

Compositionality in the expression of emotions

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Compositionality in human language

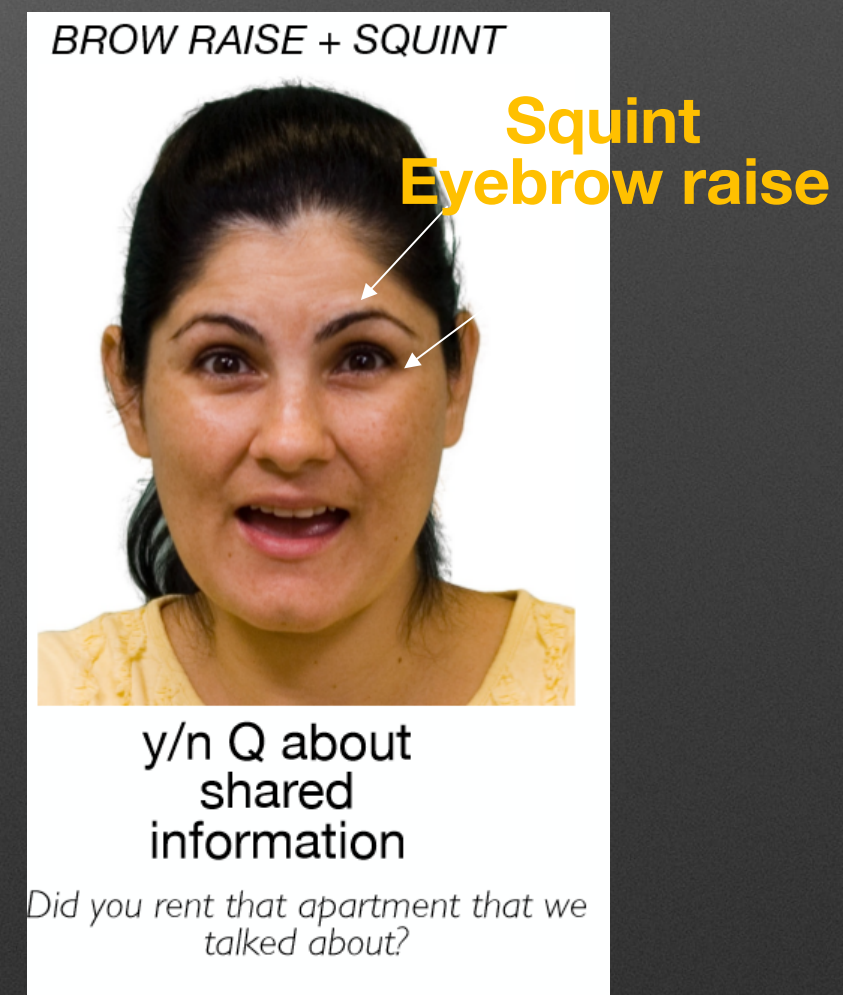
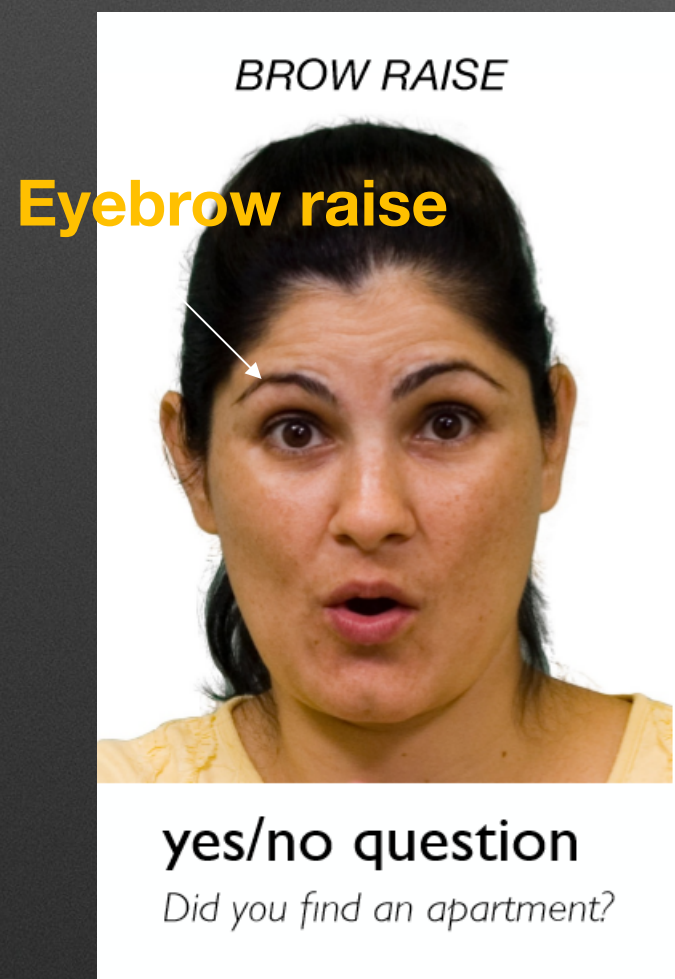
Compositionality is a fundamental property
of all human languages

