

The Emotional Landscape of Toddlers with ASD

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Overview

Importance of emotions in ASD

Notions about emotional expressivity in autism

Intensity of emotional expression in toddlers with ASD

Experience of emotions at the physiological level

Why study emotion in autism?

Positive and negative emotions influence a broad range of cognitive processes (*Ashby, Isen & Turken, 1999; Bell & Wolfe, 2004*) as well as later emotional and physical health (*Mäntymaa et al., 2003, 2015*).



Children with ASD: comorbid affective problems begin during preschool years

Emotional expressivity in children with ASD ?

Muted, less positive emotional expression?



Parent report

Capps et al., 1993; Zwaigenbaum et al., 2005; Garon et al., 2009; Clifford et al., 2013; Macari et al., 2017

Observations during adult-child interactions

Snow, Hertzog, & Shapiro, 1987; Yirmiya, Kasari, Sigman, & Mundy, 1989; Kasari, Sigman, Mundy, & Yirmiya, 1990; Joseph & Tager-Flusberg, 1997

Macari et al. JCPP 2017

Negative affectivity bias?



Anecdotal report

Kanner, 1943; Tinbergen & Tinbergen, 1977

Parent report

Zwaigenbaum et al., 2005; Adamek et al., 2011; Clifford et al., 2013; Macari et al., 2017

Structured induction

Jahromi, Meek, & Ober-Reynolds, 2012; Scherr et al., 2017

Macari et al. JCPP 2017

Limited, discrepant evidence

- Method type: Parent report, naturalistic observation or structured induction?
- If induction: social or nonsocial trigger stimuli?
- Measurement/metric (frequency, duration, intensity, etc.)
- Ages, comparison groups

Question

Do toddlers with ASD differ in intensity of emotional expressivity compared to their peers?

Laboratory Temperament Assessment Battery

(Lab-TAB Locomotor; Goldsmith & Rothbart, 1999)



ANGER



Car Seat
Arm Restraint
End of the Line



JOY



Bubbles
Puppet Peek-a-Boo
Penguin Race



FEAR



Spider
Scary Masks
Roaring Dinosaur

Anger

Expression of frustration (approach behaviors e.g., hitting, pushing) in response to restraint or goal blockage.

- » Predicts later externalizing behavioral problems

Joy

Characterized by approach; manifests in smiling, laughter, and increased activity.

- » Associated with later sociability, activity level, impulsivity, externalizing behavior

Fear

Withdrawal behaviors arising in response to stimuli that convey threat or uncertainty.

- » Predicts behavioral inhibition, anxiety



Peak Emotional Intensity – Facial Joy

(adapted from Goldsmith & Rothbart, 1999; Izard & Weiss, 1979)

