



The Impact of Facial Expression and Head Orientation on Personality Perception

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1. Introduction

→ Why Do Facial Expressions and Head Pose Matter for Personality Perception?

Motivation

- People rapidly form personality impressions from non-verbal cues such as facial expressions and head orientation.
- These impressions play a crucial role in social interaction, trust, and communication.
- With the rise of video-based communication, virtual humans, and neural rendering, understanding these cues has become increasingly important.

→ What Prior Work Shows

1

Prior research in social computing and affective computing shows that facial expressions, gaze, and head motion play a central role in how personality is perceived in video-based interactions.

2

Several studies demonstrate that personality traits—particularly Extraversion—can be predicted from facial expressions in conversational videos and vlogs. These works establish strong correlations between non-verbal behavior and perceived personality. However, these approaches are primarily observational:

- they analyze naturally occurring videos
- multiple factors (identity, speech content, expression, pose) vary simultaneously
- causal interpretation is therefore limited

3

As a result, it remains unclear which specific non-verbal cues actually drive changes in personality perception, and to what extent they do so independently.

→ 2.1 Related Works

Personality Perception from Facial Behavior

- Cognitive neuroscience shows that the human visual system processes static facial features (identity) separately from **dynamic cues** such as facial expression and head pose, using specialized neural pathways.
- Research in social perception demonstrates that:
 - Facial appearance and expression lead to systematic **Big Five** personality impressions
 - These impressions **emerge rapidly and consistently**, even without linguistic or biographical information
- According to the 2D model of face evaluation, personality impressions are largely organized around:
 - Valence (intentions, trustworthiness)
 - Dominance (power, physical capability)
- Dynamic nonverbal cues play a critical role:
 - Facial motion and head orientation influence perceived personality
 - Even neutral faces can **convey different social meanings depending on orientation**
- Personality perception is strongly shaped by dynamic facial cues, not only static facial appearance.

→ 2.2 Related Works

Neural Talking-Heads and Face Reenactment

Neural Talking-Heads & Controlled Face Reenactment

- Recent advances in neural talking-head synthesis and face reenactment enable:
 - identity-preserving facial animation
 - **motion transfer** driven by audio or source video
 - realistic expression and head pose control
- Modern approaches typically:
 - disentangle identity appearance and facial motion in latent space
 - rely on unsupervised keypoints, local transforms, or dense motion fields
 - ensure **temporal coherence** and **expressive realism**
- Recent researchs increasingly emphasize social interaction:
 - Interactive talking-listening behaviors
 - Socially meaningful nonverbal cues in conversational settings

→ 2.2 Related Works

Neural Talking-Heads and Face Reenactment

Limitation of Prior Work

Most prior systems:

- vary **multiple cues** simultaneously (expression, pose, audio, identity)

This makes it difficult to determine:

- whether perceived personality differences arise from
 - facial motion itself
 - identity or linguistic content
 - or synthesis artifacts

Our Contribution

We adopt a controlled, ceteris-paribus design:

- fixed identity, audio, lighting, background, and duration
- isolated manipulation of facial expression and head orientation

Our work aim to establish causal links between isolated nonverbal cues and personality perception.

→ 3. Stimuli Generation

- Base Identity
 - A **single identity** is used throughout the study
 - Reference images:
 - **neutral** facial expression, uniform lighting, head-only portrait views (frontal and left)
 - Identity images selected from **CMU Multi-PIE**
 - controlled capture conditions
 - consistent background and illumination

Using a single identity sacrifices generalizability but provides a **clean experimental setup**, allowing perceptual differences to be attributed directly to dynamic nonverbal cues rather than static facial appearance.

→ 3. Stimuli Generation

- Driving Videos & Emotion Selection
 - Facial motion sourced from **RAVDESS**:
 - professionally acted emotional speech
 - natural **facial motion** and head dynamics
 - **Audio removed** to eliminate emotional tone of voice
 - Clips are around 3-4 seconds
 - Four emotional expressions selected:
 - Anger, Happiness, Sadness, Surprise
 - Driving clips manually chosen to ensure:
 - **clear emotional dominance**
 - comparable duration and **expressive intensity**

→ 3. Stimuli Generation

→ Neural Reenactment

- Talking-head videos generated using **LivePortrait**
- Model disentangles:
 - identity-specific appearance
 - facial expression and head orientation
- Motion transfer achieved via:
 - dense motion fields
 - implicit keypoints
- High-fidelity reenactment minimizes:
 - expression smoothing
 - rendering artifacts
 - uncanny valley effects

Design Choice:

Perceived personality should be driven by social cues,
not synthesis artifacts.

