Measuring Progress in Early Interventions for Children with Developmental Disabilities

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Tarjan Distinguished Lecture Series

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Disclosures and Conflicts of Interest

None to report

Takeaways

01

Measuring progress in children's social communication is important.

02

There are many ways to measure progress in children's social communication goals who are enrolled in early interventions.

03

There are active efforts to improve the way we measure change over time.

Early Intervention

Wide Range of:
- Intensities
- Treatment targets
- Contexts
- Approaches

Access to early intervention leads to better outcomes

Bal et al., 2015; Schreibman., 2015; Smith & Iadarola, 2015; Sandbank et al., 2020

Combining individual studies

How do we know what works?

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Social skills groups for people aged 6 to 21 years with autism spectrum disorders (ASD)

Individual Studies

Pooled Effect
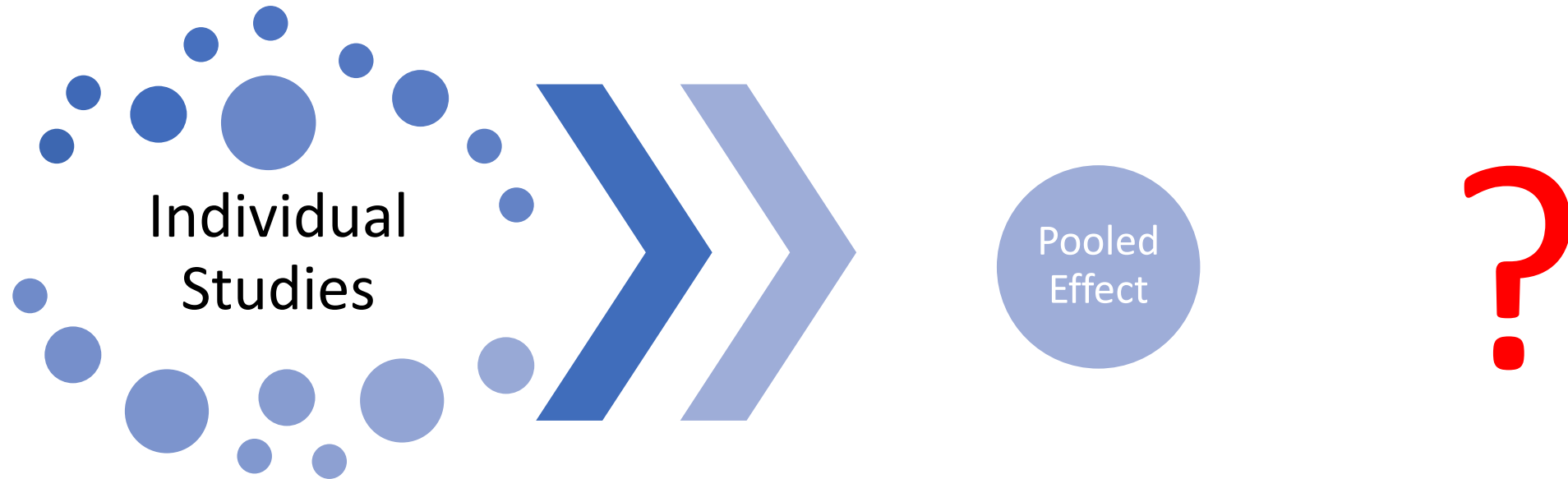
Number of Meta Analyses Related to Autism
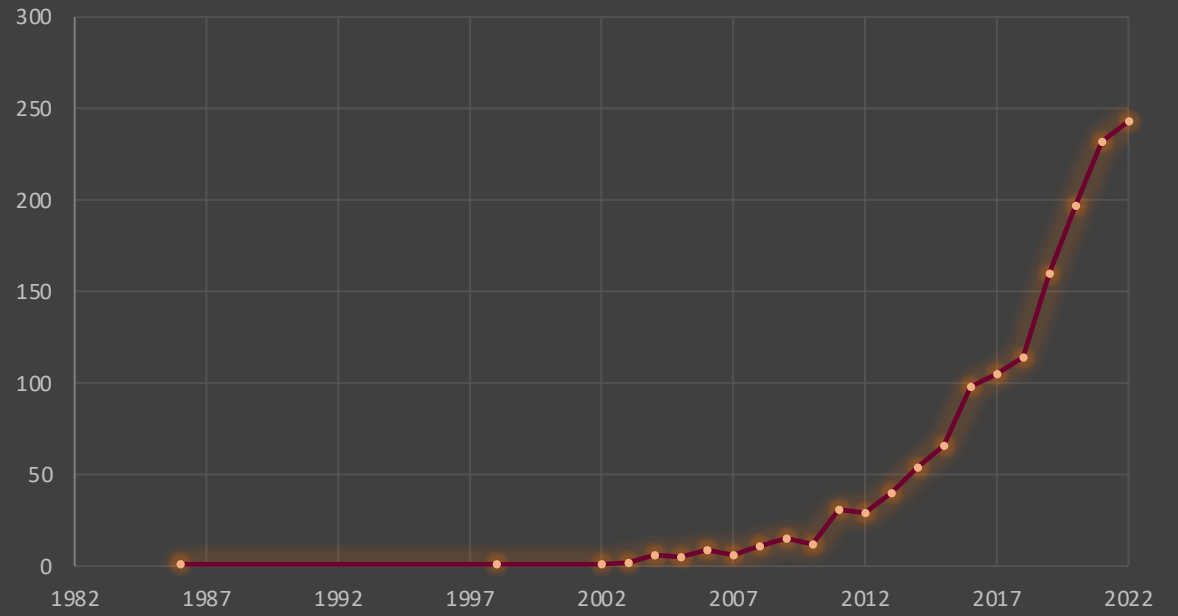
Number of Meta Analyses on PubMed
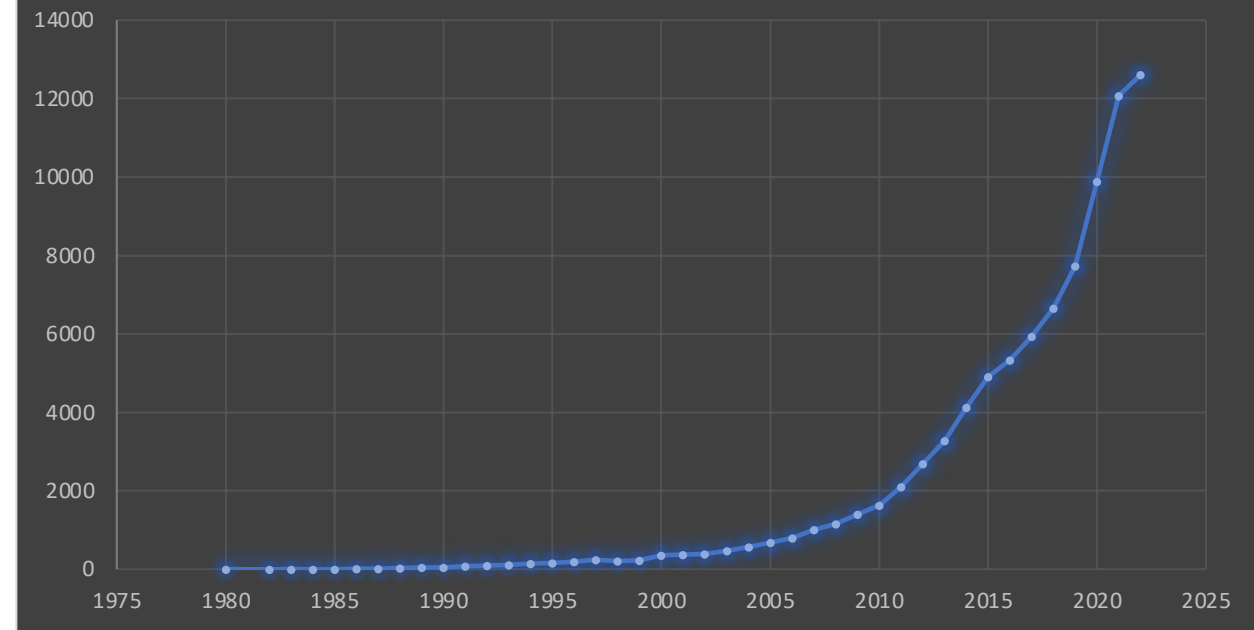
Example

