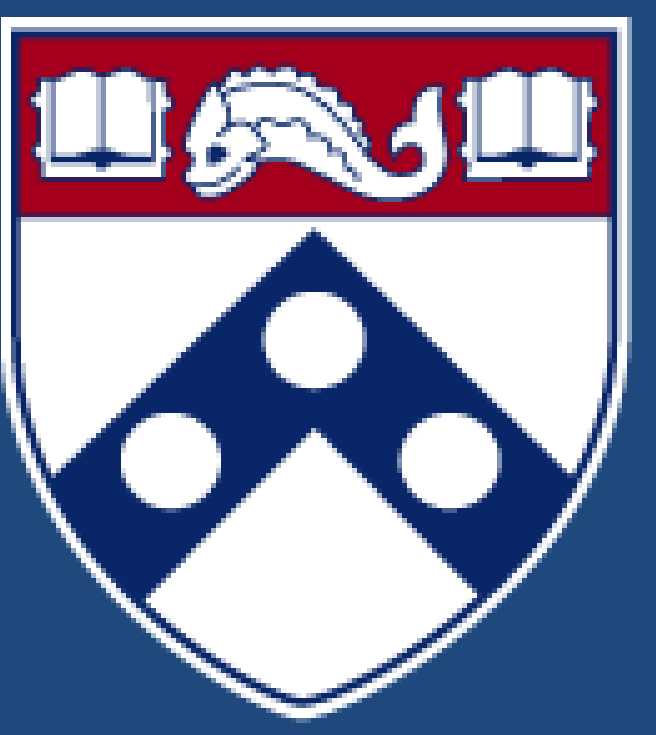# Emotion in Motion

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ABSTRACT

Emotion in Motion explores how people perceive the six universal motions: happiness, sadness, anger, fear, surprise and disgust, in motion capture data mapped to a character through two user studies. Further work will apply filters such as lowpass filters and smoothing to the motions in order to study how filters affect the emotional content of a motion.

EXPERIMENT 1

Setup: a motion capture session was held where an actor performed each emotion 10 times. 53 motion videos total were rendered with face/hands blurred & no head rotations. Screenshot examples below:

