

# **Early Infant/Toddler Behaviors That May Lead to a Diagnosis of Autism**

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# Motivation for Our Research (Crais, Baranek, & Watson)

- Diagnosis of children with autism typically occurs between 2 - 3 years of age
- Diagnosis is rare before two years of age
- Yet the literature shows enhanced outcomes with early identification and intervention
- Thus, our ultimate goal is to identify children with autism even earlier
- But what are the barriers to earlier identification?



# **Barriers To Early ID Include**

- Difficulty identifying behaviors that could be markers for group differences
- Need to look for both presence of atypical behaviors and absence of typical behaviors
- Limited knowledge of developmental course of behaviors that may be common in young children (e.g., repetitive movements, mouthing)
- Therefore, relatively “late” identification makes it difficult to know the course of early development in these children

# Possible Behaviors of Interest

- Increasing interest and research in early prelinguistic behaviors in children developing typically and with autism
- Areas of promise targeted today are gesture use, play development, and relationship between play behaviors and gesture use
- Helpful to first be familiar with typical development in these areas

# **Development of Gestures: Why Are They Important?**

- Early means to communicate
- One of the first signs of intentionality
- Can be used in profiling skills
- Can be helpful in identifying delays
- Important to intervention planning

# What Are Gestures?

- Gestures are actions produced with the intent to communicate and are typically expressed using the fingers, hands, and arms, but can also include facial features (e.g., lip smacking for "eating") and body motions (e.g., bouncing for "horsie")
- (Iverson & Thal, 1998)

# Age Ranges of Emergence of Common Gestures

- Reaching 6-9 months
- Giving 8-11 months
- Showing 8-13 months
- Pointing 9-14 months

(Bates et al., 1975; Carpenter, Nagell, Tomasello, 1998; Crais, Douglas, & Campbell, 2004; Masur, 1983)

# Functions of Gestures

- **Social interaction:** initiating or sustaining a social game or routine, providing comfort, teasing, showing off
- **Behavior regulation:** regulate behavior of others to obtain an object, get them to carry out action, or stop someone from doing something
- **Joint attention:** direct other's attention in order to comment on an object or event, provide information on an object or event, or acknowledge shared attention to an object or event

# Age of Emergence of Functional Categories

- Protests 6-8 months
- Requests for actions 6-10 months
- Requests for objects 6-10 months
- Comments 8-11 months
- Answering 13-16 months

(Carpenter, Mastergeorge, & Coggins, 1983;  
Crais et al, 2004)

# **Array of Gestures Seen in 9-12 Month Old Children (Crais et al, 2004)**

## **Behavior Regulation**

- Protest (use body, push away object with hands)
- Request Objects (reach for object, pull on adult's hand with object, point to obtain object)
- Request Actions (reach to be picked up, do action)

## **Social Interaction:**

- Seek Attention (body movt, grab hand, bang object)
- Social Games (participate, initiate games)
- Representational Gestures (“bye bye”, imitation clapping, show functions of objects)

## **Joint Attention:**

- Comment (show object, give object)

# **Array of Additional Gestures Seen in 15-18 Month Old Children** (Crais et al, 2004)

## **Behavior Regulation:**

- Protests (shake head “no”)
- Request Objects (reach while open & close hand)
- Request Actions (point, take hand of adult, give object)

## **Joint Attention:**

- Comment (point to object, point to object by request)

## **Social Interaction:**

- Seek Attention (show off)
- Representational Gestures (hug objects, smack lips, clap for excitement/accomplishment)

# Summary

- We know we want earlier identification
- We know we have some potentially good predictors
- We know there are barriers
- What are possible methodologies to address the barriers?



# **Retrospective Video Analysis: First Birthday Parties**

- Some retrospective studies of infants later diagnosed with autism have utilized home videotapes to look for behavioral “red flags” of autism (videos made before diagnosis).
- First birthday parties (Osterling & Dawson, 1994; Osterling, Dawson, & Munson, 2002).
- Provides information about novel situations, but not as representative of more typically occurring social situations and contexts in daily life.