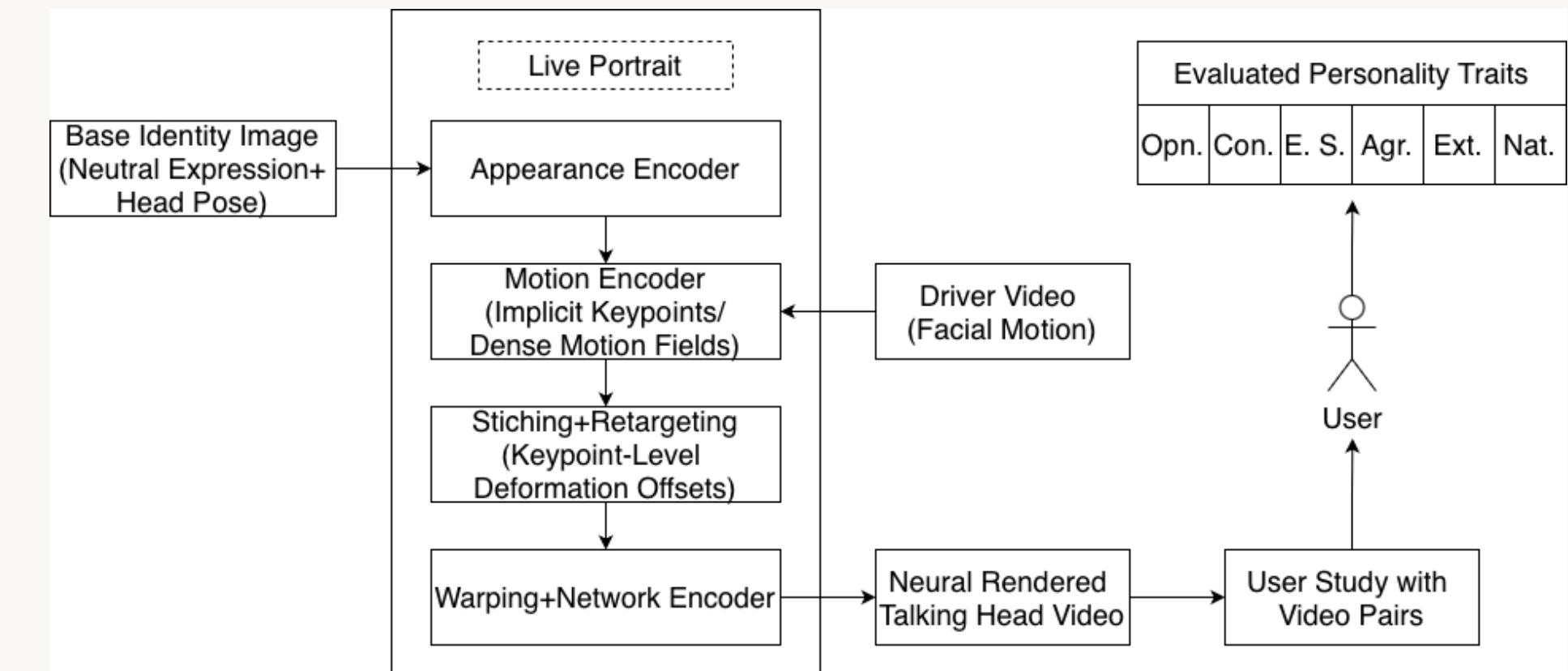


Fig. 1. Overview of the neural reenactment pipeline based on LivePortrait.

→ 3. Stimuli Generation

→ Pair Construction (Ceteris Paribus)

From 8 base conditions, we construct 10 comparison pairs:

- Same emotion, different head pose (4 pairs)
 - frontal vs. left-facing
 - isolates head orientation
- Different emotion, same head pose (6 pairs)
 - frontal view only
 - isolates facial expression
- Presentation controls:
 - randomized pair order
 - randomized left-right placement

Outcome:

Each comparison isolates one visual factor at a time, enabling interpretation.

