



# Facial Expressions May Forecast Depression Diagnosis in 5 Years

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## INTRODUCTION

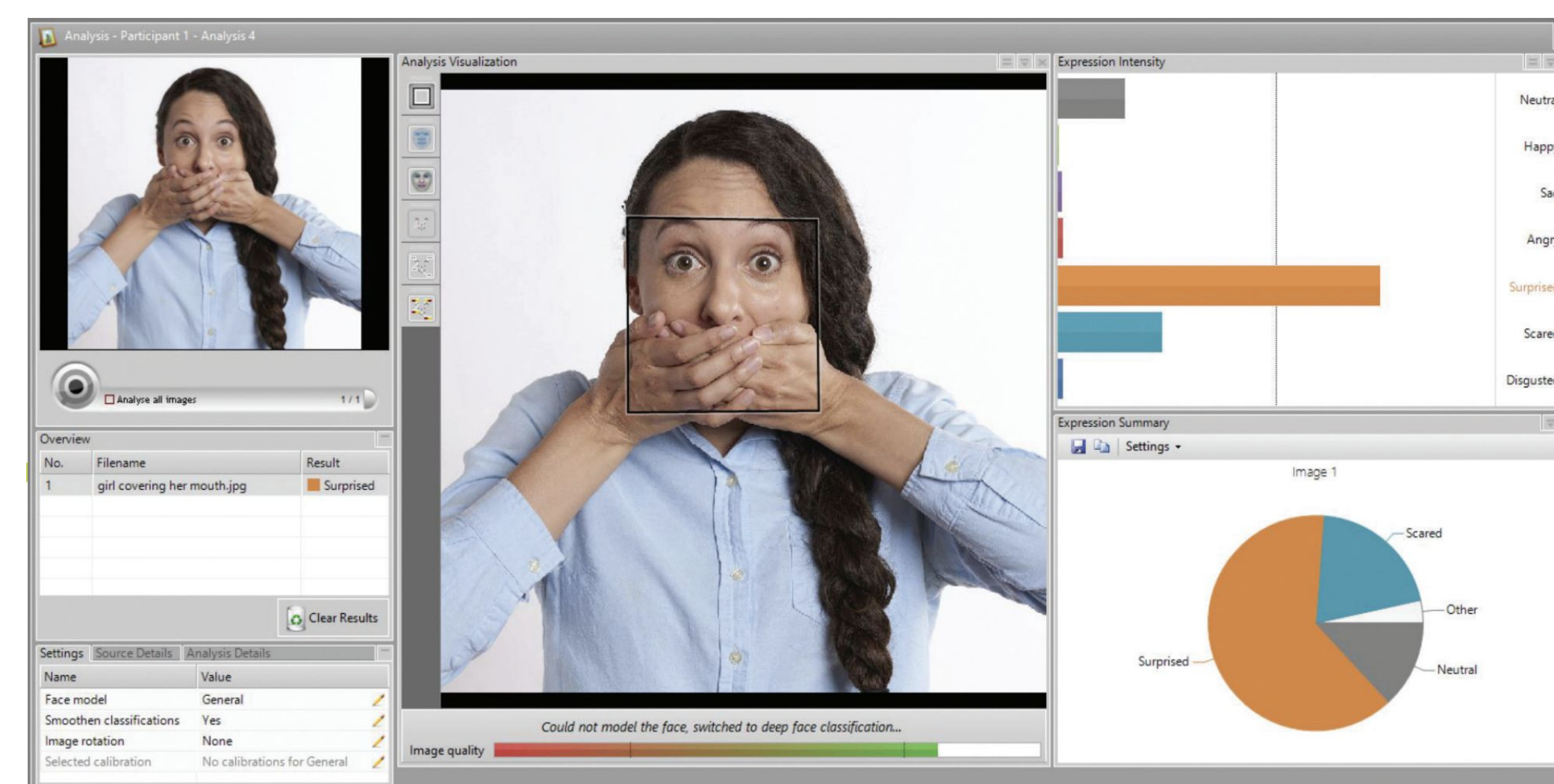
- Females are at 2x risk for developing depression
- Mid-adolescence is a critical period for early identification & intervention to combat depression
  - Onsets in adolescence (around age 14) (Daly, 2022)
- A growing body of research attempts to decipher future vulnerability to depression, using neuroimaging and experience sampling methods.
- Using these methods in the real world for preventative purposes is difficult at the moment
  - High costs
  - Complexity of methods
- We need objective, cost-effective, and user-friendly methods to early detect mental illnesses.
  - New computational methods are promising as objective
- Research suggests that clinicians rely heavily on behavioral observation of affective expressions as signs indicating current depression symptoms
  - Communicate the affective state
  - Communicate needs
  - Elicit a behavior in the other person
- Facial recognition softwares can be objective tools for identification and rating of facial expressions.
  - How to objectively measure facial expressions?
  - How to measure emotional reactivity in everyday life without a strong emotional stimuli?

### Research Question:

Can emotional facial expressions forecast future depression diagnosis during the critical period of mid-adolescence?