# **Retrospective Video Analysis: Wider Range of Contexts**

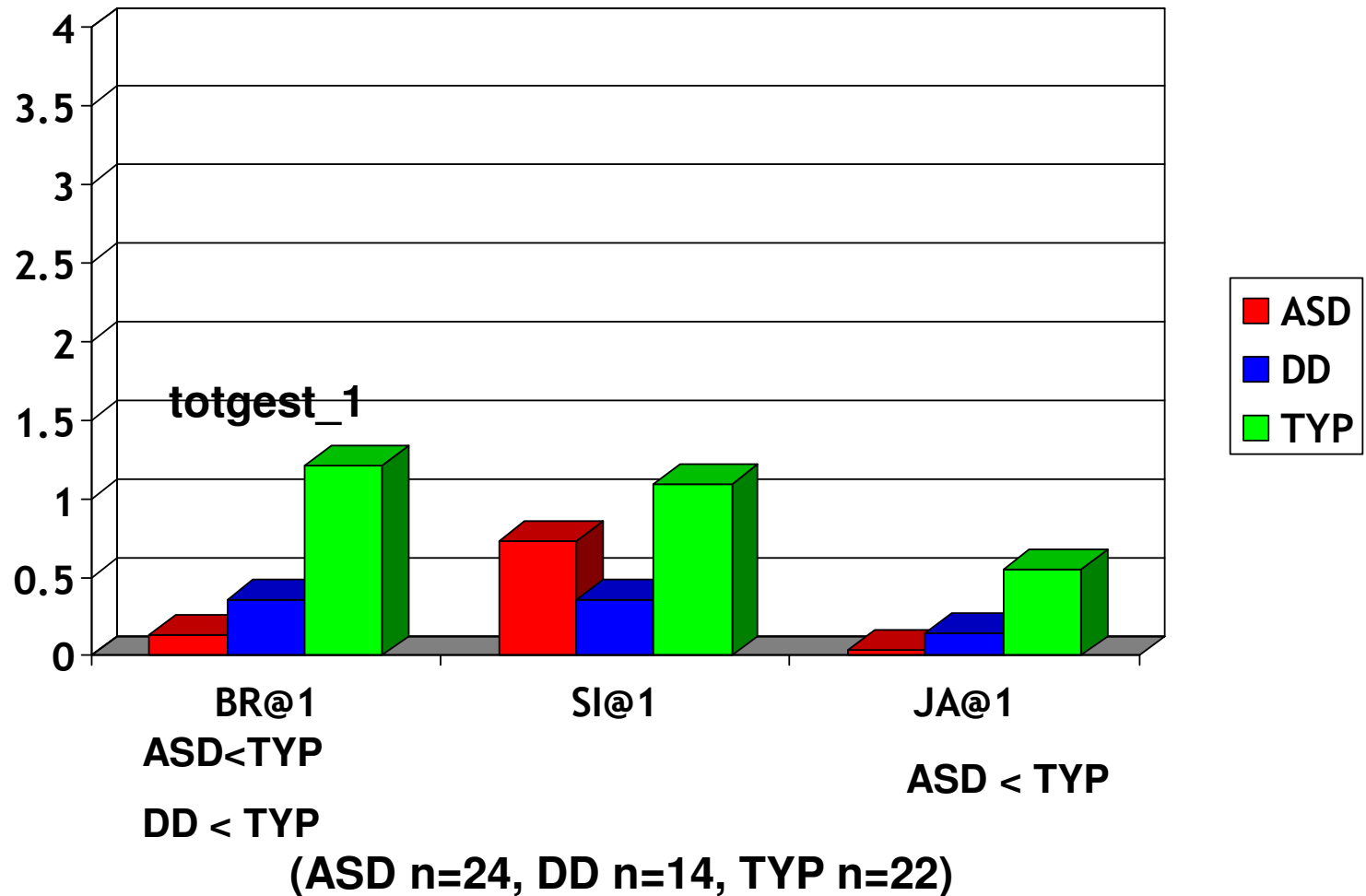
- UNC researchers use footage that families provide of their child under two years of age (before diagnosis).
- Footage = a wide range of family play situations.
- Videotapes edited for randomly selected cross-section of situations and events.
- Typically developing infants, infants later diagnosed with autism, & infants diagnosed with developmental delays (9-12 & 15-18 months).

