The Taste of Regulation: Oral Sensory Behaviors and Emotion Dysregulation in Children With and Without Autism

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Introduction

Children with autism spectrum disorder (ASD) frequently exhibit heightened reactivity to taste, texture, and other oral sensations, which can make everyday experiences like eating overwhelming or aversive (Nimbley, Golds, Sharpe, Gillespie-Smith, & Duffy, 2022; Zickgraf, Richard, Zucker, & Wallace, 2022). In a recent scoping review, we found that individuals with ASD show elevated behavioral responses to oral sensory stimuli, and that this reactivity is associated with broader eating behaviors (Goldschlager et al., 2025).

Although feeding challenges are common in autistic populations, their relationship to emotion regulation remains poorly understood. One study suggests that sensory atypicalities in ASD are linked to emotional dysregulation via a shared vulnerability (Sung, Lin, Chu, & Lin, 2024). Supporting this connection, neuroimaging studies in neurotypical adults have identified overlapping brain regions, e.g., the mid-insula, raising the possibility of shared neural mechanisms involved in both taste and emotion processing (Avery et al., 2017). Still, evidence linking selective eating and emotional outcomes in autistic populations remains mixed (Johnson et al., 2014; Page, Souders, Kral, Chao, & Pinto-Martin, 2022; Tanner et al., 2015).

Feeding behaviors also emerge in relational contexts. Parents of children with ASD often report elevated stress during mealtimes, which can become emotionally charged routines shaped by both child behaviors and caregiver responses (Crowe, Freeze, Provost, King, & Sanders, 2016). Moreover, parental emotional responses and feeding strategies are strong predictors of children's eating behavior, potentially reinforcing or buffering selective patterns (Zlomke, Rossetti, Murphy, Mallicoat, & Swingle, 2020).

Few studies have integrated sensory, emotional, and parenting dimensions into a developmental framework. Fewer still have compared these pathways in autistic and non-autistic populations. This project uses two nationally representative U.S. datasets, the Fragile Families and Child Wellbeing Study (FFCWS) and the National Survey of Children's Health (NSCH, 2023), to examine how early feeding challenges relate to later emotion dysregulation. We test whether parenting behavior moderates this association, and whether patterns differ by autism status and symptom severity.

Aims

Overview: Building on a recent scoping review of taste processing and oral sensory sensitivity, this project examines whether early feeding challenges predict later emotion dysregulation in children. It also tests whether parenting behavior moderates this relationship and whether pathways differ in autistic vs. non-autistic children.

Aim 1: Establish a developmental pathway (FFCWS)

Test whether early childhood feeding challenges (Wave 3) predict later emotion dysregulation (Wave 9) in non-autistic children, and whether this relationship is moderated by parenting behaviors (Wave 5).

- **Hypothesis 1a:** Early feeding challenges will predict greater emotion dysregulation in adolescence.


Figure 1. Hypothesized direct pathway from oral sensory reactivity during feeding to later observable emotion dysregulation

- o Predictor: Wave 3 feeding difficulty (p3a27c: "Needs more help with eating")

- o Outcome: Wave 9 emotion dysregulation, measured as the average of three CBCL items:

  (1) "Is stubborn, sullen, or irritable" (p5q3cf)
  (2) "Has sudden changes in mood or feelings" (p5q3cg)
  (3) "Temper tantrums or hot temper" (p5q3co)

  This composite score (range 0–2) reflects observable dysregulation and has been validated in prior FFCWS studies (Doom, Young, Farrell, Roisman, & Simpson, 2023)

- o Model: Linear regression

- o Covariates:
  - Child age (cm4b_age) and sex (cm1bsex)
  - Primary caregiver's age (cm4age or cf4age depending on identified caregiver) and sex (ensuring consistent caregiver identity across waves using cp3pcgrel, cp4pcgrel, and cp5pcgrel).

- **Hypothesis 1b:** Parenting behaviors will moderate this relationship.