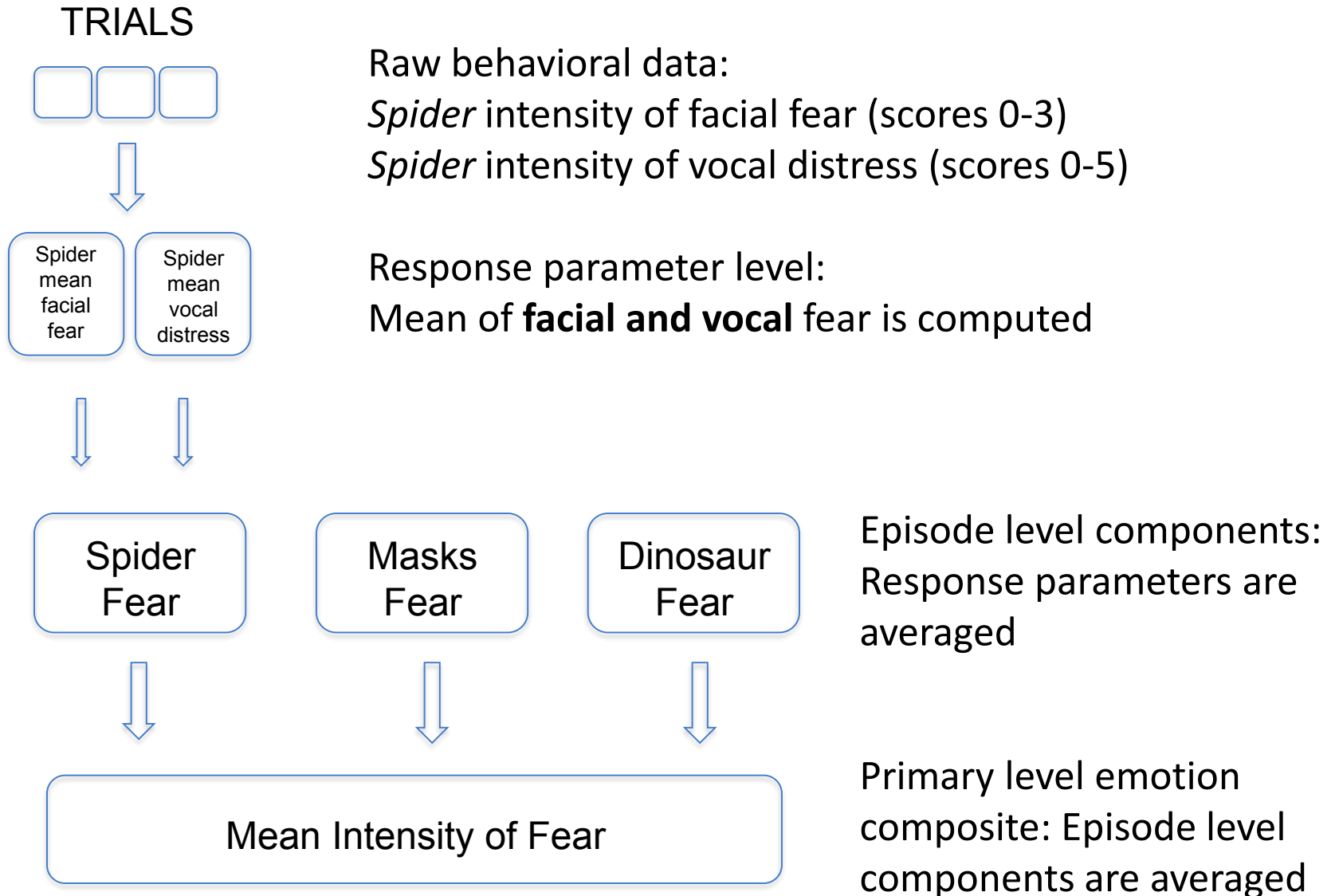
0 = No smiling at all

1 = Small smile, with lips slightly upturned, and no involvement of cheeks or eyes

2 = Medium smile, with lips upturned, perhaps mouth open, and/or slight bulging of cheeks, and/or some crinkling about the eyes (2 of these)

3 = Large smile, with lips stretched broadly AND upturned/mouth open, AND definite bulging of cheeks AND noticeable crinkling of eyes (all 3)

Deriving emotion intensity composites



Graphic adapted from Gagne et al., 2011

	ASD	DD	TD
N	43	16	40
% male	88*	48	50
Age in months	21.9 (3.0)	20.3 (3.6)	20.8 (3.9)
MSEL Visual Reception AE	17.7 (4.9)	19.6 (5.9)	23.2 (5.5)*
MSEL Fine Motor AE	18.3 (3.5)	19.3 (3.6)	22.1(3.5)*
MSEL Receptive Language AE	11.8 (7.8)	15.3 (7.8)	23.6 (5.9)*
MSEL Expressive Language AE	11.3 (6.2)	11.7 (4.6)	21.9 (6.2)*
ADOS-2 Toddler SA	13.8 (4.6)*	7.0 (3.0)	---
ADOS-2 Toddler RRB	4.2 (1.8)*	1.2 (0.9)	---

