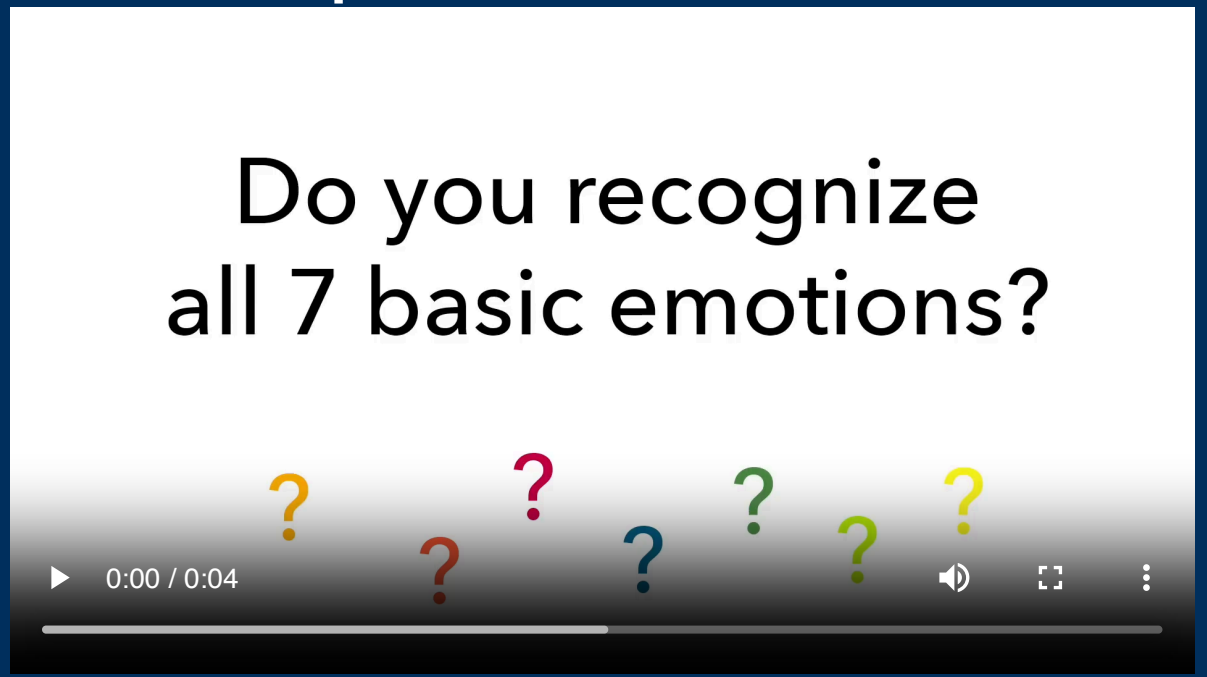
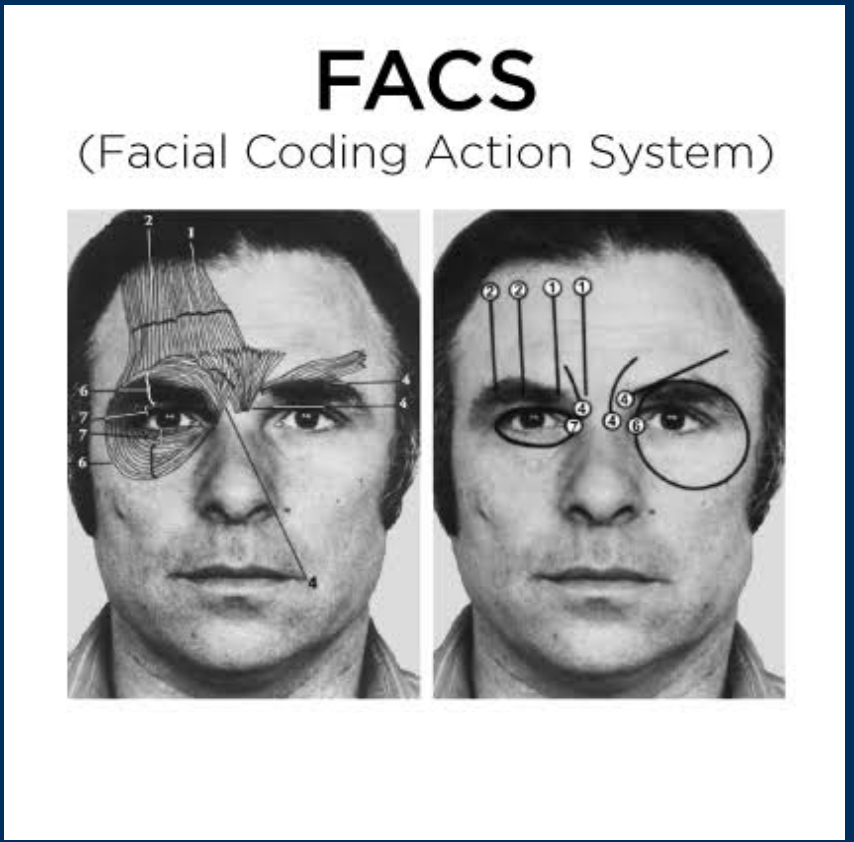
Facial recognition of emotions in autism