Most early interventions had small to medium effects

Intervention and Outcome Type	Study N	Outcome N
Behavioral		
Adaptive*	21	51
Cognitive*	21	39
Language*	14	41
Motor*	8	9
Social Communication*	20	91
Social Emotional/ Challenging Behavior*	13	60
Diagnostic Characteristics of Autism*	8	13
Developmental		
Language	8	26
Social Communication*	14	117
NDBI		
Adaptive	6	12
Cognitive*	9	26
Language*	19	80
Play*	6	53
Restrictive and Repetitive Behaviors	7	12
Social Communication*	24	233
Social Emotional/ Challenging Behavior	6	12
Diagnostic Characteristics of Autism	6	10

Sandbank et al., 2020

Key Measurement Issues

Lack of consensus on what measures should be used to monitor progress

A small number of measures have adequate evidence of validity and reliability

Of those measures only a handful are sensitive to change over time

Bolte & Diehl, 2013; Mokkink et al., 2010; McConnachie et al., 2015

The Big Picture: 2 Questions

In review studies, is it appropriate to combine different tests/measures together?

Are different types of outcomes more sensitive to change over time?

Question 1

Question 2

Sensitivity and Expected Change of Commonly Used Social Communication Measures in Longitudinal Research of Children with Autism

2021 | Sterrett, Kyle Advisor(s): Kasari, Connie L

Main Content   Metrics   Author & Article Info

Peer Reviewed: **190**

13 dissertations

Unique Groups: **347**

165 identified behavioral intervention, 36 medication, 146 TAU

Median Sample Size: **~26**

Median Age: **~49 months**

Median Length of Measurement Period: **6 months**

Sterrett, 2021

119 unique measures and about half were used only once

Question 1: Should Different Measures be Combined Together?

A prior meta-analysis reported effect size difference of 0.20 between treatments on language (small effect)

Sandbank et al., 2020

Question 1: Should Different Measures be Combined Together?

In these data…

Vineland- Communication

Behavioral Interventions Hedge's g= .44
TAU hedge's g= .25

Preschool Language Scales- Expressive

Behavioral Interventions Hedge's g= .22
TAU=.27

Reynell- Expressive Language

Behavioral Interventions Hedge's g= .52
TAU=.43

Sterrett, 2021

Question 2: Are Different Types of Outcomes More Sensitive to Change?

Vineland Socialization

Standard Score: **0.31**

Age Equivalent: **0.62**

Raw: **0.42**

Vineland Communication

Standard Scores: **0.29**

Age Equivalent: **0.55**

Raw: **0.71**

Mullen Expressive Language

Standard Scores: **0.30**

Age Equivalent: **0.58**

Developmental Quotient: **0.30**

Mullen Receptive Language

Standard Scores: **0.19**

Age Equivalent: **0.70**

Developmental Quotient: **0.50**

Summary
Need to be thoughtful about the standardized measures we choose

Choosing measures is complicated

There is not one right answer or one right approach

Standardized observations are one solution

Current Efforts

Brief Observation of Social Communication Change (BOSCC)

- Addresses issues with current measures including
  - Lack of sensitivity to change over time
  - Changes in social behaviors are subtle
  - Lack of consensus on appropriateness of measures

CrossMark

ORIGINAL PAPER

Measuring Changes in Social Communication Behaviors: Preliminary Development of the Brief Observation of Social Communication Change (BOSCC)

Rebecca Grzadzinski[1,2] · Themba Carr[3] · Costanza Colombi[4] · Kelly McGuire[5,6] · Sarah Dufek[1] · Andrew Pickles[7] · Catherine Lord[1]