Figure 2. Parenting behaviors as regulatory amplifiers or buffers of the feeding–dysregulation pathway.
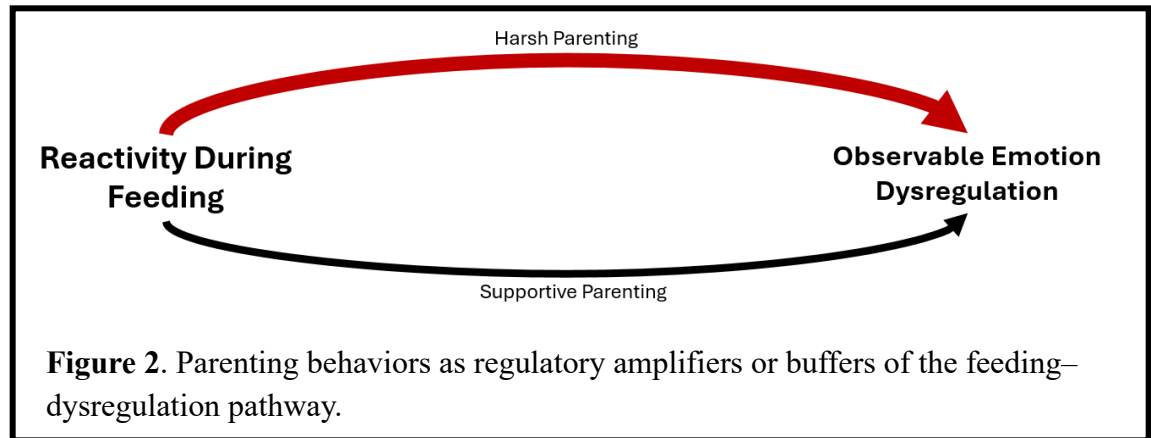
  o Moderator: CTSPC subscales (Nonviolent Discipline, Psychological Aggression, Physical Assault) (See **Appendix A**)

  o Model: Linear regression with interaction terms

- **Exploratory Extension:** Additional models will include full CBCL subscale scores (e.g., Aggressive Behavior, Anxious/Depressed, Attention Problems) to examine whether early feeding challenges predict broader emotional and behavioral difficulties.

Aim 2: Test for autism-specific divergence (NSCH)

Test whether current feeding difficulties are more strongly associated with emotion dysregulation in autistic vs. non-autistic children aged 6-11 years. This strategy prioritizes developmental visibility of behavioral dysregulation in middle childhood while allowing for exploration in **Aim 3** of potential attenuation due to masking in adolescence.

- **Hypothesis 2:** Associations between feeding behavior and dysregulation will be stronger in autistic children.

Figure 3. Proposed differences in moderation pathways between autistic and non-autistic children.
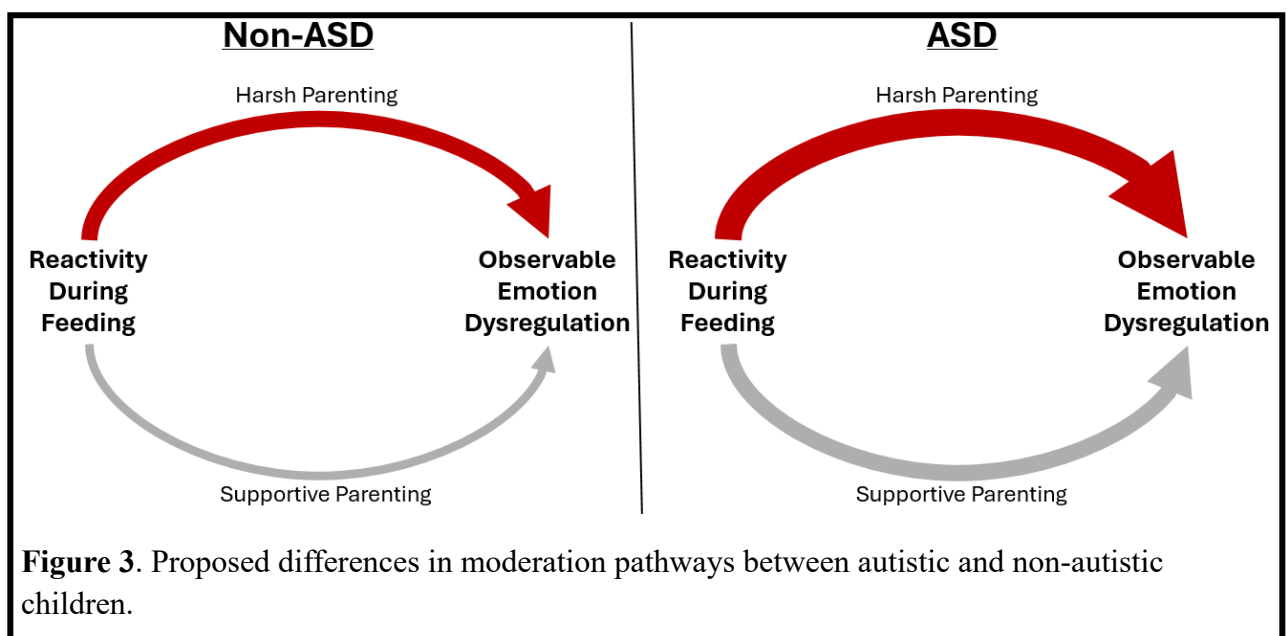
- Sample Characteristics: To improve consistency with the FFCWS outcome period (~age 15) and maximize observable variance in parent-reported dysregulation, the primary analysis will be restricted to children aged 6–11 (FORMTYPE == "T2"). This age group was selected to reduce potential masking effects that may attenuate behavioral signs of dysregulation in older youth.