Happiness

Anger

Fear

Sadness
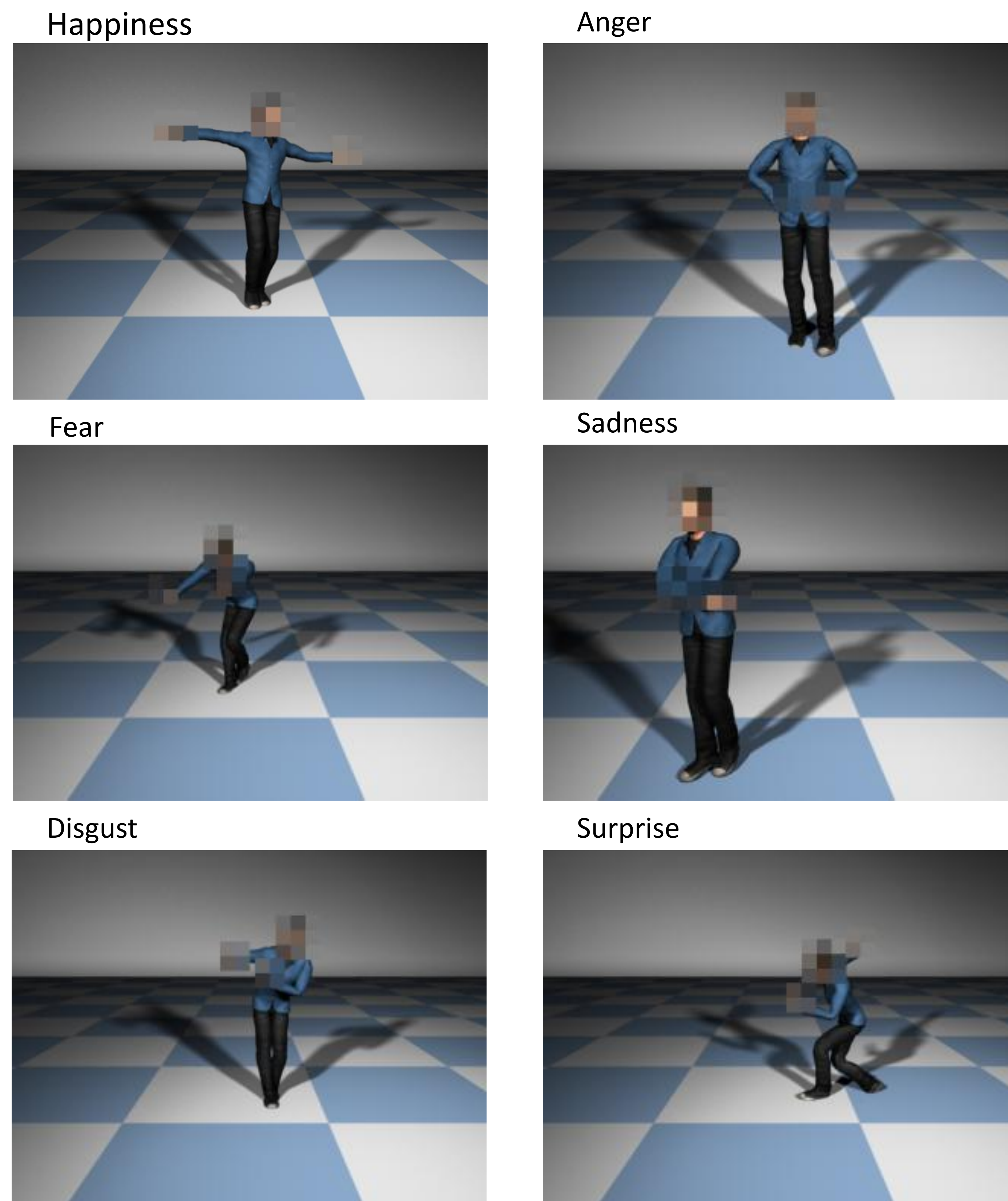
Disgust

Surprise

Survey: Users were shown the following 2-part survey, the same 53 videos for each part:

I. What emotion is being conveyed in the video?
Choose Happy, Sad, Surprise, Anger, Disgust, or Fear.

II. Choose the level of valence, arousal, dominance:
Valence: -1 (negative), -0.5, 0, 0.5, or 1 (positive)
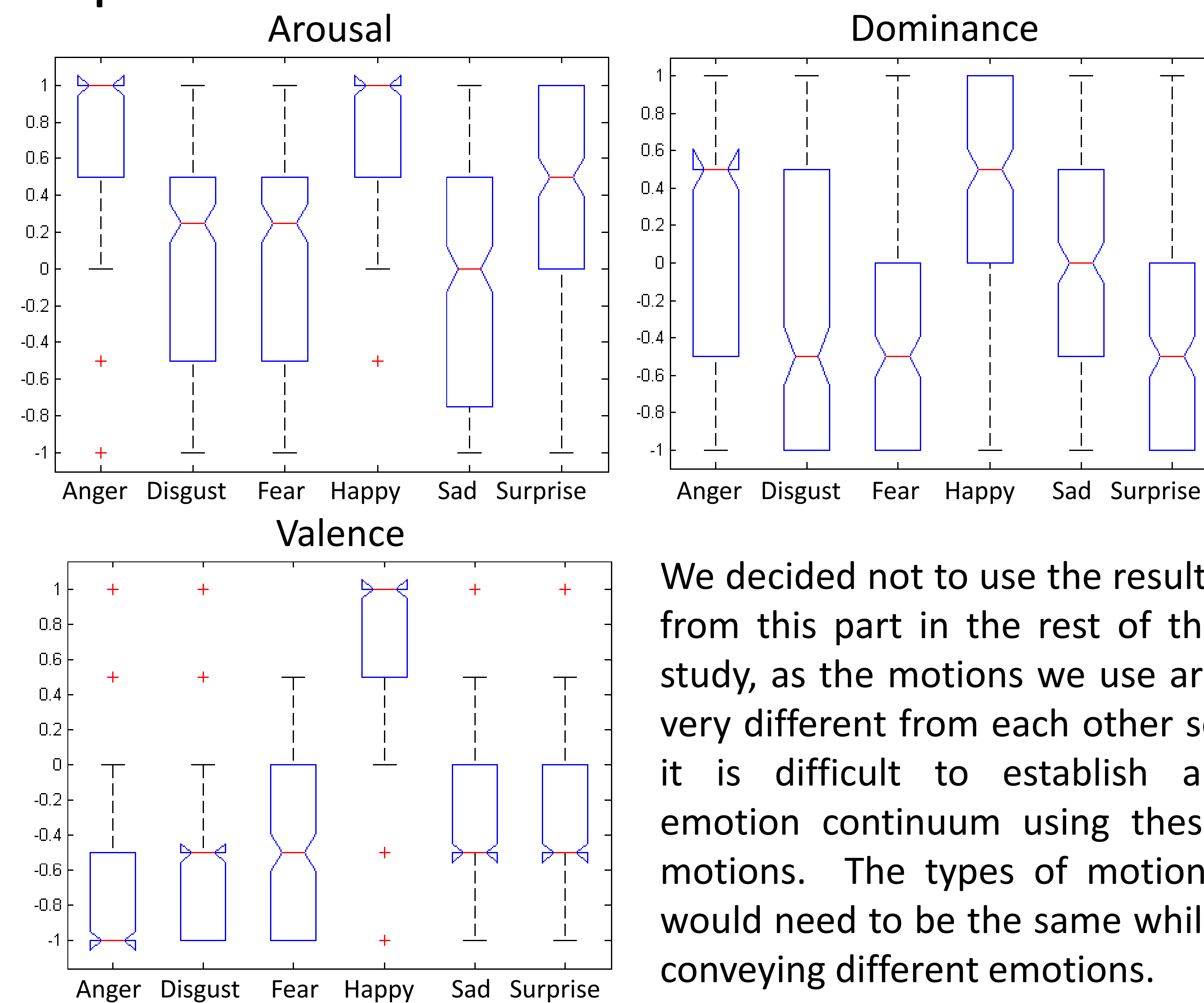**Arousal:** -1 (calm), -0.5, 0, 0.5, or 1 (excited)
Dominance:
-1 (less control), -0.5, 0, 0.5, or 1 (more control)