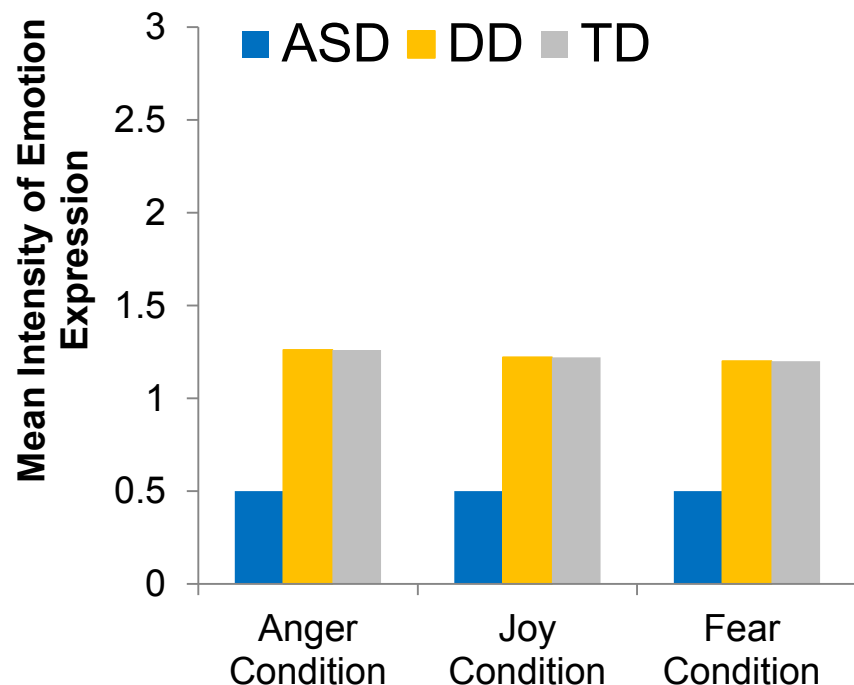
Note: AE=Age Equivalent; MSEL = Mullen Scales of Early Learning (Mullen, 1992)

* $p < .05$

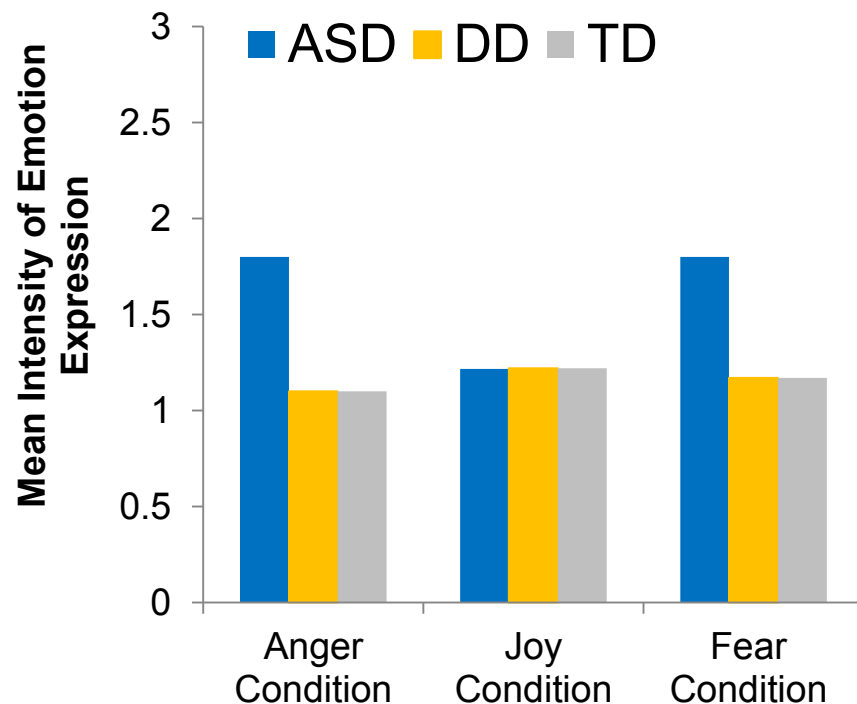
Do toddlers with ASD differ in intensity of emotional expressions compared to their peers?