# Retrospective Video Analysis

- Ecologically valid methodological tool for earlier identification of children at very early periods in development (prior to diagnosis)
- Several retrospective video studies of autism suggested young children with autism can be distinguished from typically developing children (Adrien et al., 1993; Baranek, 1999; Crais, Watson, Baranek, Lanter, Colgan, McComish, Roy, 2005; Colgan, Lanter, McComish, Watson, Baranek, & Crais, 2007; Osterling and Dawson, 1994).



# Results: Comparing Group Means for Gesture Functions at Time 1 (9-12 m) (Crais, Watson, & Baranek, 2007)



**Results: Predicting Outcomes**  
*(Crais, Watson, & Baranek, 2007)*

*Preliminary analyses & results (due to sample size limitations):*

- For group with ASD, prediction of **Vineland Communication** subscale score at preschool age:
  - a regression model using **Time 1 & 2 total** gestures yielded  $F(2,22)=7.01$ ,  $R^2=.39$ ,  $p=.004$ .

**Results: Predicting Outcomes**  
**(Crais, Watson, & Baranek, 2007)**

*Preliminary analyses & results (due to sample size limitations):*

For group with ASD, prediction of **Vineland Communication** subscale score at preschool age:

- regression using **Time 1** BR + SI + JA yielded  $F(3,55)=10.23, R^2=.36, p=.000$ .
- a regression model using **Time 2** BR + SI +JA yielded  $F(3,22)=. 2.47, R^2 =.25, p=.09$

# Gestures Seen in Sample (Colgan et al., 2007)

Autism Group (n=9)	
Total	Type of Gesture (# of each)
12	so big (11), wave (1)
5	peek-a-boo (4), wiggle (1)
5	peek-a-boo (5),
4	clap (2), peek-a-boo (1), wave (1)
3	wave (2), clap (1)
2	shake head no (2)
2	wave (2)
1	wave (1)

Typical Group (n=10)	
Total	Type of Gesture (# of each)
9	wave (3), so big (2), kiss (3), shake head (1)
6	clap (2), reach (2), wave (2)
5	clap (2), dancing (1), peek-a-boo (2)
5	kiss (1), "oh-my" (1), so big (3)
4	dancing/ waves arms (4)
3	clap (1), wave (2)
3	hop in chair (1), peek-a-boo (2)
2	claps (1), reaches (1),

# Summary: Gesture Use In Infants & Toddlers

- Results indicate differences in gesture use between 9-12 month old infants later diagnosed with autism or developmental disabilities and children with typical development.
- Total number of gestures (differences between children with ASD & TYP, DD & TYP).
- Group differences on # of behavior regulation & joint attention gestures, **but not social interaction** (9-12 & 15-18 months), however children with ASD have less variety.

# Summary: Gesture Use In Infants & Toddlers

- Total number of gestures at 9-12 months predictive of Vineland Communication subscale at preschool age.

# Levels of Play Development

**Level 0** = No object play

**Exploratory** = the way infant examines the environment in order to gain information from objects or toys (e.g., mouthing, banging, shaking, poking): **Level 1** (indiscriminate actions), **Level 2** (simple manipulations of single objects)

**Relational** = two or more objects used in combination with one another, without regard to attributes or functions of objects (e.g., objects pushed, stacked, nested, piled): **Level 3** (taking objects apart), **Level 4** (general combinations)

# Levels of Play Development

**Functional** = influenced by social or cultural properties of objects (e.g., pretend actions, spoon to doll's mouth): **Level 5** (directed toward object), **Level 6** (toward self), **Level 7** (toward doll), **Level 8** (toward other person)

**Symbolic** = items, attributes not actually present, or substitution of objects: **Level 9** (object substitution), **Level 10** (agent play), **Level 11** (imaginary play)

(Baranek, Barnett, Adams, Wolcott, Watson, & Crais, 2005; Belsky & Most, 1981; Casby, 1991, Knox, 1997; Libby, Powell, Messer, & Jordan, 1998; Lifter, Sulzer-Azaroff, Anderson, & Cowdery, 1993)

# **Age Ranges of Play Levels**

## **Exploratory**

- Level 1 (indiscriminate actions) 2 - 10 months
- Level 2 (simple manipulations) 2 - 10 months

## **Relational**

- Level 3 (Takes objects apart) 10 - 18 months
- Level 4 (General combinations) 10 - 18 months