- Predictors: ENGAGE_PICKY, ENGAGE_INTEREST

- Outcome: Parent-perceived dysregulation, measured using three items:
  (1) K8Q31: "Much harder to care for than peers"
  (2) K8Q32: "Does things that really bother you"
  (3) K8Q34: "Feel angry with this child."
  Items will be averaged to parallel the 3-item CBCL measure used in FFCWS.

- Moderator: ASD status (K2Q35A = 1 AND K2Q35B = 1)

- Model: Linear regression with interaction term

- Covariates:
  - Child's age (C_AGE_YEARS) and sex (C_SEX)
  - Caregiver's age (A1_AGE) and sex (A1_SEX)

Aim 3 (Exploratory): Assess other potential moderators (NSCH)

Within the ASD subgroup, test whether associations vary by diagnosis severity, treatment status, or age of diagnosis.

- Moderators: K2Q35A_1_YEARS (diagnosis age), AUTISMMED, AUTISMTREAT, ASD severity

- Model: Moderated regression (ASD subgroup only)

Replicate analysis in adolescents (12–17 years; FORMTYPE == "T3") to assess age-related shifts in observable behavior or parent perception.

Statistical Analysis Plan

- **Software:** All analyses conducted in R

FFCWS (non-ASD only)

- Exclusion Criteria:
  - Food insecurity:
    - p3d1c = 1: "Couldn't afford to eat balanced meals"
    - p3d3 = 1: "Child(ren) not eating enough due to cost"
  - Change in primary caregiver:

- Responses to cp3pcgrel, cp4pcgrel, and cp3pcgrel are not consistent
    - ASD diagnosis:
        - p5h2f = 1

- Aim 1a: Linear regression (feeding difficulty → CBCL dysregulation composite)

- Aim 1b: Linear regression with interaction (feeding × parenting)

- Exploratory: Add full CBCL subscales as outcomes (e.g., Aggressive Behavior, Attention Problems)

NSCH (ASD vs. non-ASD)

- Exclusion Criteria:
    - Exclude children who were ever diagnosed with ASD but no longer meet criteria
        - (K2Q35A = 1, K2Q35B = 2)
    - Food insecurity:
        - FOODSIT = 3 or FOODSIT = 4

    - Restrict to children ages 6–11 years (FORMTYPE == "T2"), to ensure developmental consistency with the FFCWS outcome age and to minimize the influence of adolescent masking on observable dysregulation.

        - In exploratory analyses, repeat models in the 12–17 year old group (FORMTYPE == "T3") to assess whether observed associations differ by age.

- Aim 2: Linear regression with interaction (feeding × ASD diagnosis)

- Aim 3: Moderated regressions within ASD group (treatment, severity, etc.)