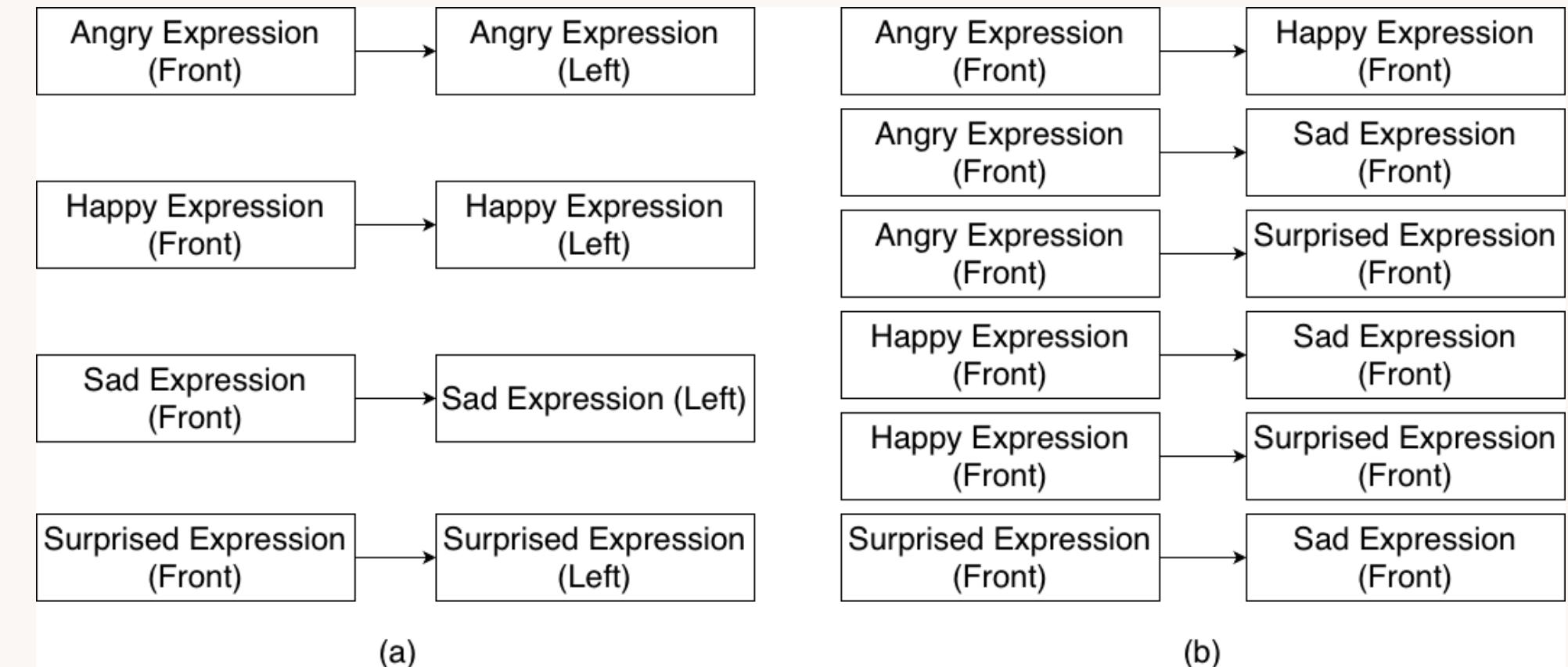


Fig. 2. Pair construction strategy used in the user study.

→ 4.Experiments

→ Study Design

- **Forced-choice pairwise comparison** paradigm
- Participants compare two neural-rendered talking-head videos at a time
- Each comparison isolates one visual factor (expression or head pose)

→ Participants

- N = **80** participants recruited via Prolific
- Location: UK & US
- Fluent in English
- Desktop / laptop usage required

→ Procedure

- Web-based interface with informed consent
- Participants complete all tasks sequentially
- Each video pair evaluated on 6 dimensions:
 - Openness
 - Conscientiousness
 - Extraversion
 - Agreeableness
 - Emotional Stability
 - Naturalness (control)
- Forced-choice answers:
 - Left / Equal / Right