## **Functional**

- Level 5 (object directed) 12 - 18 months

# Age Ranges of Play Levels

## Functional

- Level 6 (self directed) 12 – 18 months
- Level 7 (doll directed) 12 - 18 months
- Level 8 (other directed) 12 - 18 months

## Symbolic

- Level 9 (object substitution) 18 – 30 months
- Level 10 (agent play) 18 – 30 months
- Level 11 (imaginary play) 18 – 30 months

# **Concurrent Language/Play Associations**

## **13 - 20 months**

- First words appear along with more consistent communicative gestures and single play schemes (e.g., child feeds self with spoon)

## **20 - 24 months**

- Word combinations appear along with single play schemes combined (e.g., child feeds self with spoon, then drinks from cup).
- (Kennedy, Sheridan, Radlinski, & Beeghly, 1991)

# Predictive Language/Play Associations

- Early skill with communicative gestures predicts later language levels (Mundy & Gomes, 1998; Thal, Bates, Goodman, & Jahn-Samilo, 1997)
- Early functional object play has been associated with later language ability (Lyytinen et al., 1999; Ungerer & Sigman, 1984)
- Level of symbolic play exhibited is predictive of later language skills (Lyytinen, Laakso, Poikkeus, Rita, 1999; Lyytinen, Poikkeus, Laakso, Eklund, & Lyytinen, 2001).

# **Longitudinal Relations between Play and Gesture Behaviors in Infants with Autism**

**(Watson, Crais, Baranek, Roy, & Dykstra, 2004)**

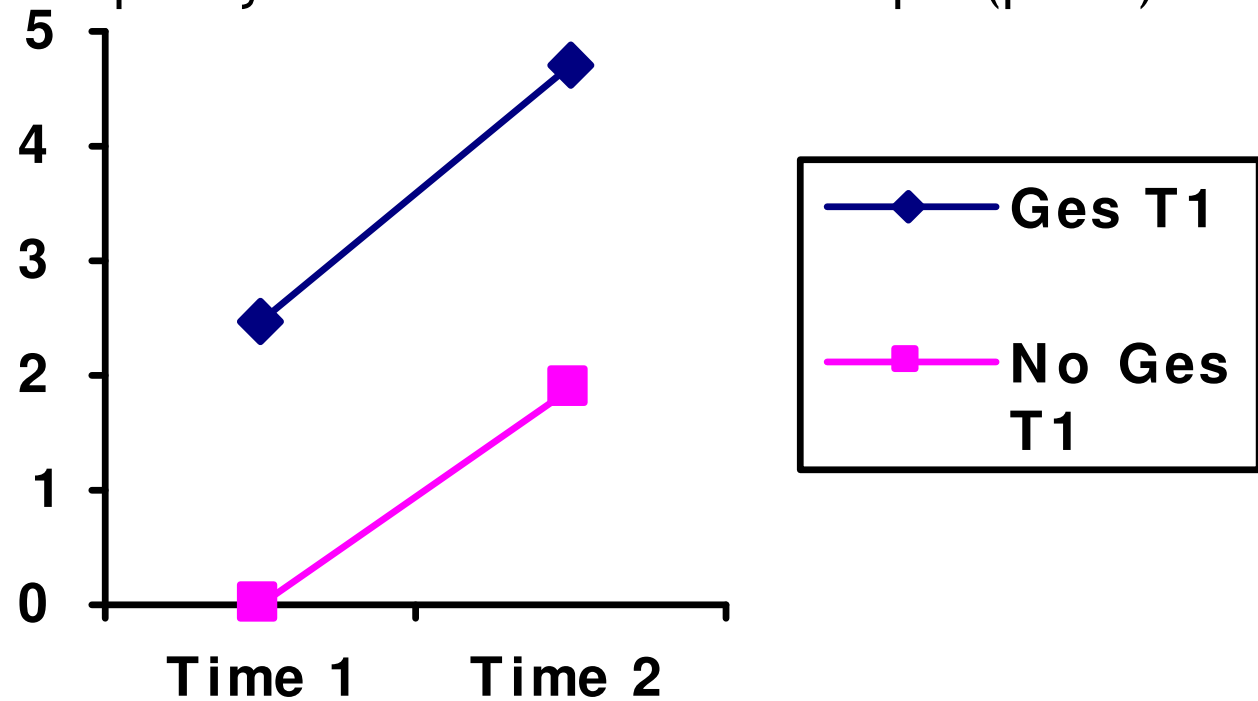
Examined predictive relations within and across play & gesture from 9-12 to 15-18 months