Exp 1 Results: Part I Confusion Matrix (% chosen)

Emotion	Happy	Sadness	Anger	Disgust	Fear	Surprise
Happy	**80**	0.56	16.11	0.56	0	2.78
Sadness	7.78	**40.56**	13.89	16.67	14.44	6.67
Anger	9.09	6.82	**73.18**	7.73	1.82	1.36
Disgust	11.11	15	8.33	**47.22**	11.67	6.67
Fear	4.17	10	4.17	7.5	**68.33**	5.83
Surprise	11.67	10.56	10.56	7.22	11.11	**48.89**

Exp 1 Results: Part II ANOVA

Arousal

Dominance

Valence

We decided not to use the results from this part in the rest of the study, as the motions we use are very different from each other so it is difficult to establish an emotion continuum using these motions. The types of motions would need to be the same while conveying different emotions.
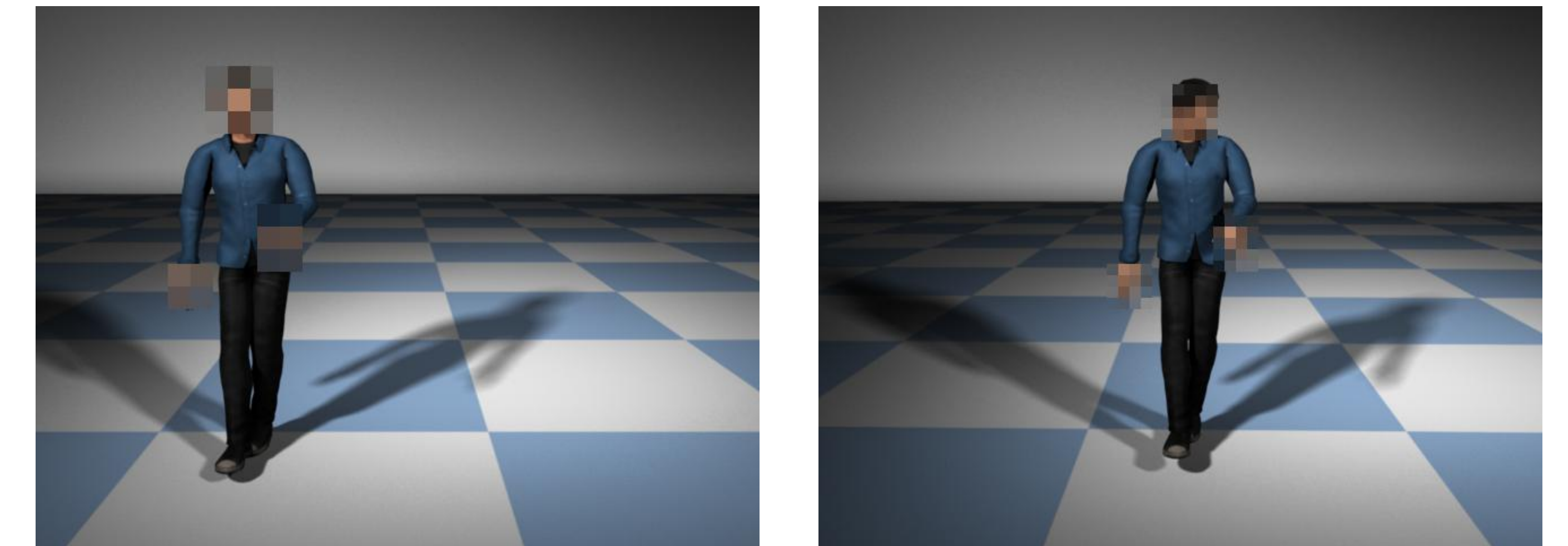
EXPERIMENT 2