## METHOD

- **Participants:** n=550 (88.5% Caucasian)
  - Healthy adolescent females
- **Time 1:** Age range: 13-15
  - KSADS diagnostic interview (videotaped)
- **Time 2:** Age range: 18-20
  - KSADS diagnostic interview



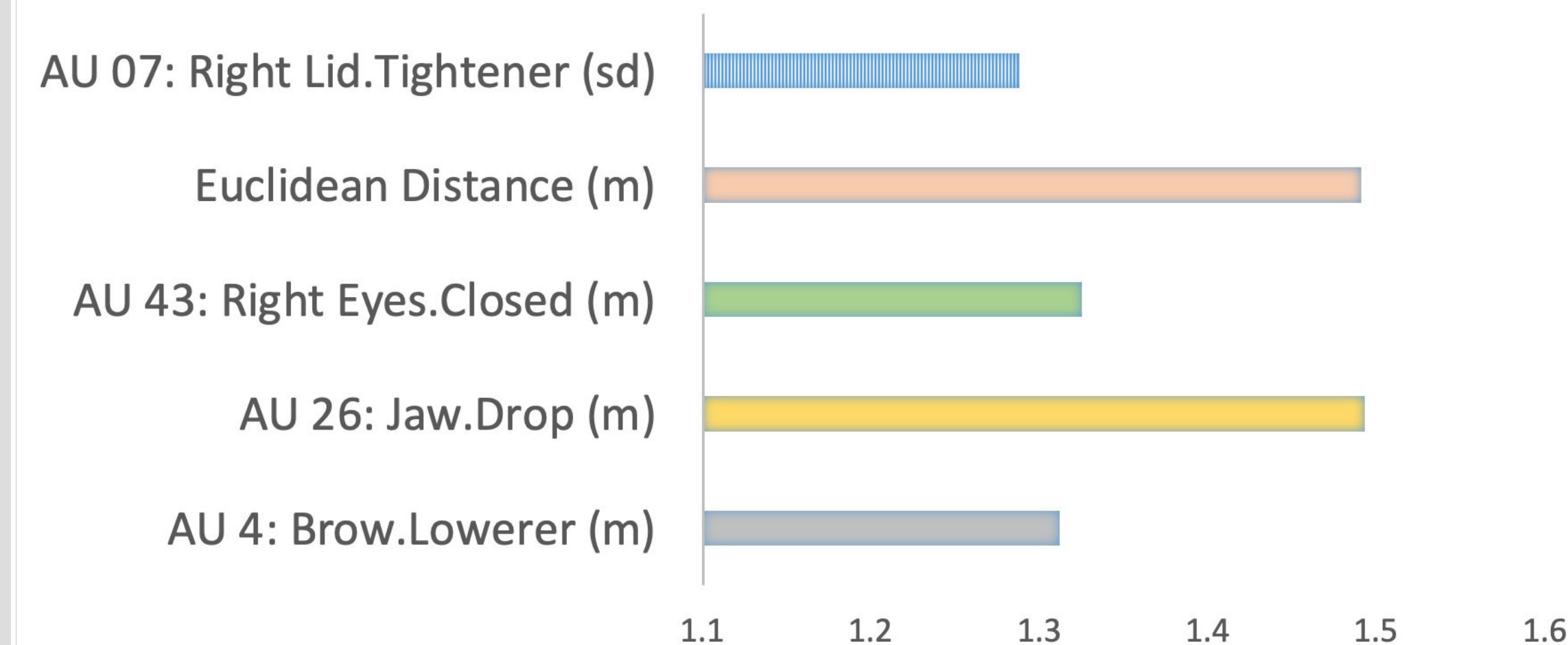
### Facial Movement Analysis

#### FaceReader Software

- Facial expression classification
- Valence calculation
- Arousal calculation
- Action Unit classification
- Head movement direction

## RESULTS

### ODDS RATIOS



## RESULTS

### Logistic Regression

$$\chi^2 (24, N = 356) = 24.53, p = .003$$

Model was able to forecast future depression diagnosis with 80.2% accuracy, 11.4% sensitivity and 98.3% specificity. The strongest predictor of future depression diagnosis was mean euclidean distance, recording an odds ratio of 1.49.

## DISCUSSION

- It is possible to early identify and target depression with use of new AI technologies.
  - Non-verbal facial expressions might be promising markers of future depression risk.
  - These methods are objective and cost-effective, can be easily used across different healthcare settings
  - However, findings should be interpreted with caution
    - Facial recognition algorithms display reduced accuracy based on race and gender (Buolamwini & Gebru, 2018; Klare et al., 2012)
- Limitations:**
- These findings are generalizable to only Caucasian females
  - Future research should understand cross-cultural and ethnic differences in facial movement and associated depression risk

### Why is this important?

Considering the debilitating effects of depression for females starting adolescence, non-verbal facial expressions objectively recorded with AI can provide a promising tool to identify depression risk and intervene early

## REFERENCES

Daly M. (2022). Prevalence of Depression Among Adolescents in the U.S. From 2009 to 2019: Analysis of Trends by Sex, Race/Ethnicity, and Income. *The Journal of adolescent health : official publication of the Society for Adolescent Medicine*, 70(3), 496–499.  
Buolamwini, J., Gebru, T. "Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification." *Proceedings of Machine Learning Research* 81:1–15, 2018 Conference on Fairness, Accountability, and Transparency  
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