- 27 children in three groups
  - Autism (n = 15)
  - DD (n = 4); nonspecific, mixed diagnoses
  - Typical (n = 8)

# T1 to T2 Gesture Use

(Watson et al. 2004)

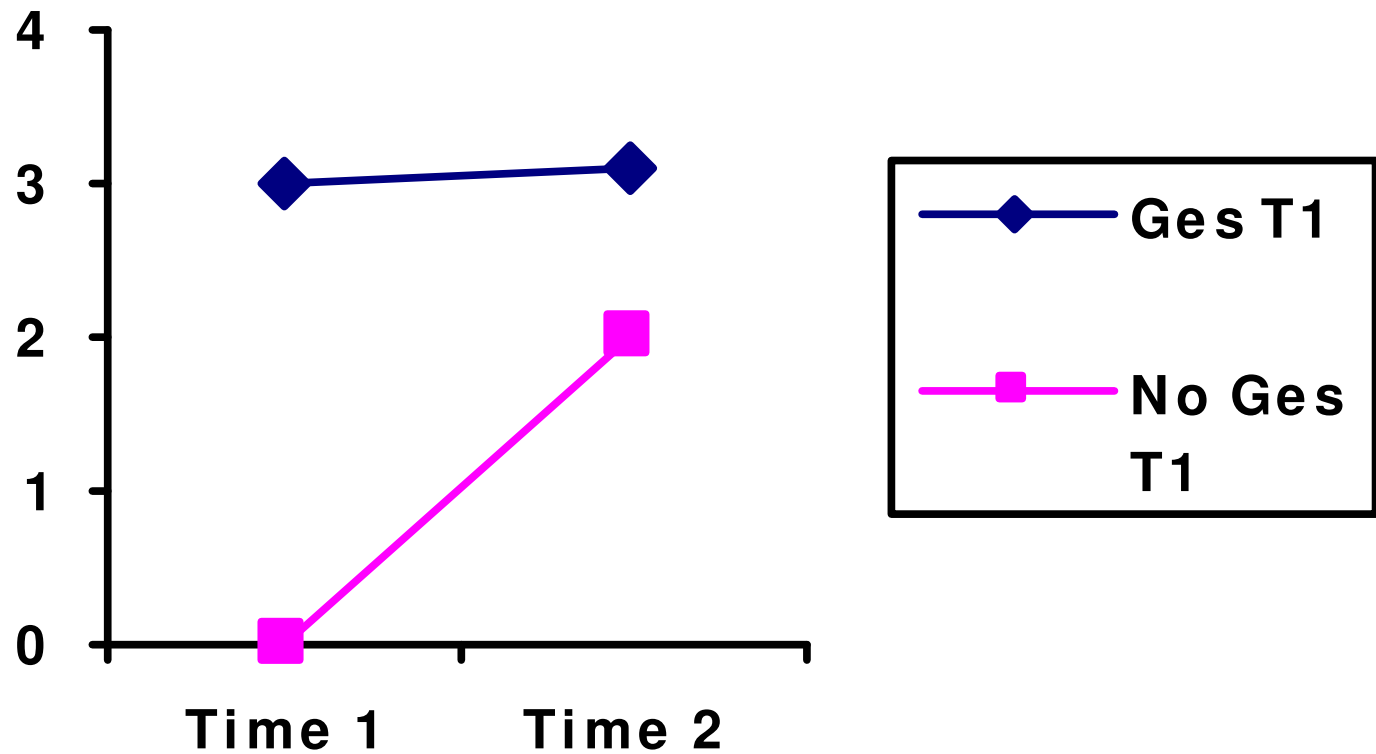
Figure 1: Mean Frequency of Gestures for Total Sample (p=.08)



