How the Emotion We See is Influenced by the Emotion We Hear Depends on the Visibility of a Face

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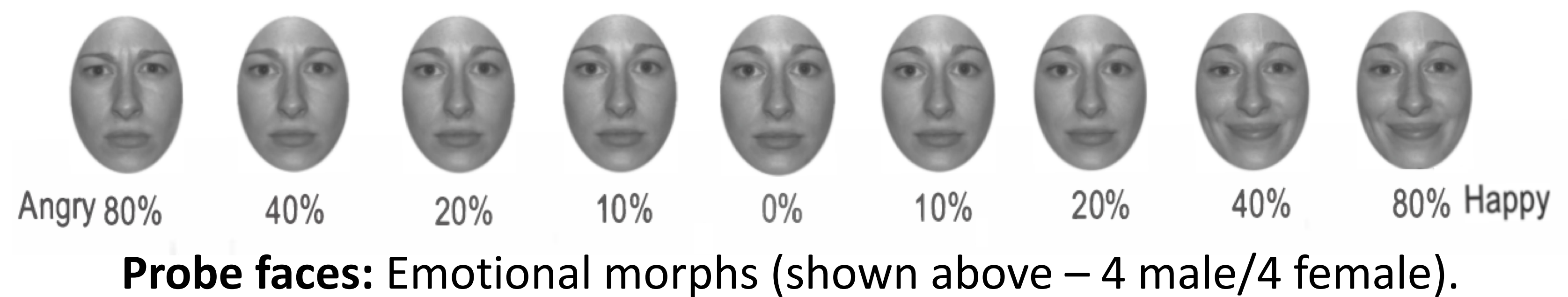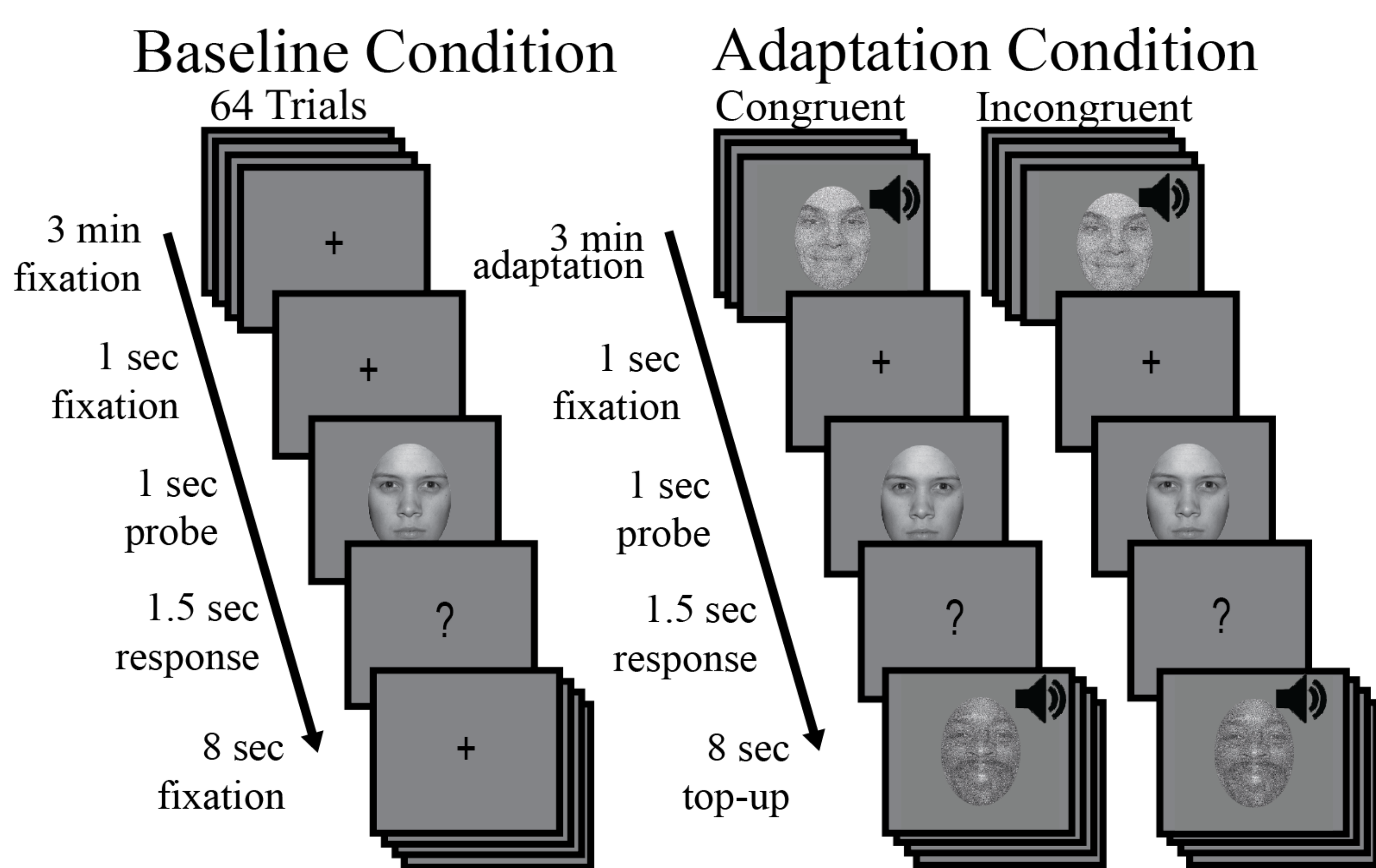[1]Developmental and Brain Sciences, University of Massachusetts Boston