A formal meta-analysis

Warm-up


Do you recognize
all 7 basic emotions?
0:00 / 0:04


FACS
(Facial Coding Action System)

Introduction

Is emotion recognition impaired in autism?

Autism Spectrum Conditions (ASC)

- According to ICD-10 and DSM-IV:
  - Marked impairments in the use of facial expressions, gestures, and body postures
  - Difficulties sharing emotions
  - Difficulties responding to emotions of others
- These difficulties involve two important components of emotion processing:
  - Emotion production
  - Emotion regulation

Emotion recognition develops early

- 4-month-old infants can discriminate: anger, fear, sadness, happiness and surprise (Walker-Andrews, 1998)
- Between 8–10 months: emotional expressions begin to guide social referencing (Camras and Shutter, 2010)

Findings are inconsistent in ASC studies

- A detailed study with well-matched participant groups did not find any evidence for basic emotion recognition difficulties (Ozonoff et al., 1990)
- Others reported deficits for:
  - negative emotions (fear, anger, disgust, sadness) (anger: Ashwin et al. 2006; disgust: Wallace et al. 2008; Humphreys et al. 2007; Ashwin et al. 2006; sadness: Boraston et al. 2007; Corden et al. 2008; Wallace et al. 2008)
  - positive emotions (Humphreys et al. 2007)

Purpose of this meta-analysis study

- To examine if individuals with ASC are impaired in their ability to read basic emotional expressions
- If such impairment does exist, to answer reading of all emotions are equally affected or reading of certain emotions might be spared

Methods

- formal meta-analysis
  - n=48 papers published from 1989 to 2011
  - 932 participants

Literature search

- Studies published before December 2011
- Web of Science, PsychINFO, PubMed
- Keywords: autism, Asperger syndrome, pervasive developmental disorders, emotion recognition, emotion perception, facial expression, facial affect, face, body
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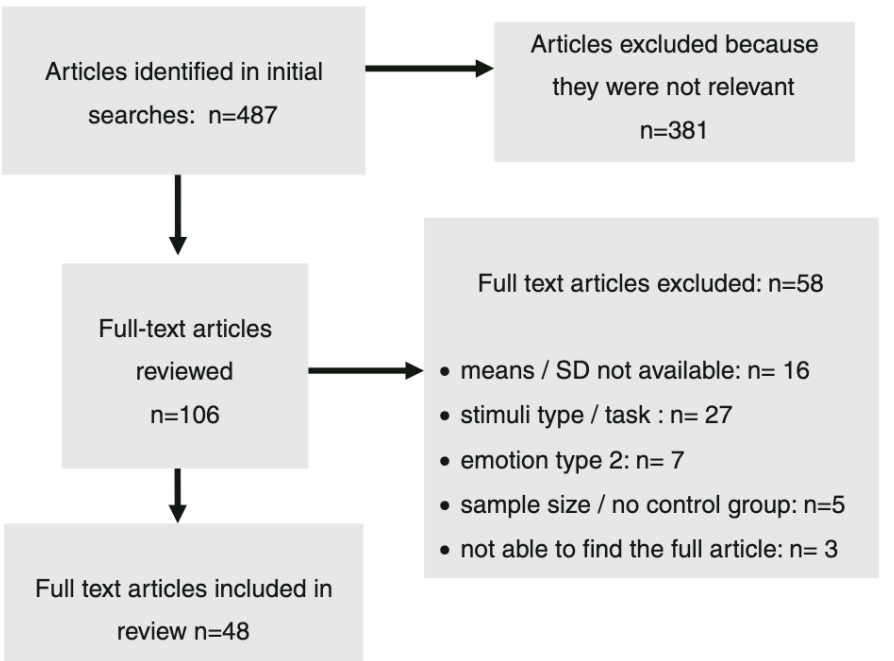