A second experiment was conducted with the same motions to test differences caused by including head rotations, changing the camera angles, and reducing the blur, as well as testing the level of intensity/energy rather than valence/arousal/dominance:

II. Choose the level of intensity & energy of motion:
Intensity: 1 (not intense), 2, 3, 4, or 5 (very intense)
**Energy:** 1 (low exertion), 2, 3, 4, or 5 (high exertion)

Experiment differences. Left: Experiment 1 Fear, Right: Experiment 2 same frame

Exp 2 Results: Part I Confusion Matrix (% chosen)

Emotion	Happy	Sadness	Anger	Disgust	Fear	Surprise
Happy	**68**	3.33	24.67	0.67	0	3.33
Sadness	13.33	**50.37**	10.37	8.15	12.59	5.19
Anger	5.45	12.73	**72.12**	6.67	0	3.03
Disgust	9.63	20.74	7.41	**46.67**	11.11	4.44
Fear	0	6.67	0.95	9.52	**71.43**	11.43
Surprise	5.19	9.63	8.15	2.96	8.89	**65.19**

Exp 2 Results: Part II Multiple Comparison

Intensity

Energy
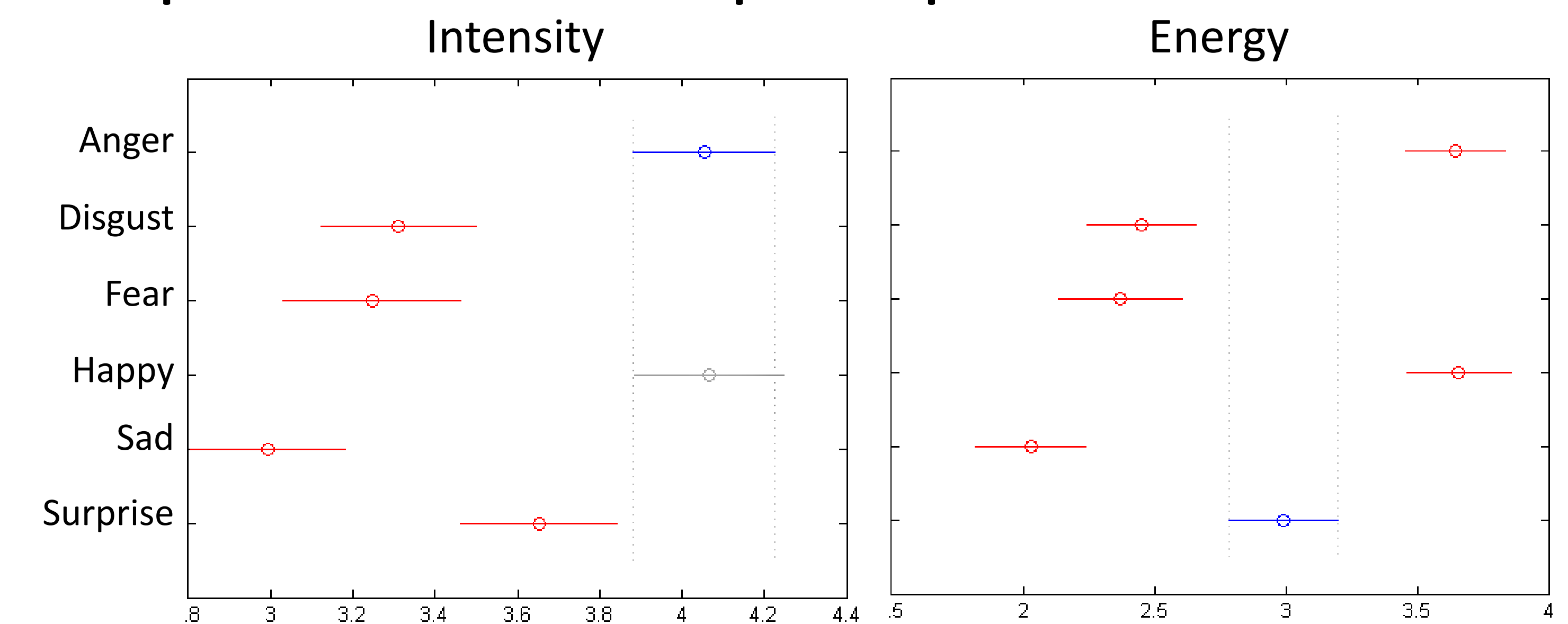
FILTERS & FUTURE WORK

The next step of this project is to study how filters affect users' perception of emotion in motion. Some of the filters we have already applied include smoothing and lowpass filtering to velocity and acceleration (left: lowpass, right: smoothing). Our next step is to conduct several more experiments with the same survey except with filtered motions.