Introduction

Emotions can be portrayed through several senses. We examined how perception of emotional faces is influenced by emotional voices. We used adaptation to quantify emotional processing for matched (congruent) compared to unmatched (incongruent) visual-auditory emotional stimuli. We expected stronger aftereffects for congruent versus incongruent stimuli. We used adapting faces made less salient by embedding them in white noise to allow for maximal multisensory integration.

Methods

During baseline, participants viewed unedited emotionally charged probe faces morphed on a continuum (80% angry - 80% happy). **During adaptation**, participants viewed either congruent (100% happy faces & positive crowd sounds) or incongruent (100% happy faces & negative crowd sounds) emotional audio-visual stimuli. Adapting faces were made less salient by being embedded in white noise. In a two-alternative forced choice task, participants judged probe faces as happy or angry.

Baseline Condition (64 Trials): 3 min fixation, 1 sec fixation, 1 sec probe, 1.5 sec response, 8 sec fixation

Adaptation Condition (Congruent / Incongruent): 3 min adaptation, 1 sec fixation, 1 sec probe, 1.5 sec response, 8 sec top-up

Angry 80% 40% 20% 10% 0% 10% 20% 40% 80% Happy

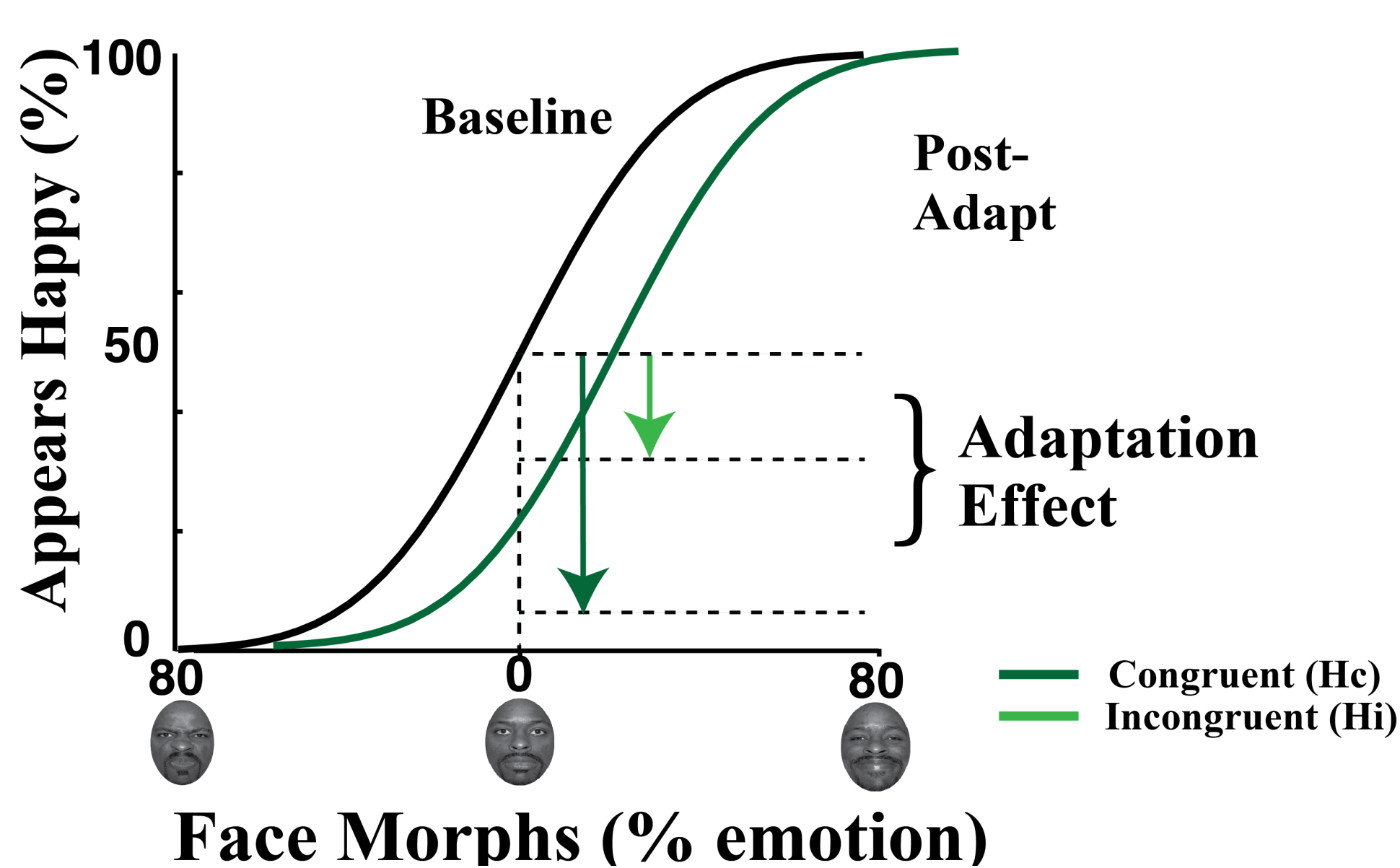**Probe faces:** Emotional morphs (shown above – 4 male/4 female).