Potential patterns of results

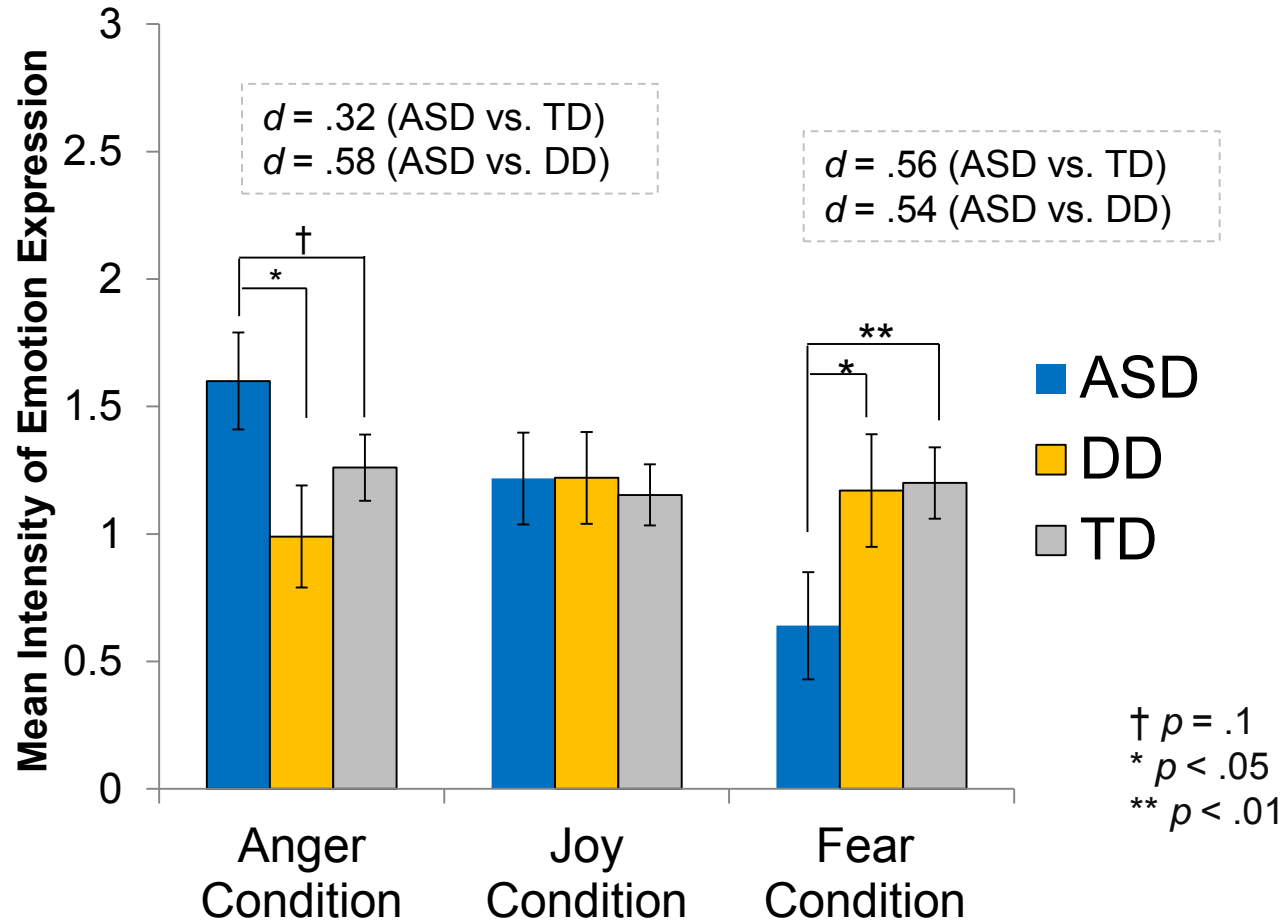
muted affect



NA bias



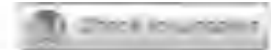
Intensity of emotion expression during Lab-TAB