Definition:

Sounds, **words**, phrases, and sentences combine and recombine with other units of the same kind to produce a potentially infinite number of interpretable expressions

- horse
- race
- horse race (a kind of race)
- race horse (a kind of horse)
- race horse track (a kind of track)

Compositionality of linguistic facial expression in sign languages



Compositionality in displays of emotions



Is communication of emotions compositional?

Theories of emotion displays

- **Holistic:** Emotional displays are holistic motor programs transmitting a basic, universally recognizable emotion (e.g. anger, Fear...Ekman 1993; Izard, 1977)
- **Dimensional:** Emotion displays are signals conveying the core meaning of an internal state along few general dimensions (e.g. positive vs negative, aroused vs calm... Russell, 2003; Scherer, 2005)

Mixed facial expressions of emotions



Body as a cue for emotion valence

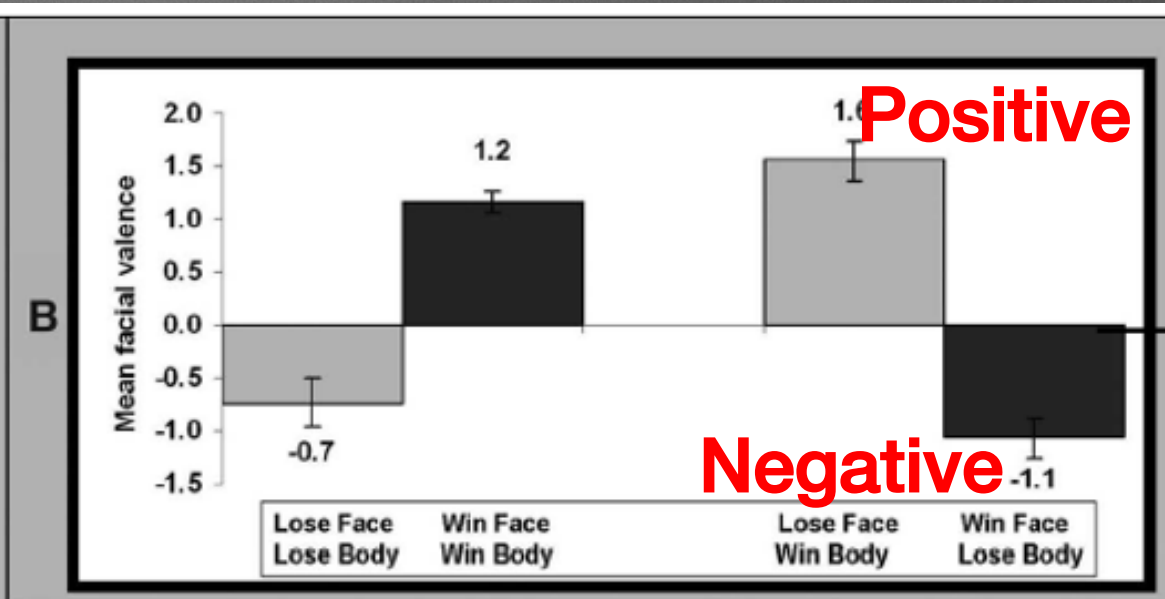


Fig. 2. Experiment 2. (A) Examples of original images of players (1) losing or (2) winning a point. The same faces combined with incongruent-valence bodies such as (3) a losing face on a winning body and (4) a winning face on a losing body. [All photos in Fig. 2 credited to a.s.a.p. Creative/Reuters] (B) Mean valence ratings of the facial expressions.