ORIGINAL PAPER

Check for updates

Extending the Usefulness of the Brief Observation of Social Communication Change (BOSCC): Validating the Phrase Speech and Young Fluent Version

Katherine Byrne[1] · Kyle Sterrett[1] · Alison Holbrook[1] · So Hyun Kim[2] · Rebecca Grzadzinski[3] · Catherine Lord[1]

Grzadzinski et al., 2016

BOSCC Details

		Domain	Total
1	Eye Contact		
2	Facial Expressions		
3	Gestures		
4	Vocalizations	Social-Communication	Core
5	Integration of Vocal and Non-Vocal		
6	Social Overtures		
7	Social Responses		
8	Engagement		
9	Play		
10	Unusual Sensory Interests	RRB	
11	Hand/Finger/Body Mannerisms		
12	Repetitive/Stereotyped Interests/Behaviors		
13	Activity Level		
14	Disruptive Behavior/Irritability	Other Abnormal Behaviors	
15	Anxious Behaviors		

BOSCC Applied to Non-Speaking Children with Autism

Central Question:

Does observational context effect the change over time we observe?

Sample Characteristics

Number of Therapist Child Interactions Videos

= 184 (number of obs 509)

Number of Caregiver Child Interaction Videos

= 192 (number of obs 545)

Participant Characteristics

Variable: mean (SD) or % (n)	Whole Sample n = 193
Age at entry (years)	6.05 (1.34)
Male	79.3% (153)
ADOS total score mean	19.98
Social Affect	14.56 (2.85)
RRB	5.42 (1.93)
Nonverbal age equivalent (years)	3.25 (1.18)
NDWR at entry	5.54 (6.45)
0	22.7% (44)
1-10	57.5% (111)
11-20	17.6% (33)
21-30	2.6% (5)
Mother highest education	
Less than high school	7.2% (14)
High school	9.2% (18)
Specialized training	6.1% (12)
College	53.0% (104)
Graduate/Professional	21.9% (43)
Race/Ethnicity	
White	44.6% (86)
African-American	7.8% (15)
Latinx	23.3% (45)
Asian	6.7% (13)
Other/Mixed	17.1% (33)
Unknown	0.06% (1)