Fig. 1 Selection process. This *chart* indicates how papers were selected for inclusion in the meta-analysis. Articles were excluded if they were not relevant (e.g. did not examine participants with autism, did not examine recognition of emotion, were review articles, were not published in English)

Included studies

- Inclusion criteria
  - published in English
  - ASC group and typically developed group
  - emotion recognition in visual modality
  - accuracy on behavioral tasks had to be available
  - examining ≧ 1 emotion(s) in six standard emotions: fear, surprise, anger, disgust, happiness and sadness

Extracted variables

- age
- gender
- IQ
- level of function
- type of task
  - **emotion labeling**
  - emotion matching
- type of stimuli: **static** vs dynamic

Data analysis

- effect size
  - Hedge's *d*
  - negative values: ASC performed worse than controls
- moderator effects (age and IQ), conducted in MetaWin 2.0 (Rosenberg et al., 2007)
- publication bias, `"meta"` package in R, `trimfill()` to ameliorate bias
- individual emotion comparisons (n=16 studies), ANOVA and *t* tests in SPSS

Main results

Overall emotion recognition deficit

- raw estimate of mean overall effect size is -0.80, 95% CI (-0.57 to -0.99).
  - but the studies also had substantial heterogeneity (Q total = 77.83, df = 49, p = 0.0054), *indicating that effect sizes were not uniform across studies* (Gurevitch and Hedges 1999)
- Age and IQ moderator effects?
  - no significant effects of age (slope = -0.01, p = 0.24) or of IQ (slope = -0.004, p = 0.27) on effect size
- Task effect? EL vs EM
  - no evidence for systematic effects of task

Publication bias

- the estimate of mean overall effect size gets smaller, -0.41, 95% CI (-0.64 to -0.18)
- even though it is smaller, it is still negative, indicating ASD group do have ER difficulties

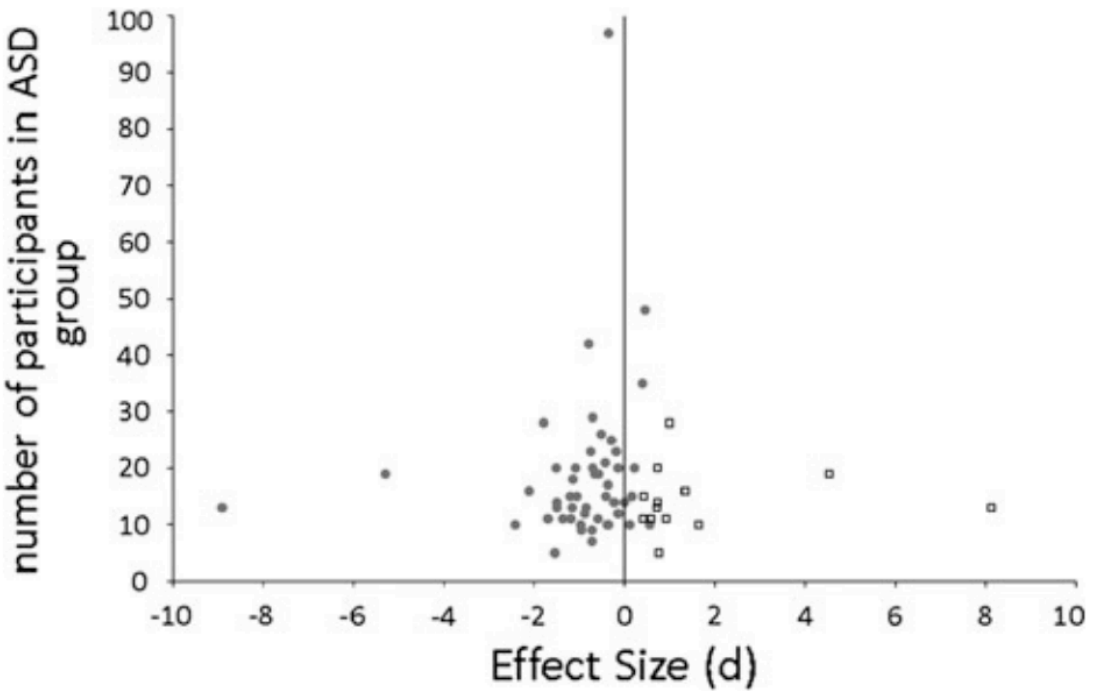

Fig. 2 Funnel Plot. Effect size for each study (Cohen's d) is plotted against the number of participants with autism in that study. *Filled circles* indicate studies in the meta-analysis. *Open squares* indicate studies inferred in the trim-and-fill analysis