# T1 to T2 Gesture Use

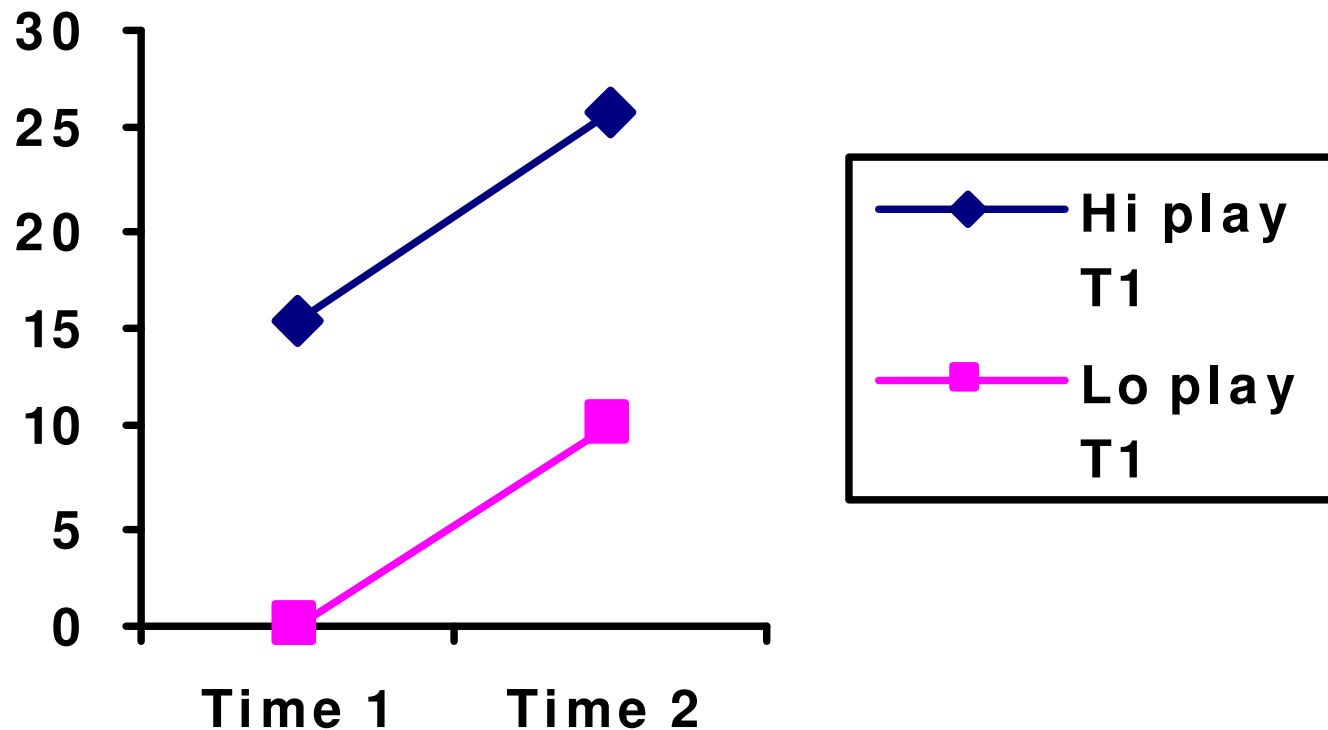
(Watson et al., 2004)