→ 4.Experiments

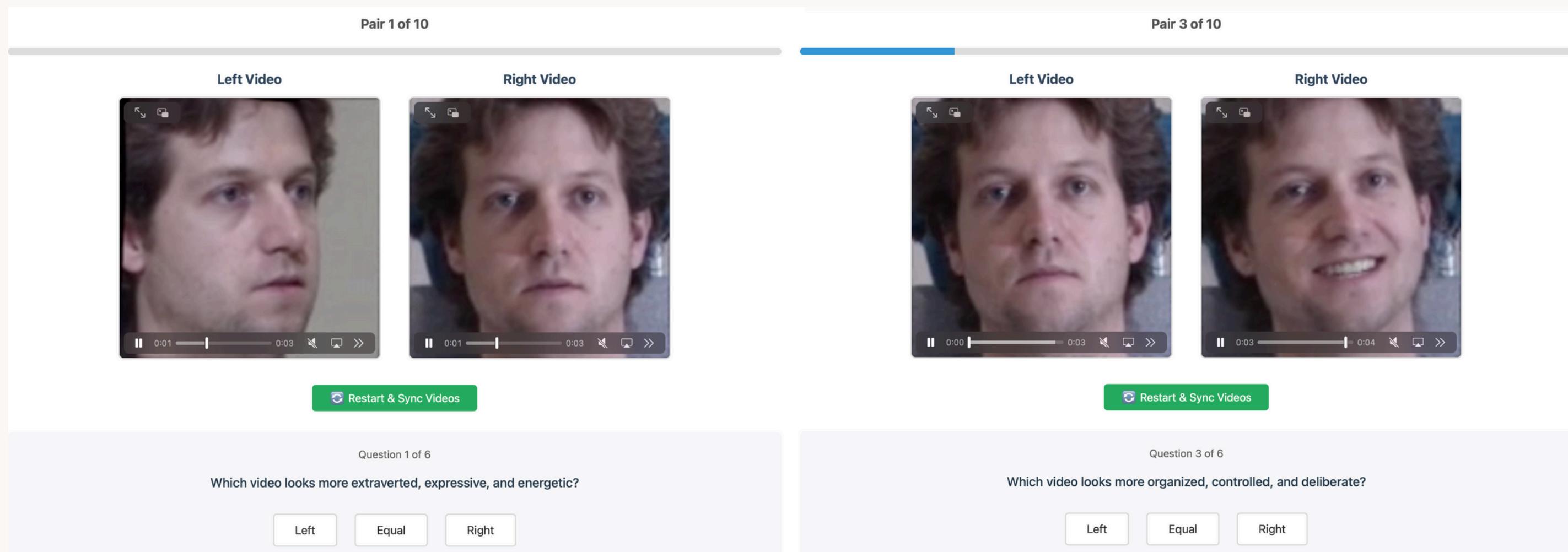