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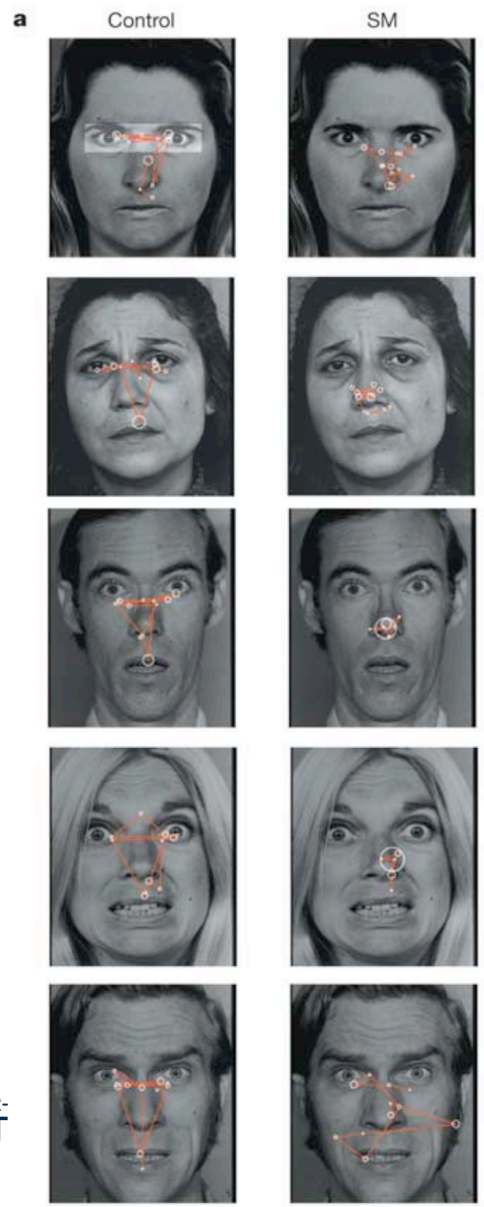
Individual emotion comparisons

happiness seems spared | ANOVA | happiness as a baseline

- for 5 emotions (sadness, anger, surprise, fear, disgust) the 95% CI are entirely in the negative range
  - ASD group do have difficulties with ER of each of these individual emotions
- but for happiness, the 95% CI spanned zero
  - showing no reliable difficulty in the ER of happiness across these studies

Discussion

Happiness is preserved? Eye-mouth hypothesis



- happiness
  - primarily identified from the mouth
- fear
  - relies heavily on eyes and eyebrows (Adolphs et al., 2005)
- research suggests autistic individuals
  - look less at eyes
  - look more at mouths
- -> supports the **Amygdala Theory**, suggesting that amygdala dysfunction leads to a lack of orienting toward the eye region.

Challenges to existing accounts

- Theory of Mind
  - previously predicted that **surprise** would be the most difficult emotion for autistic individuals because it requires assessing another person's mental state (e.g., "he expected something different")
- This meta-analysis found no special deficit for surprise

Methodological issues

- publication bias
  - studies with null effects are harder to be published
  - -> authors strongly encourage researchers to report in full the results of the statistical tests they conducted, even when not significant
- sample size
  - a large group difference (effect size = 0.8) between two independent populations with a power of 0.95 requires 35 participants in each group
  - -> most of the studies are underpowered
  - interestingly, in this meta-analysis, the two largest studies (97 and 80 autistic participants) both found no evidence of group differences in emotion recognition
- Age, IQ and task factors
  - Mental age vs chronological age
  - Limited IQ information
  - Subgroups within the autism spectrum have different capabilities
  - Task factors
    - emotion matching task
      - -> lack sensitivity and allow ASD participants to use compensatory strategies
    - emotion labeling task
      - -> may allow participants to guess a correct answer

Extended directions

- dynamic emotional expressions
- the role of timing in emotion recognition
- eye-tracking during emotion recognition
- neural mechanisms
- different autism subgroups

In-class discussion

- Does recognizing emotions in photographs in laboratory settings really reflect social functioning?
- Would emotion recognition look different in voices than in faces? Some people have difficulties recognizing faces, but have intact voice recognition. Is it feasible to move emotion-recognition research beyond faces?