Compositionality hypotheses

- Holistic: Emotional displays are holistic motor programs transmitting a basic, universally recognizable emotion (e.g. fear, anger... Ekman 1993; Izard, 1977)
- Compositional: Emotion displays are signals conveying the core meaning of an internal state (e.g. positive vs negative, aroused vs calm... Russell, 2003; Scherer, 2005)
 - Features (or groups of features) of face and body are “meaningful” components that together make up the complex meaning of an emotional display
 - They recombine to create complex meanings

First experiment:

What are the components in displays of spontaneous emotion

- Victory vs defeat in high stakes sports competition
 - Spontaneous
 - Complex
 - Unfiltered by social conventions

First experiment: Method

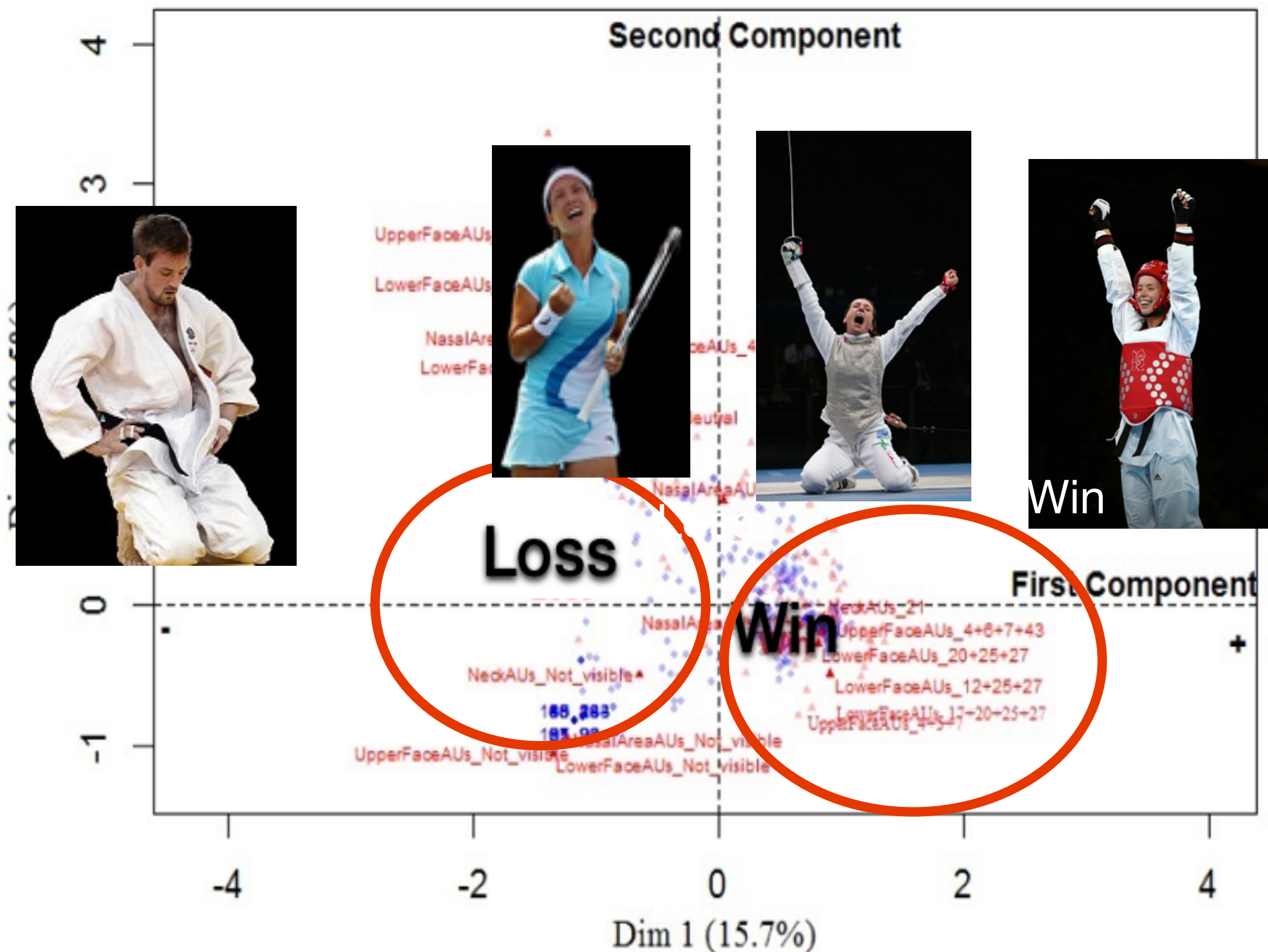
- 350 pictures and video frames of displays of extreme emotion in athletes in win and loss contexts (see Matsumoto et al., 2008; Aviezer et al., 2012)
- Eliciting queries: “Reaction to winning”- “reaction to losing” + sports

