# A Dynamic Systems Approach to Emotion Co-Regulation in Father-Child Dyads when Children have Autism Spectrum Disorder

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## Introduction

Emotion regulation abilities facilitate the development of emotional functioning and long-term adaptive skills (Gross, 1998, 2007). Emotional dysregulation, while not a core deficit of ASD, is frequently observed among children with ASD and contributes to problems in social interaction.

## Objective

To compare micro-level positive and negative emotion coregulation processes in father-child dyads for children with ASD and neurotypical (NT) children.

## Methods

- **Participants**
  - 72 Father-child dyads: 46 ASD dyads (70% boys) and 26 NT dyads (65% boys)
  - Child age: $M_{ASD}$= 5.27, $SD$=1.42; $M_{NT}$= 4.32, $SD$=1.12
  - Ethnicity: ASD- 43% European American, 15% Asian American, 24% Hispanic/Latino, 17% multiethnic/other
    NT- 46% European American, 23% Asian American, 23% multiethnic/other
- **Measures**
  - ADOS-2 (Lord, Rutter, DiLavore, & Risi, 2001) used to confirm ASD diagnosis.
  - Social Communication Questionnaire (SCQ; Rutter, Baile, & Lord, 2003) indicated symptom severity.
  - Vineland Adaptive Behavior Scales (VABS-II Sparrow, Cicchetti, & Balla, 2005) completed by parents regarding child's adaptive and maladaptive behaviors.
  - Fathers and their children were videotaped in their homes during the Three Boxes procedure (Vandell, 1979).
  - Emotion engagement coding scheme was developed to evaluate dyadic interaction in 5s intervals using Mangold International's INTERACT 9.47 software. Inter-coder reliability was > $k$=.80.
  - The emotional structure of coregulation was indicated by dispersion, transition, and grid duration per visit, which were derived from the State Space Grid (SSG).
  - The emotional content of coregulation was indicated by 5 regions marked in the SSG in terms of region ratios (region duration/total duration) in the Three Boxes procedure (see Figure 1).