Adapted table from Pizzano, 2020

Effect of Time
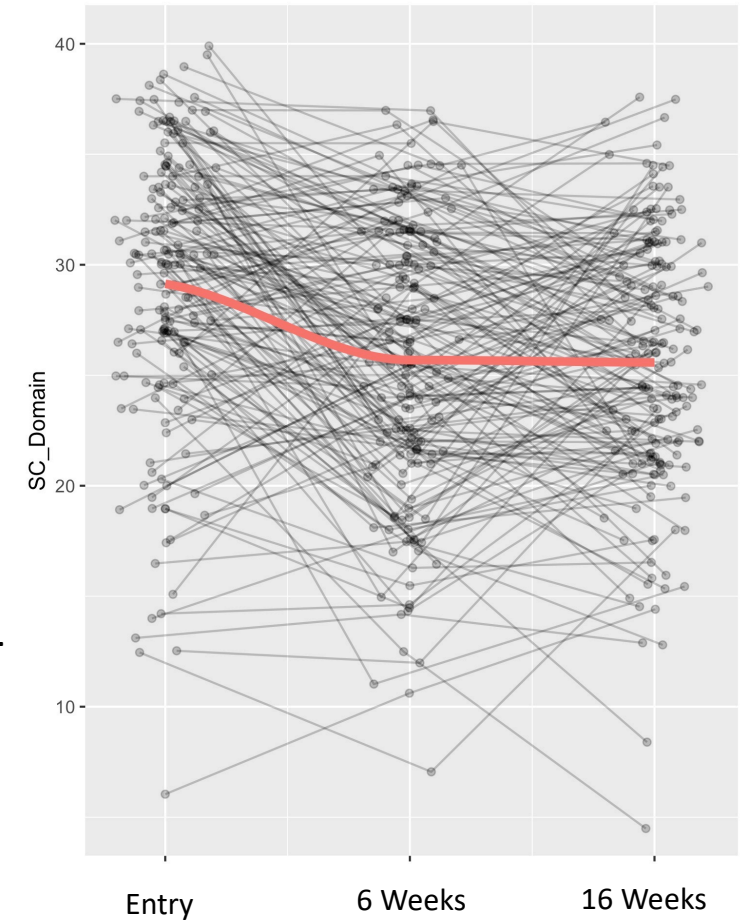
Caregiver Child Interaction
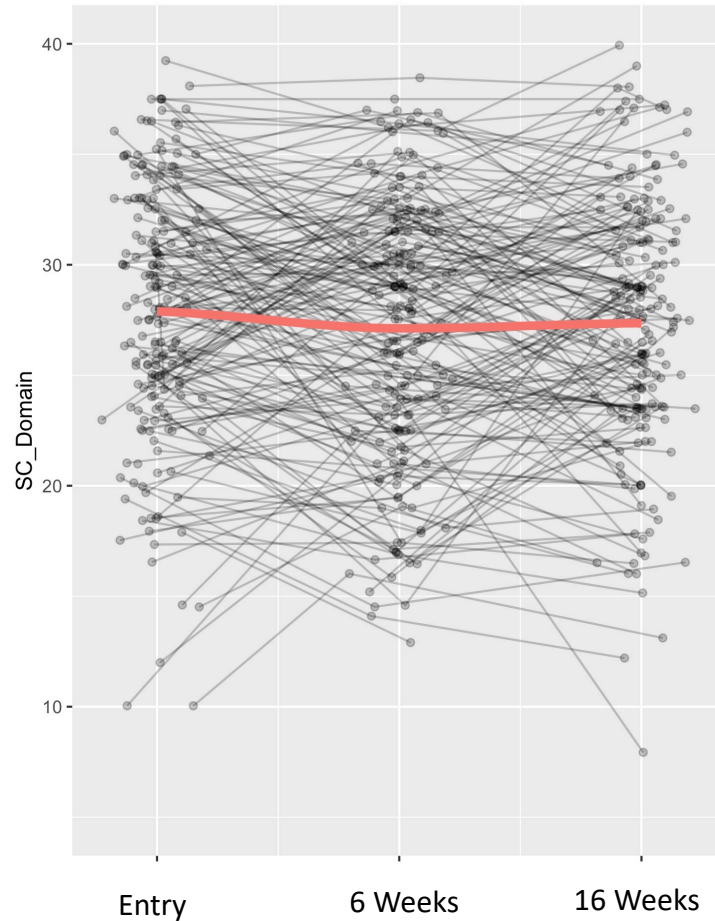
Effect Sizes
Entry to 6 Weeks=
.22 [.009,.43]   **p=.04**

Entry to 16 Weeks=
.16 [-.05,.373]
                      p=.12

	Entry	6 Weeks	16 Weeks
Mean (SD)	27.92 (5.86)	27.12 (5.98)	27.33 (5.89)

Therapist Child Interaction

Effect Sizes
Entry to 6 Weeks=
.74 [.52,97]   **p<.001**

Entry to 16 Weeks=
.74 [.53, .97]
                    p<.001

	Entry	6 Weeks	16 Weeks
Mean (SD)	29.14 (6.29)	25.69 (6.31)	25.58 (5.79)

Time by Treatment

Caregiver Child Interaction

Effect Sizes

Group 0
Entry to 6 weeks=
.16 [-.13, 45]