Analysis

Coding:

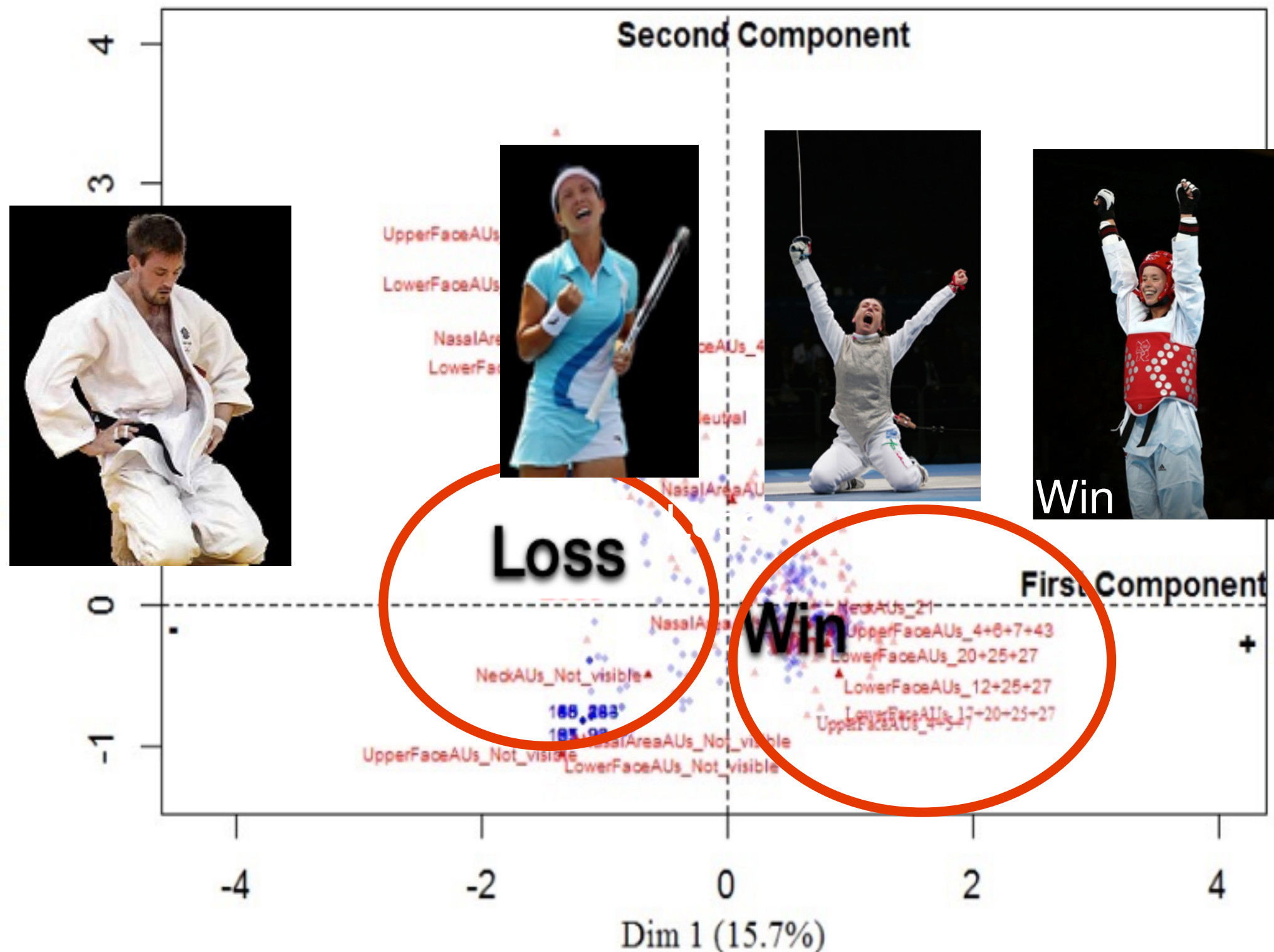
- Face, head position coded using FACS: Facial Action Coding System (Ekman, Friesen & Hager, 2002)
- Body postures were coded using BACS: Body Arrangement Coding System (Marom & Cavicchio, 2015)
- Multiple Component Analysis (MCA)