Intensity of emotion expression during Lab-TAB

Journal of the American Academy of
**CHILD & ADOLESCENT
PSYCHIATRY**

NEW RESEARCH



Emotional Expressivity in Toddlers With Autism Spectrum Disorder

Suzanne Macari, PhD, Lauren DiNicola, BA, Finola Kane-Grade, BA, Emily Prince, MS, Angelina Verneti, PhD, Kelly Powell, PhD, Scuddy Fontenelle IV, PhD, Katarzyna Chawarska, PhD

Interim summary

Results inconsistent with accounts of muted affect or negative affectivity bias

Anger: $ASD > DD, TD$

Communication difficulties/emotion regulation problems

Joy: $ASD = DD = TD$

Passive receipt of enjoyable activities, no need to interact or seek out

Fear: $ASD < DD, TD$

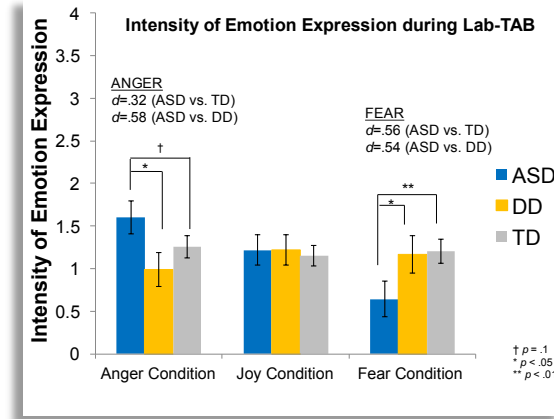
Muted fear response warrants further investigation:
What's going on "under the hood"?

Physiological reactivity to emotional challenges



Angelina
Vernetti, Ph.D.
Associate
Research
Scientist

Diminished expression of fear, enhanced expression of anger in response to real-world challenges (Macari et al., 2018)

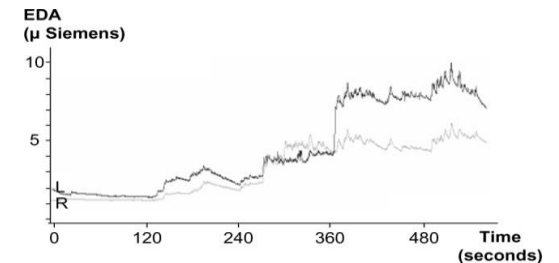
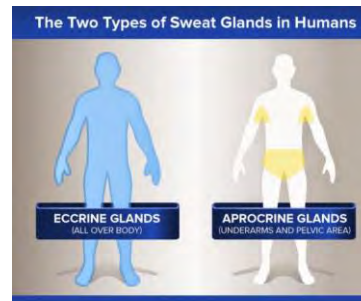
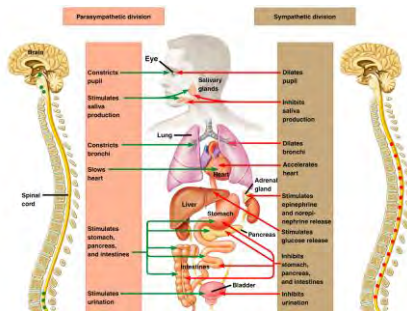


Findings explained by differences in:

- behavioural display of emotions?
- physiological arousal levels?
 - EDA

Electrodermal activity (EDA)

Stressors → Sympathetic nervous system → Regulation of continuous sweating from eccrine glands → electrical changes at the surface of the skin (μS) = electrodermal activity