Adapting Faces: 100% happy either embedded in white noise (left), unedited (center), or 4 in a ring shape (right) (15 male/15 female, or 30 configurations for ring)

Adapting Sounds: Nonlinguistic positive or negative crowd sounds (15 clips – 1 sec each)

Predictions & Results

Theoretical Predictions

Baseline / Post-Adapt / Adaptation Effect
Appears Happy (%): 0, 50, 100
Face Morphs (% emotion): 80, 0, 80
— Congruent (Hc)
— Incongruent (Hi)

We determined the point of subjective equality (PSE), the unique face morph judged equally happy or angry for each subject, at baseline, and changes in each participant's PSE post-adaptation.

Shift in Point of Subjective Equality (Happy / Angry)
Faces in Noise, Faces Without Noise, Ring of Faces
Happy Bias / No Bias / Angry Bias
Congruent / Incongruent

	Faces in Noise		Faces Without Noise		Ring of Faces	
n =	n = 17	n = 17	n = 23	n = 21	n = 12	n = 13
Mean trial # =	61.35	62.18	61.92	59.73	63.17	62.23

We expected

(1) _stronger adaptation for congruent vs incongruent_ visual-auditory emotional stimuli.

(2) _stronger adaptation for less salient faces_, embedded in white noise, since these faces should allow for stronger integration with voices given the _principle of inverse effectiveness_ (Stein & Meredith, 1983).