## Results

**Figure 1.  Five Regions in State Space Grid**
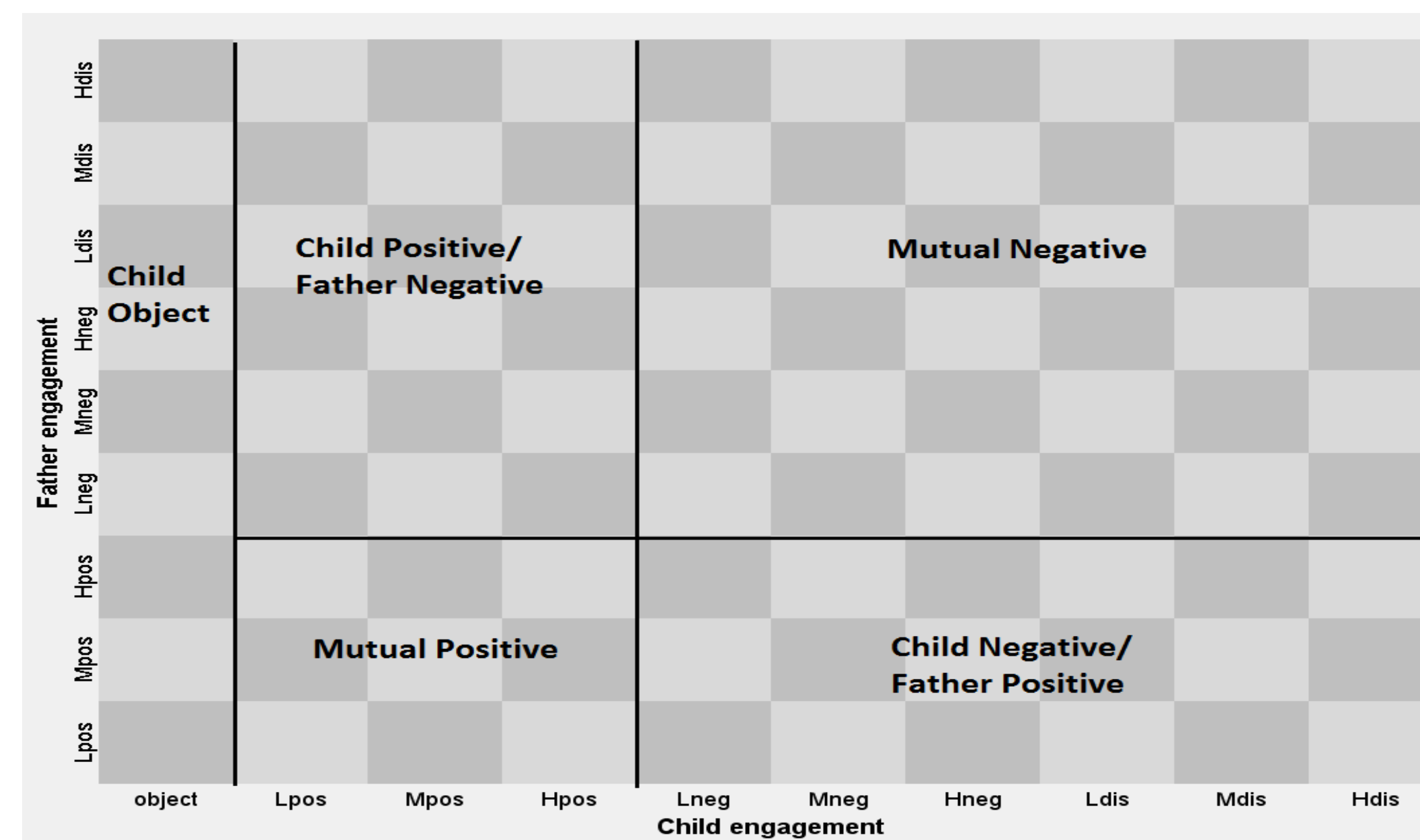


**Mutual Positive**: both father and child in any positive engagement state
**Mutual Negative**: father and child both in a negative or disengagement state
**Child Positive/Father Negative**: child in one of the three positive states and father in either a negative or disengaged engagement state
**Child Negative/Father Negative**: child in a negative or disengaged engagement state and father in a positive state
**Child Object**: child fixated on a play object; father in any engagement state