Group 1
Entry to 6 weeks=
.28 [-.02, .57]
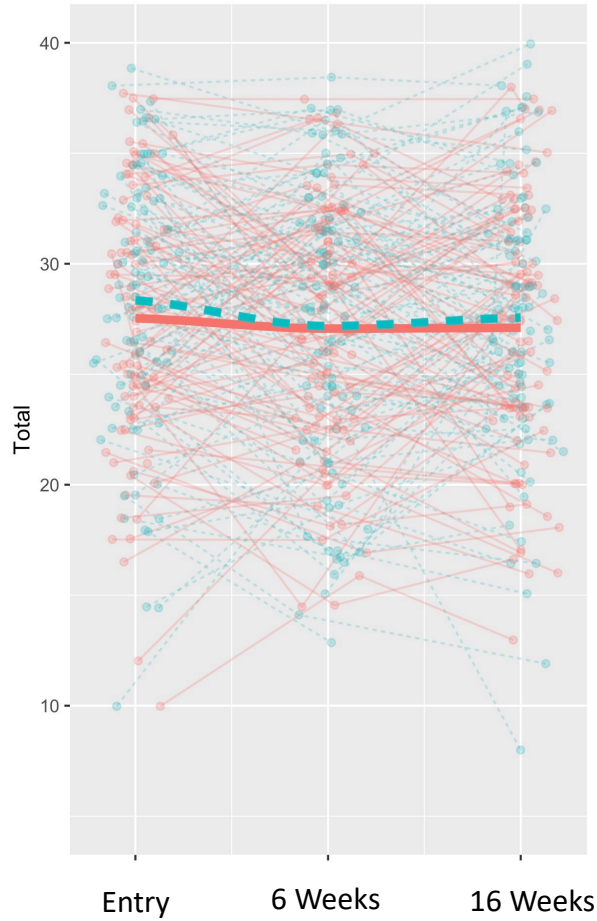
p=.58

Group 0
Entry to 16 weeks=
.13 [-.17, .42]

p=.73

Group 1
Entry to 16 weeks=
.20 [-.10, .50]

Therapist Child Interaction

Effect Sizes

Group 0
Entry to 6 weeks=
.93 [.61, 1.26]

Group 1
Entry to 6 weeks=
.58 [.28, 87]

p=.11

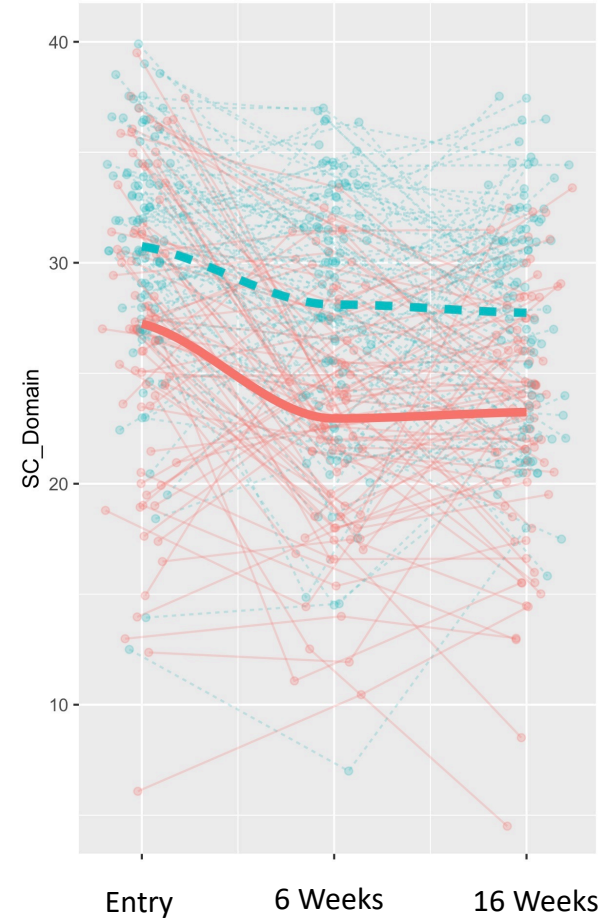**Group 0**
Entry to 16 weeks=
.87 [.55, 1.18]