Results



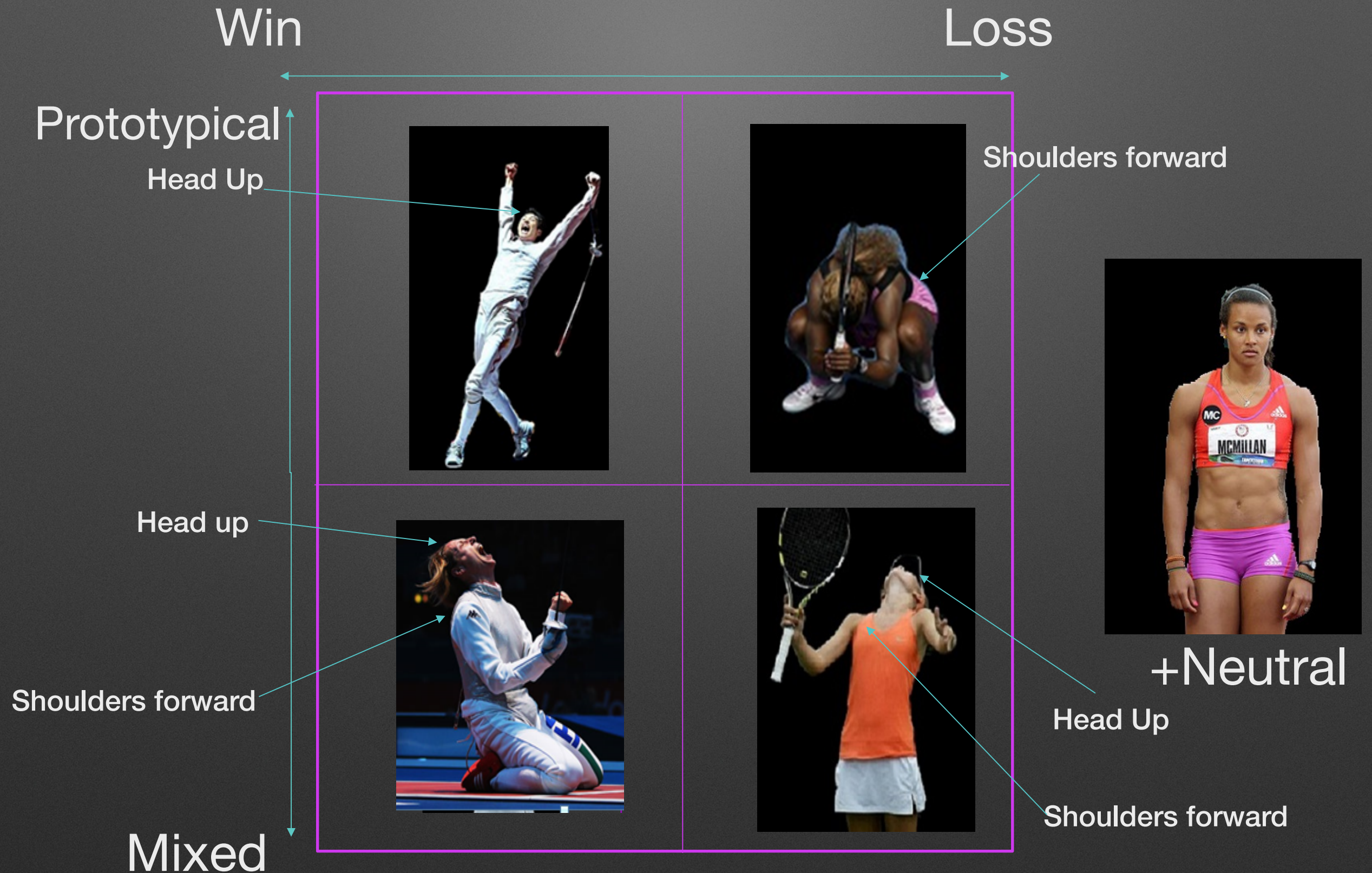
Research Question:

Are these features associated with particular meanings?