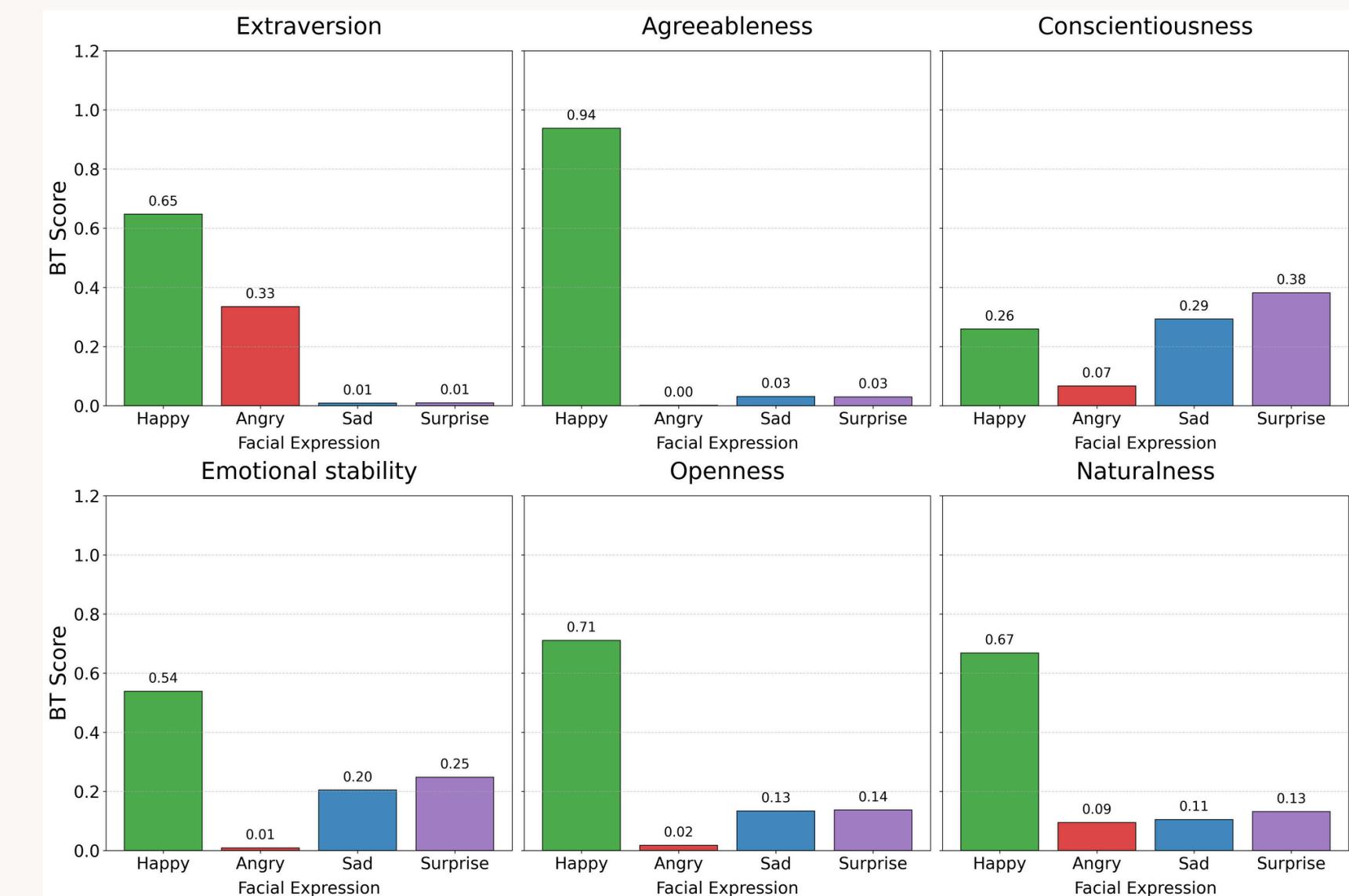