Group 1
Entry to 16 weeks=
.63 [.34, .93]

p=.30

	Entry	Early Response	Exit
DTT: Group 0	27.53 (5.77)	27.06 (5.58)	27.10 (5.79)
JASPER: Group 1	28.34 (5.96)	27.18 (6.39)	27.56 (6.01)

	Entry	Early Response	Exit
DTT: Group 0	27.24 (6.85)	22.95 (5.53)	23.24 (5.56)
JASPER: Group 1	30.74 (5.19)	28.11 (5.99)	27.73 (5.14)

Item Level Comparison across TCX and CCX at Entry

Item	P-value	P-value Bonf Correction	Mean Dif (CCX-TCX)
Eye Contact	0.57	1.00	0.06
Facial Expressions	0.03	0.41	0.27
Gestures	0.25	1.00	-0.14
Vocalizations	0.01	0.16	-0.37
Integration of Communication	0.04	0.58	-0.22
Social Overtures	0.49	1.00	0.08
Social Responses	0.0000	0.0000	-0.51
Engagement	0.002	0.003	-0.40
PLAY	0.52	1.00	0.05
Sensory Behaviors	0.21	1.00	-0.20
Mannerisms	0.49	1.00	-0.12
RRB-I	0.0004	0.006	0.50
Activity	0.0000	0.0000	0.62
Aggressive Behaviors	0.0014	0.02	0.35
Anxious Behaviors	0.43	1.0	0.02

Summary

- Context is an important consideration in measuring treatment progress
- Consider where you expect change to happen and make sure you measure it in that context
  - As well as in more generalized contexts

Future Directions

Individualized Approaches to Understanding Treatment Response

Critical Questions

1. How to translate what we are learning from randomized controlled trials to everyday decision making about intervention?

Critical Questions

1. How to translate what we are learning from randomized controlled trials to everyday decision making about intervention?

2. Are their measurement tools we can develop to facilitate that decision-making process?
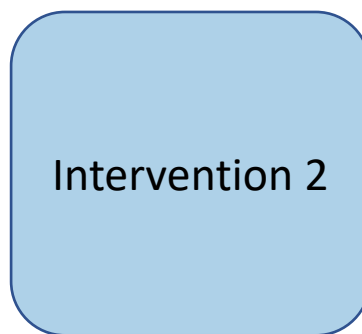
Probability of Intervention Benefit

**Low Autism Symptom Severity
Low Language
(less than 10 spoken words)**

Intervention 1

60% Chance

Intervention 2

25% Chance

(Beidas et al., 2014; Lindheim et al., 2012)
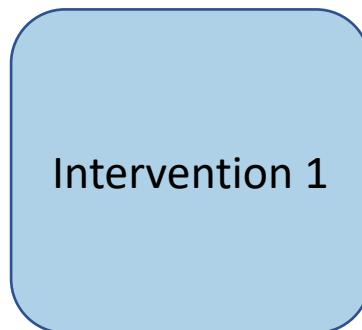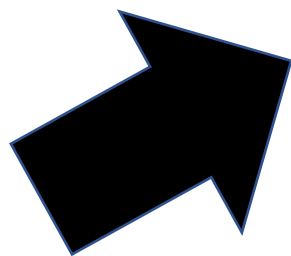
Interested in applying this approach to early interventions for children with ASD

Data from Three Randomized Trials

- **Predictors**
  - Age
  - IQ
  - Autism Symptoms

Brief Observation of Social Communication Change (BOSCC)

Model	Treatment	
	Dosage	Length
Early Start Denver Model (ESDM)	20 hours/week; Mean ranged from 18.54 to 25.73 hours/week	2 years (~104 weeks)
Early Social Interaction Project (ESI)	3.33 hours/week possible; Mean = 2.46 ESI hours + 1.26 outside hours/week	9 months (~36 weeks)
Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER)	2 hours/week	12 weeks

Kim et al., in-press
Grzadzinski et al., 2016

Takeaways

01

Measuring progress in children's social communication is important.

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There are many ways to measure progress in children's social communication goals who are enrolled in early interventions.

03

There are active efforts to improve the way we measure change over time.

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Questions?

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