising and distinguishing GEs from SEs facial cues. For instance, a simulated smile entails larger distances between the angles of the mouth (Figure 2a) compared to a genuine smile (t = 2.749, p < 0.05; Figure 2b). Crucially, this effect is also evident on the velocity profiles: the maximum speed, reached by the anatomical landmarks of interest upon the mouth, is higher for simulated than for authentic smiles (t = 2.925, p < 0.05; Figure 2c). Moreover, in terms of time, the peak of smile amplitude is reach earlier (in the first part of the movement time) for authentic smiles than simulated smiles (t = 3.330, p < 0.01; Figure 2d).
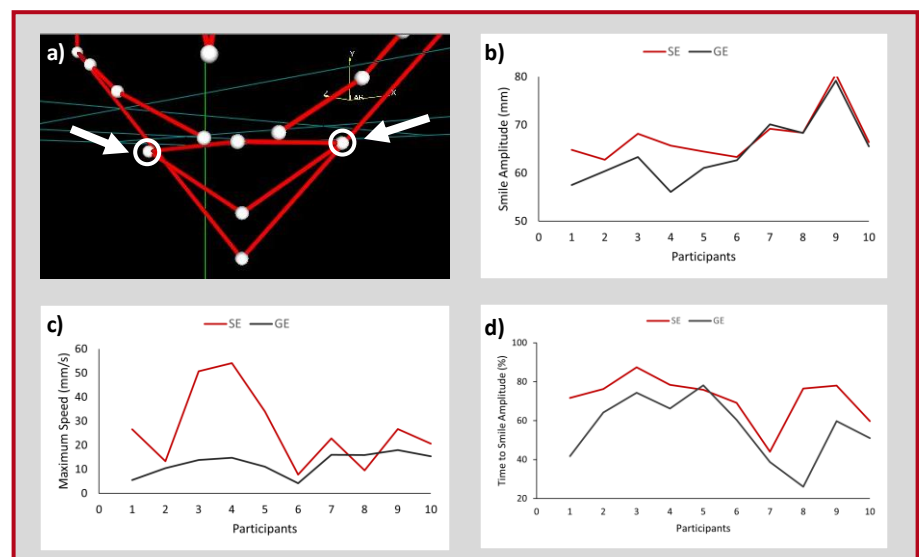

Figure 2. a) Angles of the mouth (right and left cheillon). b) Smile Amplitude: maximum distance reached by the angle of the mouth. c) Maximum Speed reach by the angles of the mouth. d) Time to Smile Amplitude: the proportion of time in which the Right cheilion and Left cheilion reach a maximum distance, calculated from movement onset.

REFERENCE
Ekman, P. & Friesen, W. (1978). The facial action coding system. Palo Alto: Consulting Psychologists Press.

CONCLUSION

These findings indicate that SE are characterized by greater amplitude and velocity peaks within the same amount of time spent for authentic expressions. In practical terms, these results will provide a decisive step forward for the detection of facial deceptive cues and the creation of a well-established database of GEs and SEs for multi-disciplinary future studies.