(3) _stronger adaptation to a crowd of faces,_ given their matching numerosity with the auditory stimuli.
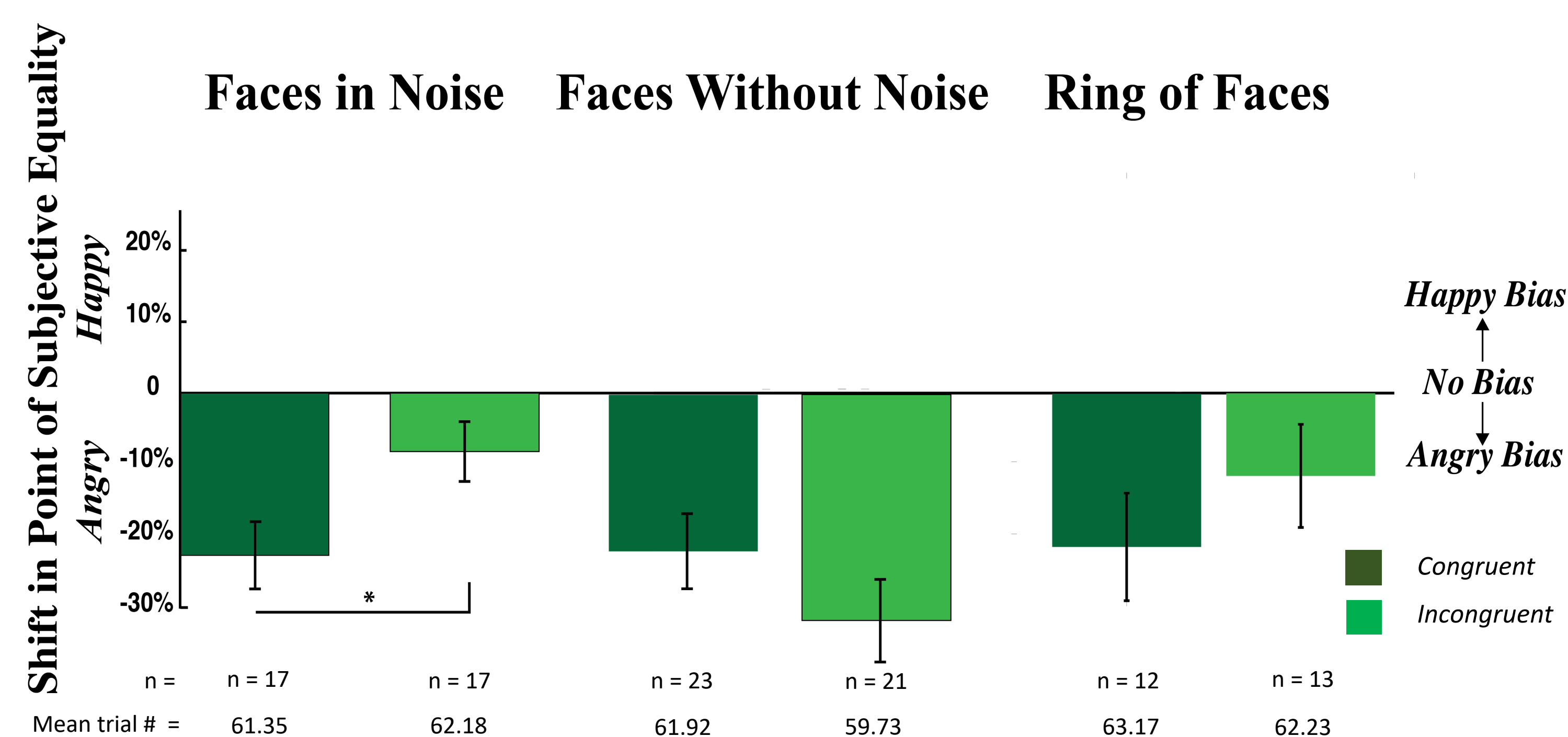
Adapting to happy faces induced stronger adaptation when emotional voices were congruent vs incongruent, but only when faces were less salient and embedded in noise.

We found no difference if congruent vs incongruent auditory crowd sounds were presented with a crowd of visual faces.

Discussion

➢ **The representation of a given emotion is enhanced when it is accompanied by an emotional sound of matched valence compared to when the sound valence does not match.**

➢ **Integration of emotional information may be more effective when faces are embedded in white noise, and are less salient, due to the principle of inverse effectiveness**

References

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