Second experiment:

Face and body features in emotion interpretation



Method:

Emotion rating

- 64 participants
- 184 pictures
- A continuous scale

Task: Emotion rating

- Opposite Emotions:

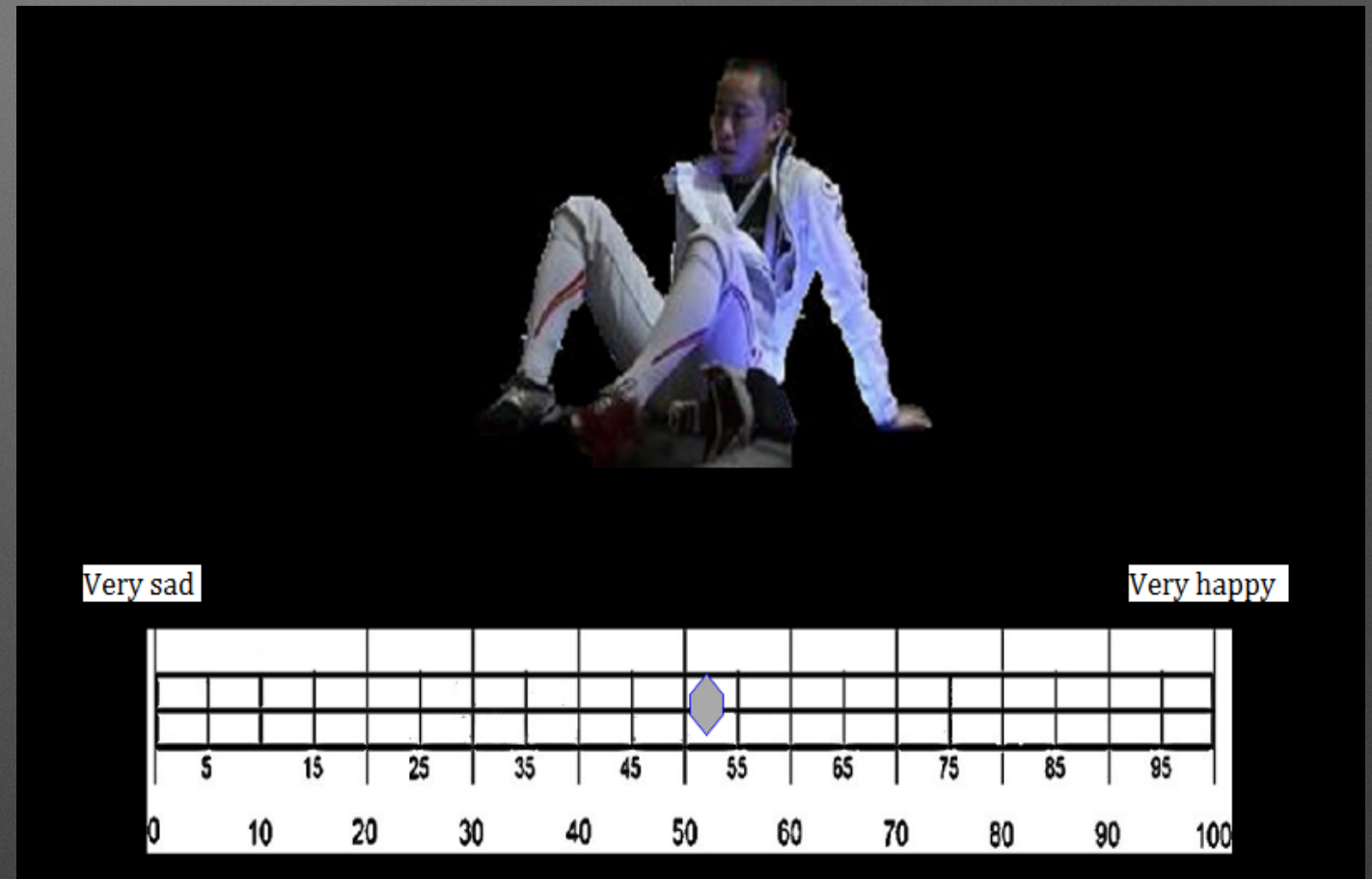
- Ashamed - Proud
- Very Sad - Very Happy

- Degree of Emotions:

- Angry - not Angry
- Frustrated - not Frustrated
- Disappointed - not Disappointed
(Wilson&Kerr, 2003)