Method: LabTAB and EDA sensor

- EDA Sensor on child's ankle
- EDA measured in μS
- Temperature & x,y,z axes

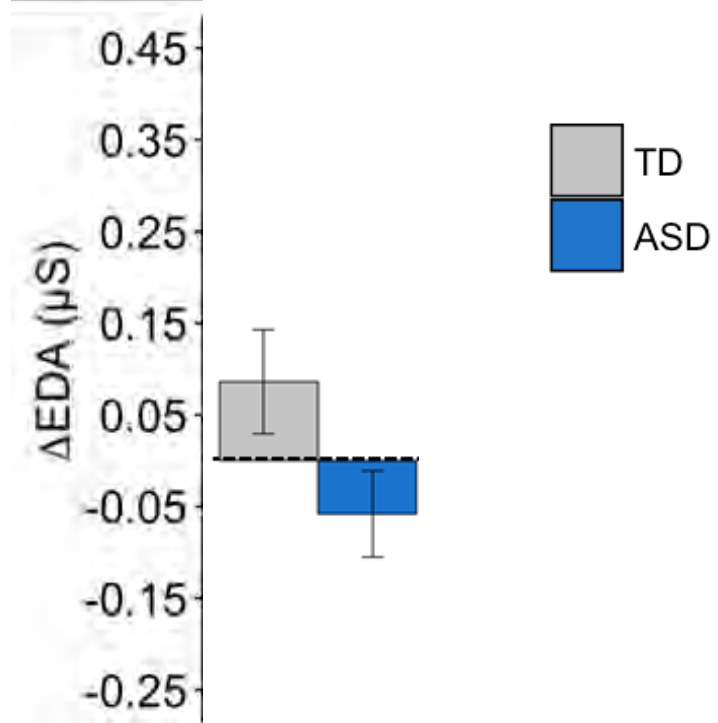
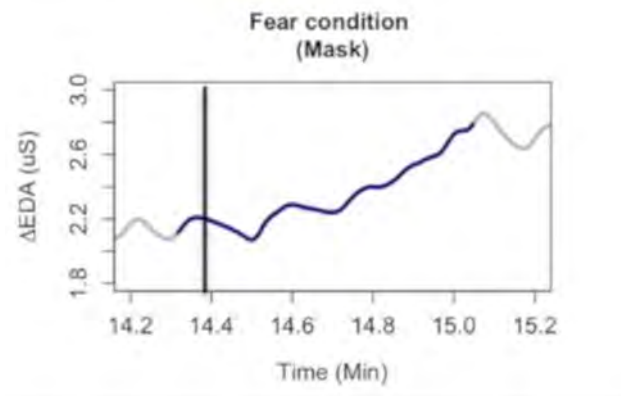
Laboratory Temperament Assessment Battery
(LabTAB) adapted from Goldsmith & Rothbart, 1999

+



Affectiva Q sensor

Electrodermal reactivity during Fear condition



- ΔEDA different from zero?
 - TD: \uparrow ΔEDA during Fear ($t(26)=2.23$, $p=.035$)
 - ASD: No change of EDA during Fear ($t(26)=1.26$, $p<.219$)
- Group difference? $ASD < TD$, $p=.025$