**Figure 2. Comparison of Emotion Coregulation between ASD Dyads and NT Dyads**
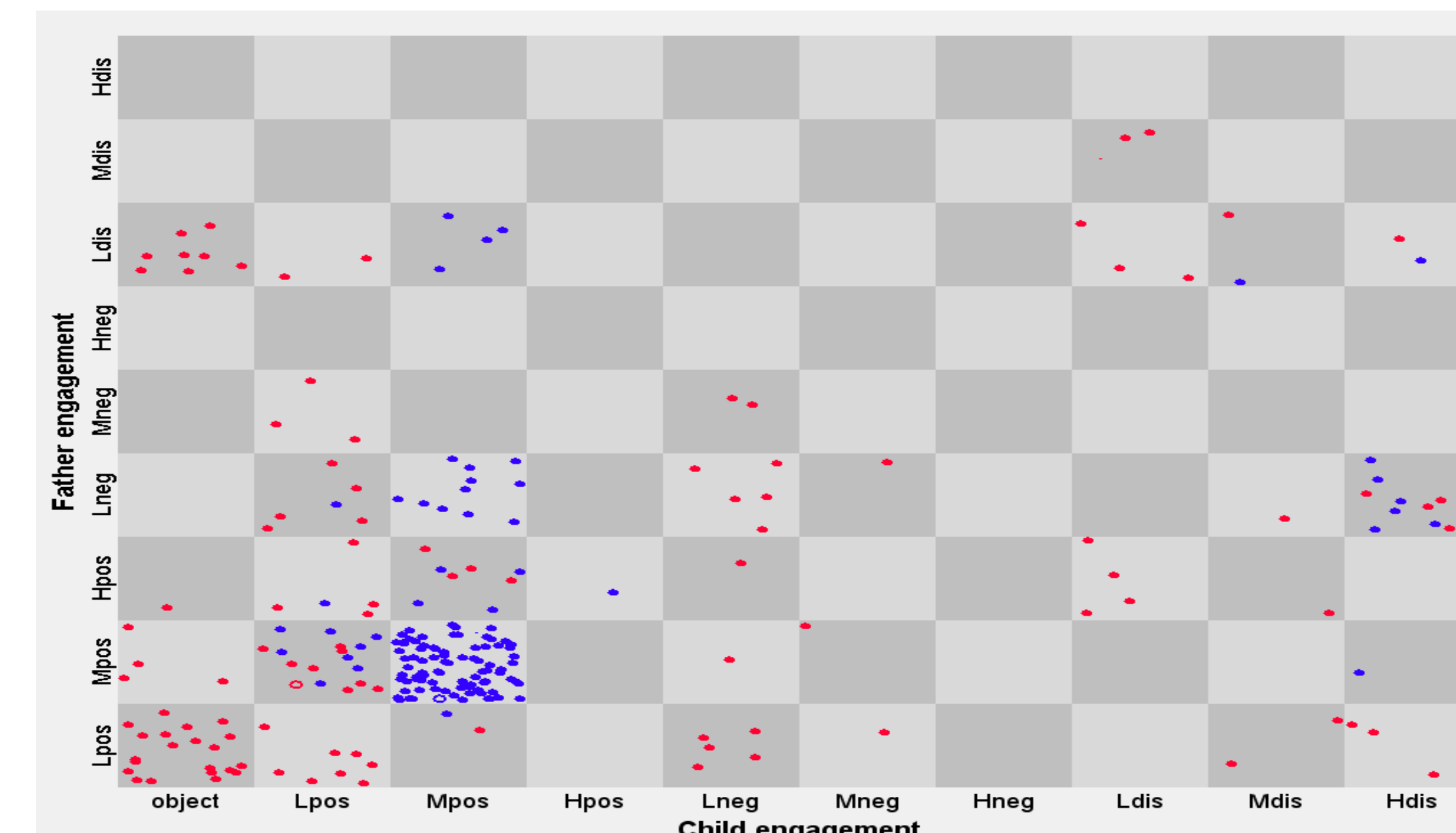


**L**: Low;  **M**: Moderate;  **H**: High
**Pos**: Positive engagement; **Neg**: Negative engagement; **Dis**: Disengagement
**Lpos**: low positive; **Mpos**: moderate positive; **Hpos**: high positive
**Lneg**: low negative; **Mneg**: moderate negative; **Hpos**: high negative
**Ldis**: low disengagement; **Mdis**: moderate disengagement; **Hdis**: high disengagement

Red = a trajectory of ASD dyads;   Blue = a trajectory of NT dyads.

**Comparison of ASD and NT Children on Key Space State Grid Variables ($N$ = 72) Multiple Regression Analyses Controlling for Child Age**

| Variables | M(SD) | | t | *p*-value | Model F | Model *p*-value |
|---|---|---|---|---|---|---|
| **Grid variables** | **ASD** $n$=46 | **NT** $n$=26 | | | | |
| **Dispersion** | 0.76  (0.11) | 0.69 (0.10) | 2.94 | .004 | 4.49 | .014 |
| **Transition** | 63.50(13.92) | 59.88(14.28) | 2.05 | .044 | 5.67 | .005 |
| **Region variables** | | | | | | |
| **Mismatch ratio** | 0.20 (1.13) | 0.01 (2.08) | 2.19 | .032 | 2.89 | .062 |
| **Positive ratio** | 0.67 (0.20) | 0.83  (0.10) | -3.47 | <.001 | 6.28 | .003 |
| **Object ratio** | 0.15 (0.11) | 0.07  (0.06) | 3.95 | <.001 | 8.92 | <.001 |

Next, a series of multiple regression analyses (one for each father-child SSG variable) tested the relationship between SSG variables and Vineland adaptive behaviors. Father-child SSG variables, ASD diagnosis, and child age were all entered into each SSG model simultaneously.
**More adaptive behaviors** were associated with **lower "mismatch" of child negative/father positive ratio**, $b$= -140.16, $p$=.022, **lower mutual negative ratio,** $b$= -118.31, $p$=.001, **higher mutual positive ratio**, $b$= 21.26, $p$=.001, and **longer grid duration per visit,** $b$=1.53, $p$=.025.
In all models, ASD diagnosis was significant ($p$s <.001) such that ASD was lower than NT on adaptive behaviors.

## Conclusions

- Compared to NT dyads, ASD father-child dyads in this study showed:
  - Structure of coregulation
    - Wider range of emotional repertoire (dispersion)
    - More switches between positive and negative emotional states (transition)
  - Content of coregulation
    - More mismatched states (child negative/father positive)
    - More object-focused states
    - Shorter mutual positive states
- ASD children had lower reported adaptive behaviors than NT children.
- Higher adaptive behaviors were associated with:
  - Higher grid duration per visit (overall degree of "stickiness" of dyadic emotion)
  - Higher mutual positive states
  - Lower mutual negative states
  - Lower mismatched states

## Implications

- Findings provide insight into moment-to-moment emotion regulation processes in the structure and content of father-child interactions of children with ASD and NT children.

- Findings suggest that the dyads' ability to remain positively engaged and reduce the time in mutual negative or mismatched engagement states would promote adaptive behaviors in children.

- The relationship between the overall degree of "stickiness" of dyadic behavior and adaptive behavior needs further study.

## Acknowledgements

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