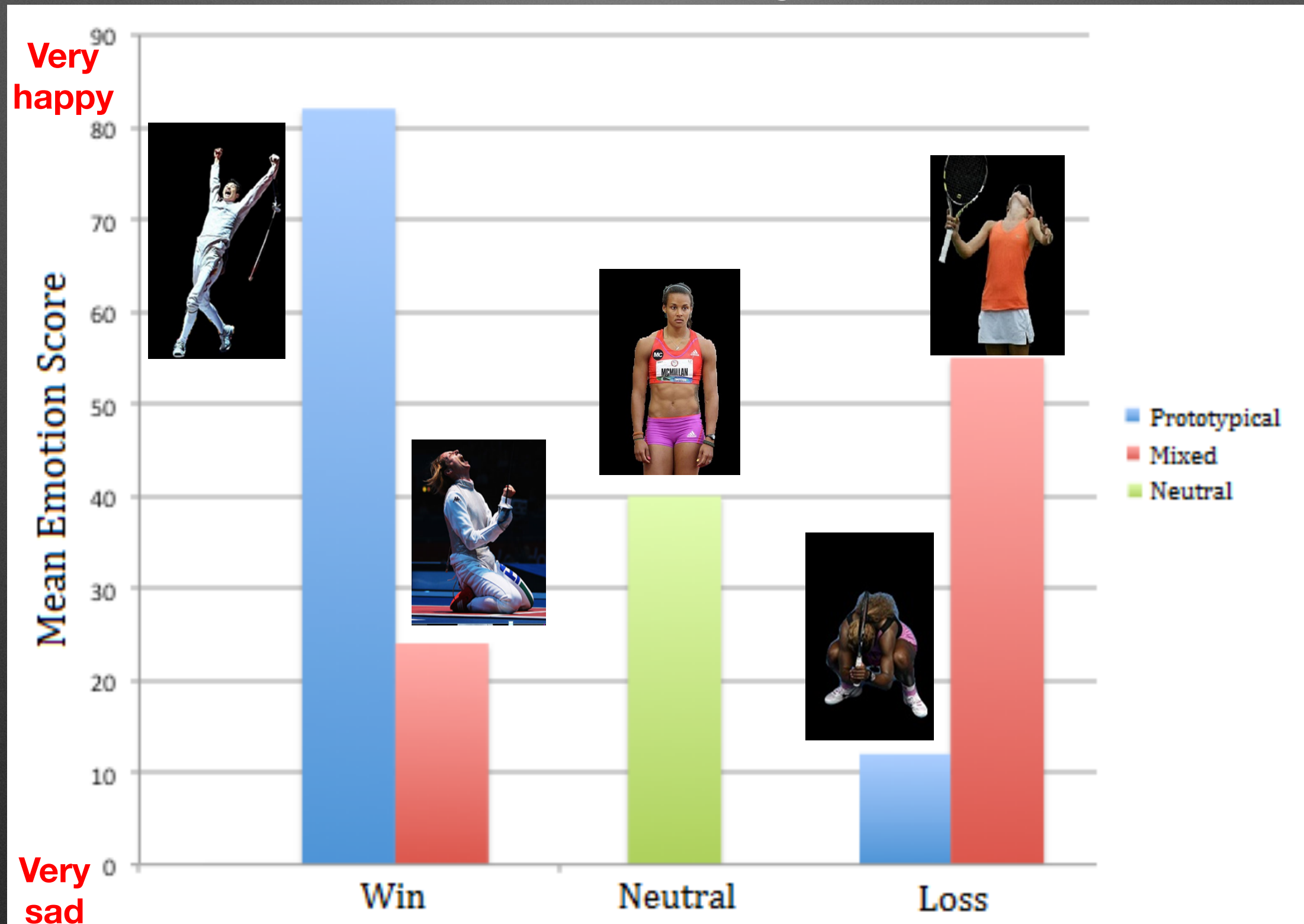
-Dimension:

- Submissive – Dominant (Preuschoft & van Schaik, 2000)



Results:

Emotion score by condition



Research Question

The results suggest that face and body features
influence the emotion ratings

Which features predict
each emotion?