Physiological reactivity – atypical and modulated by context

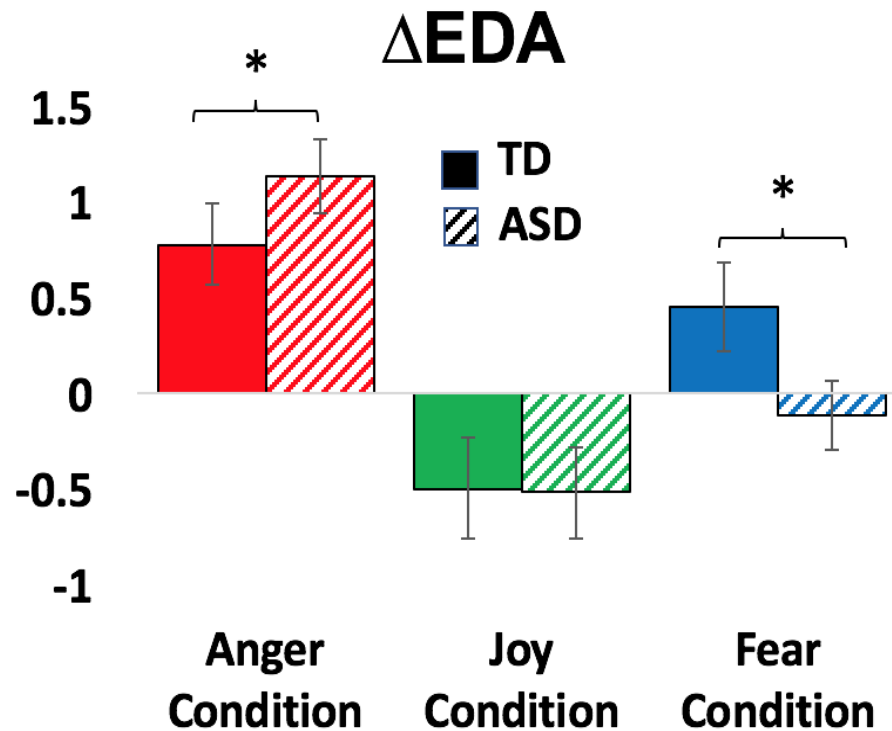
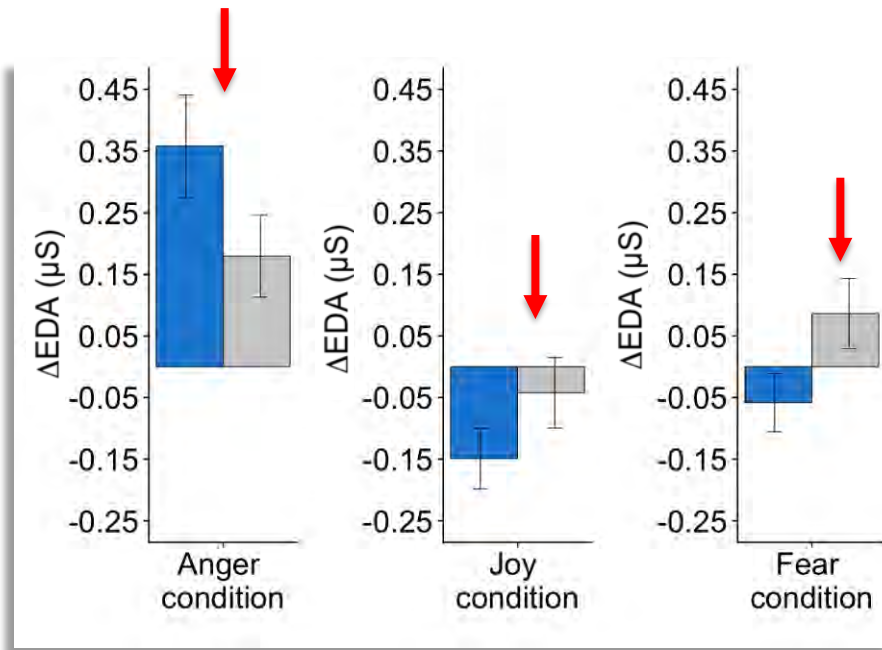


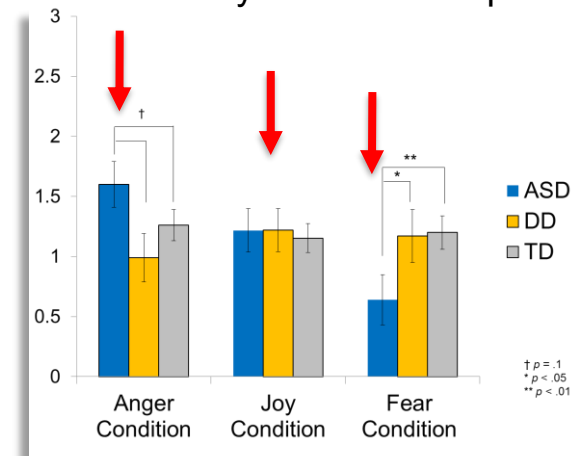
Figure 1. ΔEDA in toddlers with ASD and TD under three emotion conditions.