Fig. 3. Screenshots from the user study: a pair with the same expression (left) and different poses, and different expressions with a frontal view (right).

→ 5. Analysis and Results

Bradley-Terry Analysis

- We apply Bradley-Terry modeling to obtain probabilistic rankings of facial expressions for each trait.
- Results reveal a clear **dominance of happy expressions for positive social traits**:
 - Agreeableness: BT = 0.94
 - Openness: BT = 0.71
 - Strong effects also observed for:
 - Extraversion
 - Emotional Stability
- Key insight:
- Happy expressions are the strongest indicator of positive personality perception in neural-rendered faces.



→ 5. Analysis and Results

Arousal vs. Valence

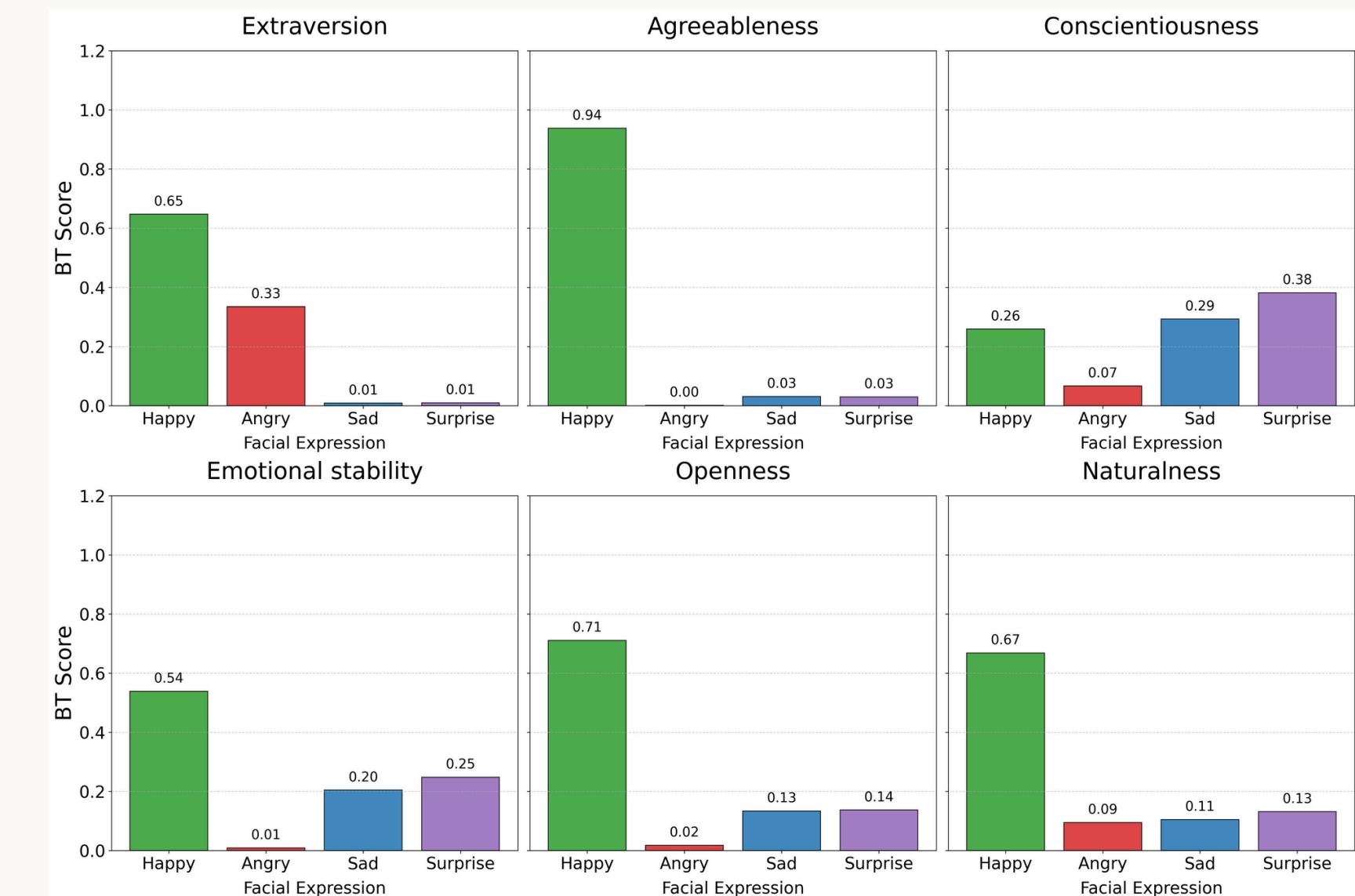
- **Angry expressions** also score relatively high in Extraversion (BT = 0.33), despite being negatively valenced.
- This suggests:
 - **High emotional arousal**, rather than positivity alone, contributes to perceived extraversion.

Conscientiousness & Naturalness

- Unlike other traits Surprise scores highest for conscientiousness (BT = 0.38).
- Happy expressions are perceived as the most natural, but do not dominate conscientiousness.

Interpretation:

Participants did not simply select the most natural-looking videos, indicating no halo effect.