Mixed effects regression model

Submissive/Dominant: Body postures

Submissive

Dominant



Kneeling

Hands on face



Hands away
from face

Standing

Submissive/Dominant: Facial features

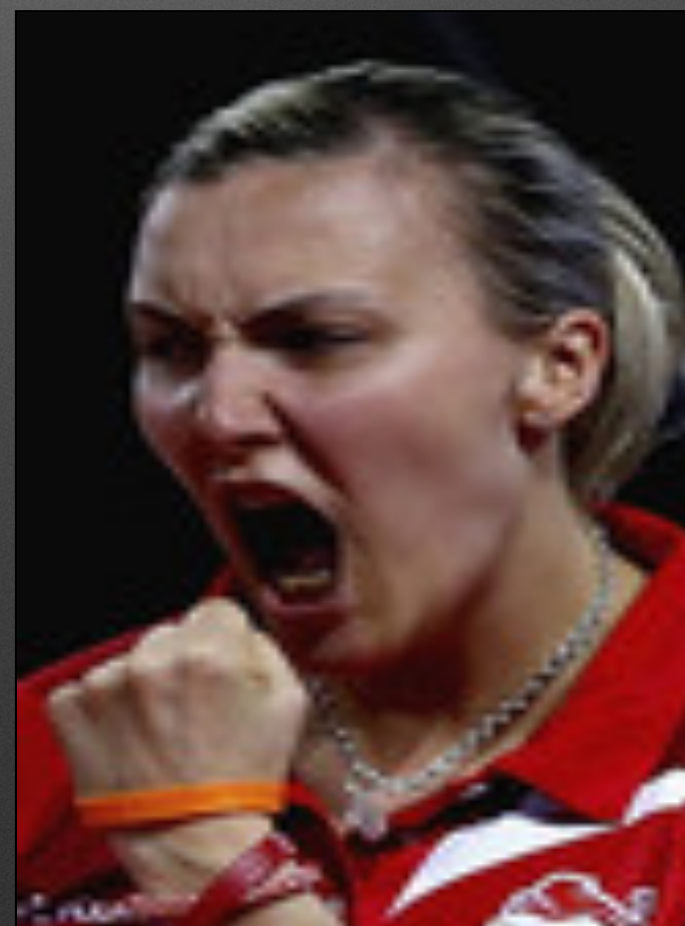
Submissive



Eyebrow raised

Lip part/
jaw dropped

Dominant



Contracted
upper face
Dilated nose

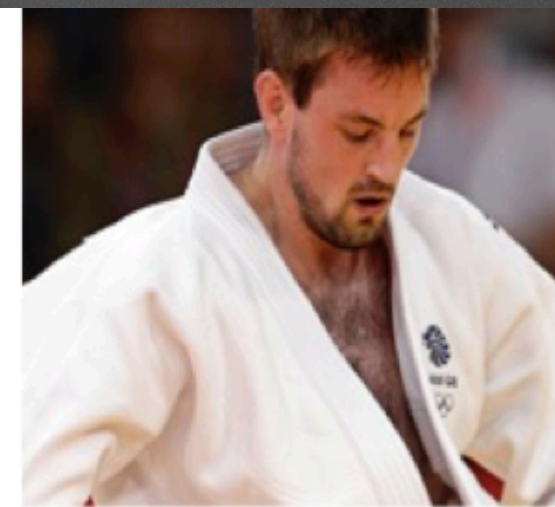
Open,
stretched
mouth

“Goal obstruction” emotions: Body asymmetry

	Body Forward	Body Asymmetry
Sad	✓	
Angry		✓
Frustrated		✓
Disappointed		✓
Ashamed	✓	



Disappointed/Frustrated



Ashamed/Sad

Df=1, $p < 0.01$

Ortony & Turner, 1990

Angry= Combination of Dominant face and body + asymmetrical body



Contracted upper face
Dilated nose
Open stretched mouth

Hands away from face
Standing



Body Asymmetry

Proud face = combination of happy +dominant

Contracted upper face

Dilated nose

Corners lip up
Chin raiser



Contracted upper face

Dilated nose

Lower lip depressor
chin raiser



Contracted upper face

Dilated nose

Corners lip up
Lower lip depressor
Chin raiser



Df=5, $p < 0.01$

2 Summary and conclusions

1. Features (or groups of features) of face and body are “meaningful” components that together make up the complex meaning of an emotional display
 - The biggest opposition is between dominant submissive (different from Aviezer’s et al. 2012 findings)
 - Perceptual prominence and redundancy of signals would offer an evolutionary advantage
 - Body asymmetry and goal obstruction emotions (Ortony & Turner, 1990)

2 Summary and Conclusions

2. Features recombine to create complex meanings

- Asymmetry+ dominant body and face=**Anger**
(opposite to Ekman's holistic theory, anger is a complex emotion)
- Lip corners up (happy)+ dominant face+dominant body= **Proud**

Is the communication of emotions compositional?



YES

Thanks to:

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