Figure 2: Mean Frequency of Gestures for ASD Sample



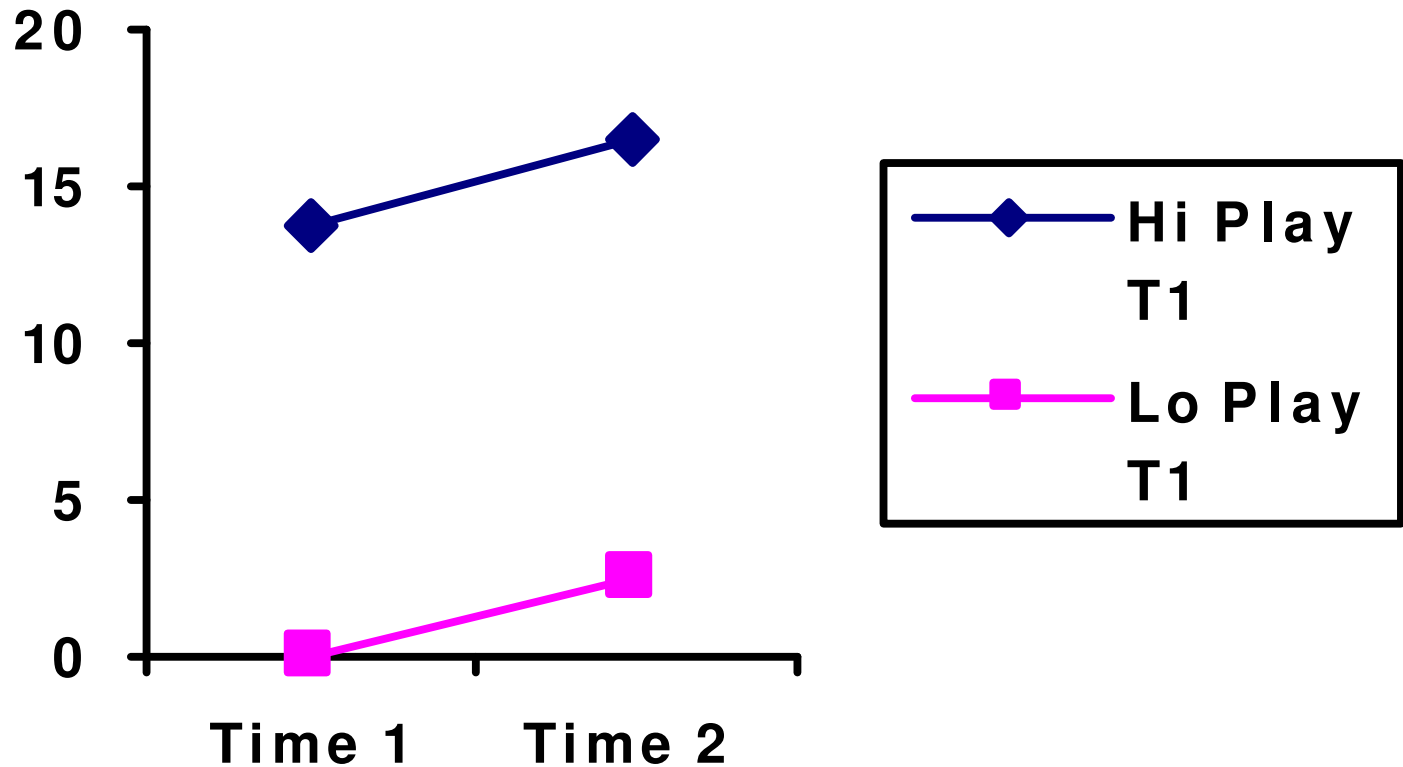
# T1 to T2 Higher Level Play (Relational Play+) (Watson et al., 2004)

Figure 3: Mean Second in Higher Level Play for Total Sample



# T1 to T2 Higher Level Play (Relational Play+) (Watson et al., 2004)

Figure 4: Mean Seconds in Higher Level Play for ASD Sample



# What have we learned?

- Developmental progression of gesture use
- Qualitative and Quantitative differences in gesture use between typically developing children and those later diagnosed ASD.
  - Differences in behavior regulation & joint attention gesture use for children with autism
  - Fewer total types of gestures used at 9-12 months associated with group with autism
- Relationship between gesture development & later play
- Wide variability up to 18 months; may be an excellent time to implement early intervention. Assessment of gesture use in young children may contribute to early screening efforts in identifying autism and other disabilities.

# Clinical Implications

- Preliminary guidelines for clinicians seeking developmental models for both the range of expected ages of emergence of targeted gestures and their hierarchy in typically developing children.
- Clinicians can assess the depth and breadth of gestures used by children demonstrating communication delays
- Hierarchy of gesture development can be used in determining potential developmental targets for intervention.

# **Implications and Directions for Future Research**

- Continued research examining the different types of gestures used in early stages of development as well as their different communicative functions.
- Important to examine the frequency and quality of support provided by caregivers of both children with TD and ASD.
- Examine the relationship between the support provided by a caregiver and their child's use of communicative gestures.

# Resources

- <http://www.firstsigns.org/index.html> (updates on autism)
- <http://firstwords.fsu.edu/> (CSBS-DP Checklist)
- <http://www.autismspeaks.org> (conference announcements)
- <http://www.autismspeaks.org/video/glossary.php>  
(video glossary of children with & without autism)
- [http://www.kylestreehouse.org/treatment\\_options.cfm](http://www.kylestreehouse.org/treatment_options.cfm)  
(overview of interventions)
- <http://www.researchtopractice.info/products.php>  
(evidence-based research summaries, handouts for families)