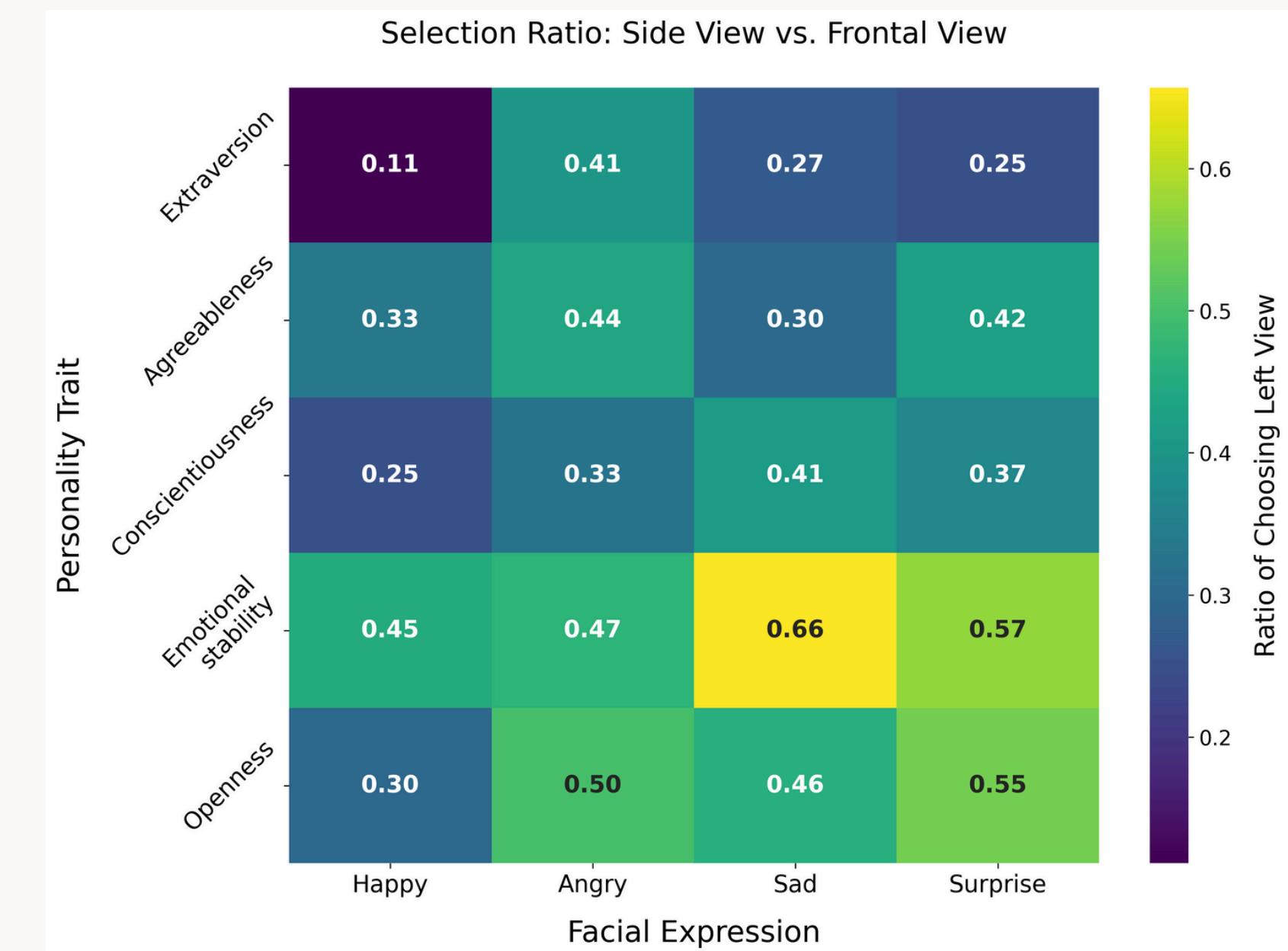


→ 5. Analysis and Results

Pairwise Comparisons & Head Orientation Effects

Pairwise Emotion Comparisons

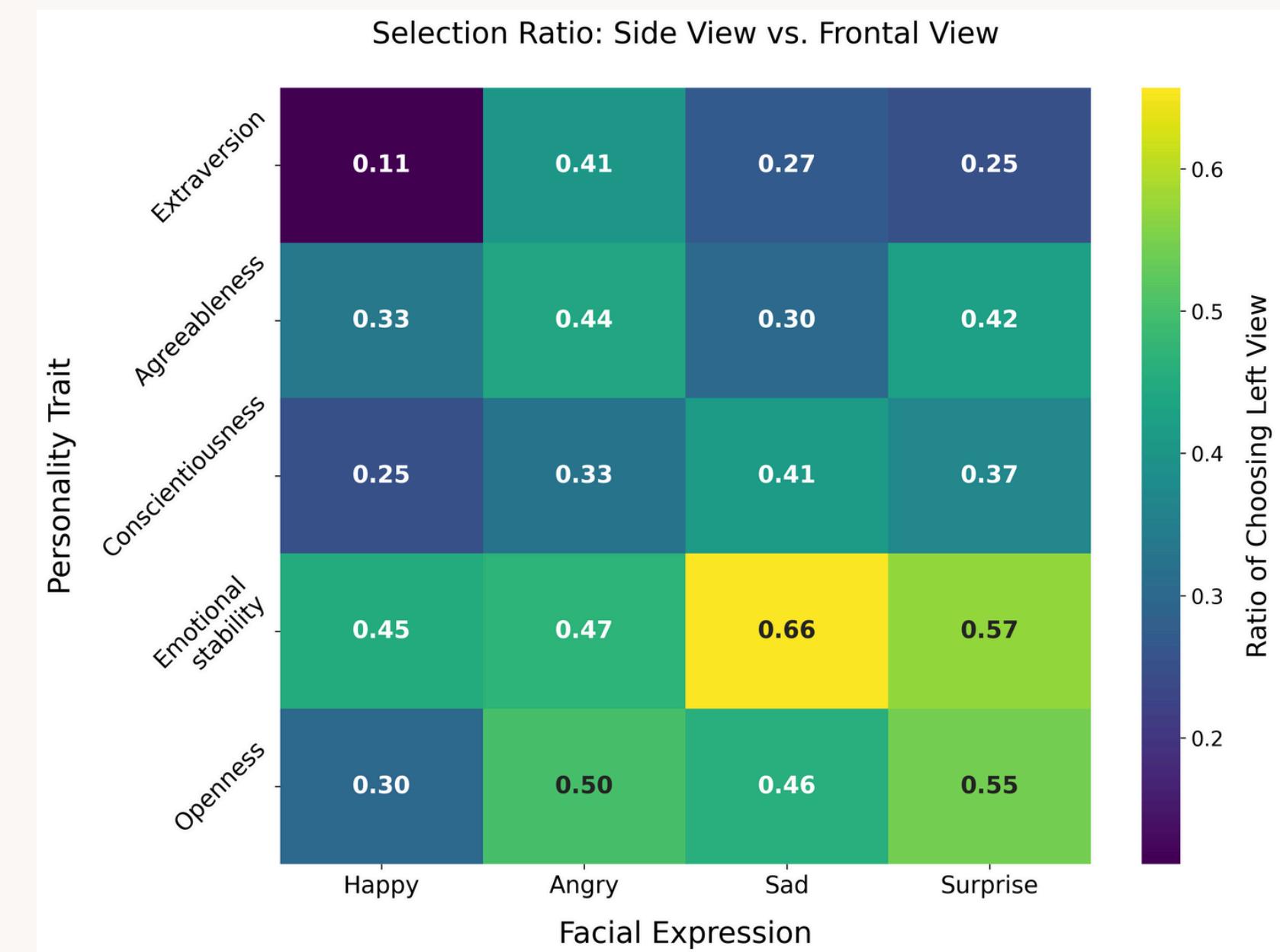
- Binomial tests confirm:
 - **Happy expressions dominate Angry and Sad expressions especially for:**
 - Agreeableness
 - Emotional Stability
- Example:
 - Happy vs. Angry:
 - Agreeableness = 1.00*
 - Emotional Stability = 0.94*
- Sad vs. Surprise:
 - No significant differences across traits ($p > 0.05$)
 - → **Nearly indistinguishable personality profiles**



→ 5. Analysis and Results

Influence of Head Orientation

- Comparing frontal vs. left-facing views under identical expressions:
 - Frontal view perceived as more:
 - Extraverted
 - Emotionally stable (in most cases)
- Exception: For **sad expressions, left-facing orientation** favored for emotional stability.
- **Head orientation** does not carry a fixed social meaning. Its effect **depends on** both the underlying emotional expression and the personality trait being judged



→ 6. Conclusion and Future Work

Conclusion

- We studied personality perception in neural-rendered talking-head videos using:
 - 4 facial expressions
 - 2 head orientations
 - controlled pairwise comparisons
- Key findings:
 - Facial expression is the primary driver of perceived personality
 - Happy expressions dominate:
 - Extraversion
 - Agreeableness
 - Emotional Stability
 - Sad and surprised expressions are perceived as conceptually similar
 - Head orientation interacts with expression:
 - Frontal view → more extraverted
 - Side view → higher emotional stability, especially for sad and surprised expressions
 - Participants rely on dynamic nonverbal cues, not perceived naturalness

Personality perception emerges from dynamic changes in expression and head pose, not from static realism.

→ 6. Conclusion and Future Work

Design Implications

- Findings can be translated into automated design rules for:
 - animation
 - games
 - virtual agents
- Example:
 - switch from frontal → side view when expressing sadness
 - use high-energy expressions + frontal view to emphasize extraversion and agreeableness

Future Work

- Integrate auditory cues (voice, prosody, dialogue), especially for:
 - conscientiousness, which is weakly conveyed visually
- Study longer interactions to examine:
 - temporal stability of personality perception
 - adaptation effects over time
- Extend beyond short-term exposure and single identity

Thank you for listening me
Q&A