Thanks for listening :-)

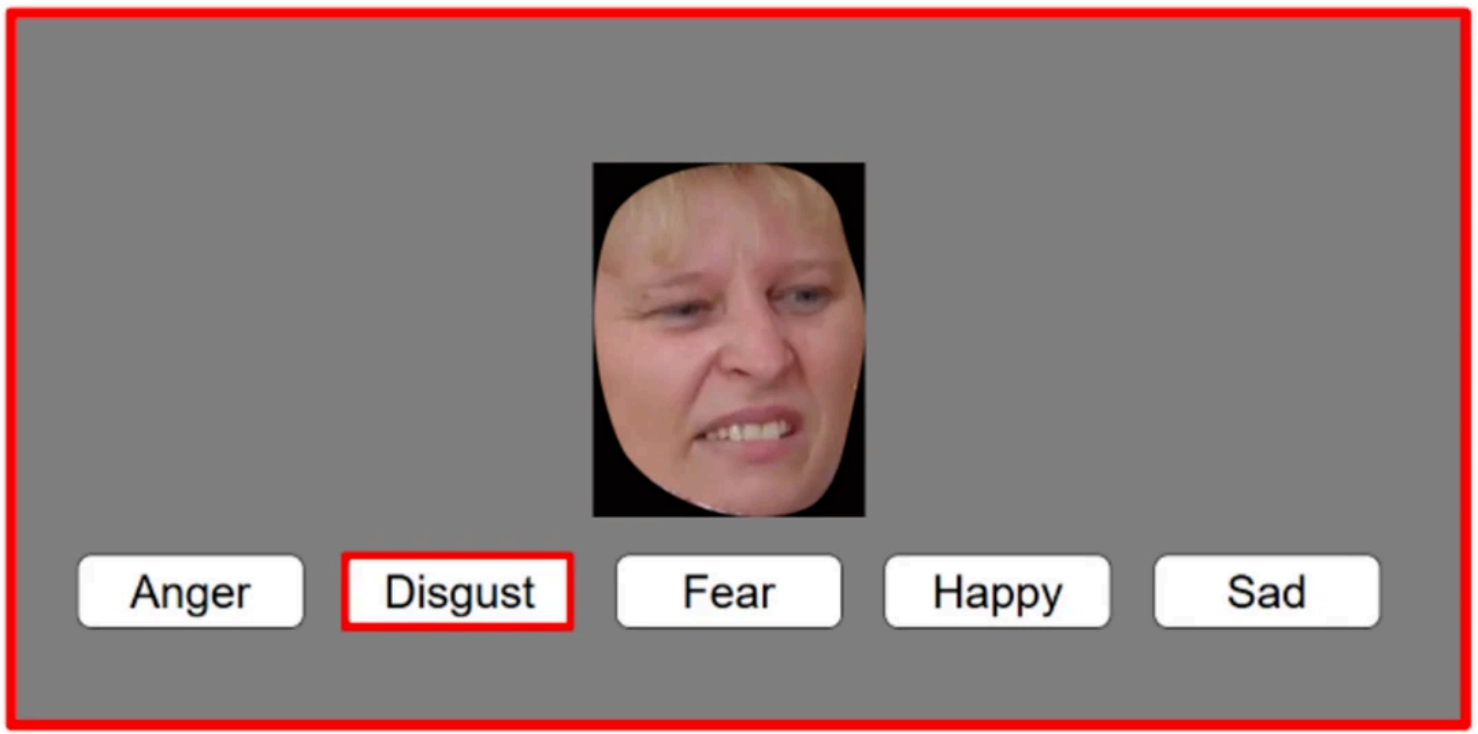
References

Adolphs, R., Gosselin, F., Buchanan, T. W., Tranel, D., Schyns, P., & Damasio, A. R. (2005). A mechanism for impaired fear recognition after amygdala damage. *Nature*, *433*(7021), 68–72. https://doi.org/10.1038/nature03086

Talipski, L. A., Palermo, R., Sutherland, C. A. M., Gignac, G. E., Jeffery, L., Crookes, K., Wilmer, J. B., Krumhuber, E. G., Bell, J., & Dawel, A. (2026). Introducing the naturalistic expression labeling task (NELT): Associations with posed expression labeling, empathy, and general cognitive ability. *Behavior Research Methods*, *58*(5), 116. https://doi.org/10.3758/s13428-026-02944-y

Uljarevic, M., & Hamilton, A. (2013). Recognition of emotions in autism: A formal meta-analysis. *Journal of Autism and Developmental Disorders*, *43*(7), 1517–1526. https://doi.org/10.1007/s10803-012-1695-5

Emotion labeling



"Choose the emotion label that best describes the emotion expressed by the face."

(Talipski et al., 2026)

Emotion matching

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