- NSCH dysregulation outcomes will be harmonized with the CBCL 3-item composite using three analogous parent-report items (K8Q31, K8Q32, K8Q34).

Appendix A: CTSPC Subscales

CTSPC Category	FFCWS Variable	Question Text
Nonviolent Discipline	p5q1a	Explained why something was wrong
	p5q1b	Gave child a time-out
	p5q1e	Gave child something else to do instead
	p5q1l	Took away privileges or grounded child

Psychological Aggression	p5q1f	Shouted at child
	p5q1h	Swore or cursed at child
	p5q1i	Sent child away or put child in another room
	p5q1j	Threatened to spank child
	p5q1n	Called child dumb or lazy
Physical Assault	p5q1c	Shook child
	p5q1d	Hit child on bottom with an object
	p5q1g	Spanked child with bare hand
	p5q1k	Slapped child
	p5q1m	Pinched child

References:

Avery, J. A., Gotts, S. J., Kerr, K. L., Burrows, K., Ingeholm, J. E., Bodurka, J., . . . Kyle Simmons, W. (2017). Convergent gustatory and viscerosensory processing in the human dorsal mid-insula. *Human brain mapping, 38*(4), 2150-2164.

Crowe, T. K., Freeze, B., Provost, E., King, L., & Sanders, M. (2016). Maternal perceptions of nutrition, stress, time, and assistance during mealtimes: Similarities and differences between mothers of children with autism spectrum disorders and mothers of children with typical development. *Journal of Occupational Therapy, Schools, & Early Intervention, 9*(3), 242-257.

Doom, J. R., Young, E. S., Farrell, A. K., Roisman, G. I., & Simpson, J. A. (2023). Behavioral, cognitive, and socioemotional pathways from early childhood adversity to BMI: Evidence from two prospective, longitudinal studies. *Dev Psychopathol, 35*(2), 749-765. doi:10.1017/S0954579421001887

Goldschlager, J., Cintron, C., Hall, R., Shields, T., Tolbert, G. L., Woldebirhan, R., . . . Joseph, P. V. (2025). Taste processing in autism spectrum disorder: A translational scoping review. *Neurosci Biobehav Rev, 170*, 106031. doi:10.1016/j.neubiorev.2025.106031

Johnson, C. R., Turner, K., Stewart, P. A., Schmidt, B., Shui, A., Macklin, E., . . . Manning Courtney, P. (2014). Relationships between feeding problems, behavioral characteristics and nutritional quality in children with ASD. *Journal of autism and developmental disorders, 44*, 2175-2184.

Nimbley, E., Golds, L., Sharpe, H., Gillespie-Smith, K., & Duffy, F. (2022). Sensory processing and eating behaviours in autism: A systematic review. *European Eating Disorders Review, 30*(5), 538-559.

Page, S. D., Souders, M. C., Kral, T. V., Chao, A. M., & Pinto-Martin, J. (2022). Correlates of feeding difficulties among children with autism spectrum disorder: A systematic review. *Journal of autism and developmental disorders*, 1-20.

Sung, Y.-S., Lin, C.-Y., Chu, S. Y., & Lin, L.-Y. (2024). Emotion dysregulation mediates the relationship between sensory processing and behavior problems in young children with autism spectrum disorder: a preliminary study. *Journal of autism and developmental disorders, 54*(2), 738-748.

Tanner, K., Case-Smith, J., Nahikian-Nelms, M., Ratliff-Schaub, K., Spees, C., & Darragh, A. R. (2015). Behavioral and physiological factors associated with selective eating in children with autism spectrum disorder. *The American Journal of Occupational Therapy, 69*(6), 6906180030p6906180031-6906180030p6906180038.

Zickgraf, H. F., Richard, E., Zucker, N. L., & Wallace, G. L. (2022). Rigidity and sensory sensitivity: Independent contributions to selective eating in children, adolescents, and young adults. *Journal of Clinical Child & Adolescent Psychology, 51*(5), 675-687.

Zlomke, K., Rossetti, K., Murphy, J., Mallicoat, K., & Swingle, H. (2020). Feeding problems and maternal anxiety in children with autism spectrum disorder. *Maternal and Child Health Journal, 24*, 1278-1287.