Electrodermal reactivity vs intensity of expression of emotions?

Intensity of physiological response



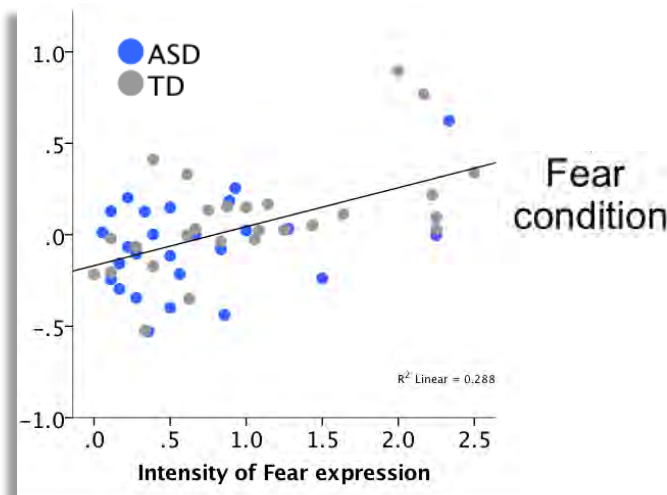
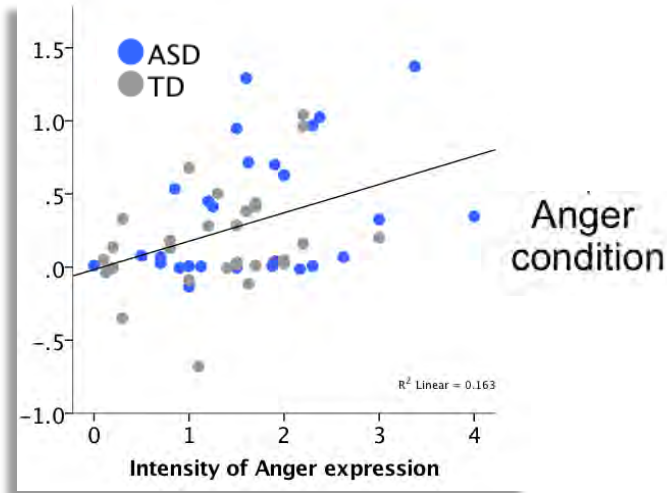
Intensity of emotion expression



Macari et al. *in Press*

Is physiological response associated with intensity of behavioural emotional expression?

- **Δ EDA response during Anger / intensity of anger expression**
 - $r(56)=.40, p=.002$
- **Δ EDA response during Fear / intensity of fear expression**
 - $r(54)=.54, p<.001$
- No association of Δ EDA response during Joy with intensity of joy expression
 - $r(55)=-.04, p=.799$



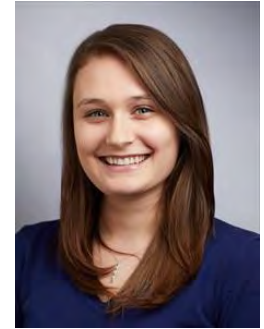
Altered intensity of behavioural emotional expression in ASD driven by atypical emotional experience of the stimuli

Summary & Implications

- Complex emotional landscape
- Broad construct of Negative Affect less useful in capturing emotional phenotypes
- Harness intact capacity for joy in toddlers with ASD for therapeutic purposes
- Δ EDA responses map onto intensity of behavioural expression in toddlers with ASD: What we see is how they feel
- How are early emotional profiles related to later psychopathology?
- Limited understanding of how affective comorbid symptoms emerge

Toddler Developmental Disabilities Clinic

Yale Social Affective Neuroscience of Autism Lab



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