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Measuring Joint Attention in Children with Autism Spectrum Disorder Through Structured and  
Unstructured Play

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Arts in  
Education

by

Jonathan Luke Panganiban

2017

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## ABSTRACT OF THE THESIS

# Measuring Joint Attention in Children with Autism Spectrum Disorder Through Structured and Unstructured Play

by

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Master of Arts in Education

University of California, Los Angeles, 2017

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Joint attention, or the shared experience of an object or activity, is one of the earliest indicators of social interaction, and an important precursor to language. Skills used to coordinate joint attention often emerge within the first and second years of life. Research shows that children with an autism spectrum disorder (ASD) exhibit atypical development of joint attention skills compared to typically developing children. Considering the important role joint attention plays in language development, the accurate assessment of joint attention skills in children with ASD is critical for identifying deficits and designing early interventions. The commonly accepted gold standard for joint attention assessment is the Early Social Communication Scales (ESCS). However, researchers and clinicians may benefit from expanding their methods of joint attention assessment. Multiple observations across different constructs may improve the

accuracy of assessing a child's development of joint attention, and improve ecological validity. The current study aims to explore the validity of measuring joint attention within structured and unstructured play interactions by comparing rates of joint attention in these contexts with rates of joint attention in the ESCS. Using the same guidelines established by the ESCS, joint attention skills were coded from structured play assessments and unstructured caregiver child interactions administered to 28 young children with ASD, ages 2 to 5 years. Correlation analysis shows strong positive correlations between rates of child initiated joint attention in the structured ( $r = .67$ ) and unstructured ( $r = .61$ ) play when compared to the ESCS. Comparison of correlation coefficient rates of child initiated joint attention against rates of child initiated behavior regulation coded in the three measures provides evidence of convergent and discriminant validity. These findings suggest that structured and unstructured play assessments can be utilized as tools to measure child initiated joint attention, providing researchers with more opportunities to observe these skills in young children with ASD.

The thesis of Jonathan Luke Panganiban is approved.

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2017

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## **Introduction**

Joint attention, defined as the shared focus between two (or more) individuals on an object or an event, represents a critical moment in human development. Through the use of gestures, and eventually language, joint attention is achieved by one individual coordinating the attention of another towards an object or event of interest. Emerging within the first year of life, joint attention skills are often regarded as some of the earliest forms of social communication and precursors to language. These moments of joint attention play a significant role in development, particularly in the development of language (Tomasello & Farrar, 1986) and theory of mind (Charman et al., 2000). Furthermore, joint attention has been shown to play an important role in the language development of atypically developing children (Mundy, Sigman, Ungerer & Sherman, 1987; Mundy, Sigman, & Kasari, 1990), specifically children with Autism Spectrum Disorder (ASD). As such, the emergence of joint attention skills represents an important milestone in all human development.

Research often points to 12 months-of-age as a critical phase in childhood development. Within this period infants begin to distinguish themselves from another person and recognize that they are each interacting with the world around them. Trevarthen and Hubley termed this concept secondary intersubjectivity (1978). Infants most frequently display this concept through the early social acts of referencing and imitating adults. One of the primary behavioral aspects of these early social communicative acts is joint attention. Research in the development of joint attention suggests a typical developmental pattern of emergence. In a study examining typically developing infants from 9 months to 15 months of age, infants were found to progress from sharing interest with others, to following another person's interest, and to directing another person's attention and behavior (Carpenter, Nagell, & Tomasello, 1998). In this sequence, we

see the development of awareness of others, awareness of the intent of others, and finally awareness of one's ability to influence others. In a more recent study, typically developing children exhibited a full range of non-verbal joint attention skills by 18 months of age, with a specific pattern emerging. The sequence of emergence was as follows: coordinated looks, showing, following gaze, following points, and pointing (Paparella, Goods, Freeman, & Kasari, 2011). These findings mirror the findings from Carpenter and colleagues (1998) where we see a pattern of sharing attention with others, responding to others' attention, and finally directing attention. These findings have done much to establish the developmental process of joint attention emergence in typically developing children.

Considering the relationship between joint attention, language, and theory of mind, individuals with Autism Spectrum Disorders (ASD) represent an important population for research. With marked difficulties in social communication and theory of mind, it is important to understand the development of joint attention among individuals with ASD. Much of the literature on atypical development of joint attention focuses on children with ASD. When compared to children with developmental delays and typically developing children, children with ASD perform significantly worse on measures of joint attention (Mundy, Sigman, Ungerer, & Sherman, 1986; Dawson et al., 2004). These findings suggest atypical development of joint attention is a specific characteristic of ASD. Retrospective data analysis of home videos shows marked joint attention delays throughout the second year of life in children later diagnosed with ASD (Clifford & Dissanayake, 2007). These results demonstrate increasing evidence of significant differences in the development of joint attention skills after 1 year of age for children with ASD. However, other findings comparing joint attention levels at 24 months and 42 months may indicate more complexity in the development of joint attention for children with

ASD. A comparison of children with ASD, children with other developmental disorders, and typically developing children found that children with ASD showed significantly less joint attention at 24 months than the other groups. However, by 42 months, the children with ASD were showing similar levels of joint attention (except visual joint attention) as the other groups (Naber et al., 2008).

Paparella and colleagues further explore this complexity in their study examining specific non-verbal joint attention skills. Not only were children with ASD delayed in their development, but the sequence of emergence of specific skills differed from that of typically developing children (see above). Unlike the findings with typically developing children, only coordinated looks and following points came in under 20 months-of-age. Pointing and showing behaviors emerged after 20 months-of-age, and following gaze after 46 months-of-age. While children with ASD may go on to develop joint attention behaviors, they do so atypically and at a delayed rate. This atypical development of joint attention is often directly connected with the atypical social communication exhibited by individuals with ASD.

In recent years, joint attention has been shown to be an important target for early intervention, resulting in sustained improvement in language outcomes (Kasari, Paparella, Freeman, & Jahromi, 2008; Kasari, Gulsrud, Freeman, Paparella, & Hellemann, 2012). Therefore, accurate measurement of joint attention skills is necessary for researchers and clinicians working with young children with ASD. In the research literature, measurement of joint attention has varied across studies. Furthermore, different constructs of joint attention are identified and measured in different studies. The most basic distinction is between the initiation of joint attention (IJA) and response to joint attention (RJA). Within those two constructs are specific joint attention skills. Different methods of measurement capture these constructs and

skills in a variety of ways. The most common method of measurement is through the use of structured assessments designed to elicit joint attention skills (IJA, RJA, or both). Alternative methods include eye tracking, questionnaires, coding of retrospective video, and coding of unstructured interactions.

The most commonly used assessment of joint attention is the Early Social Communication Scales (ESCS; Mundy et al., 2003). The ESCS is a structured assessment designed to elicit IJA, RJA, requesting behavior, and social interaction. Assessors engage the child with a standardized set of play activities, systematically administered on a table top. ESCS sessions are videotaped and later coded for specific joint attention skills. While the ESCS is an effective and validated measure, it does have limitations. The assessment requires a controlled setting, with assessors trained in the standardized administration. This can place high demands on both the child and the assessor. Very young children or children with attention difficulties may have difficulty expressing their full capabilities in such a structured setting. While standardized administration is a strength of the ESCS, it may also make it difficult for professionals outside of research institutions to effectively administer.

Some studies have used assessments similar to the ESCS, while incorporating eye tracking technology (Johnson, Gillis, & Romanczyck, 2012; Navab, Gillespie-Lynch, Johnson, Sigman, & Hutman, 2012). Eye tracking technology provides an alternative to live or video coding and a level of detail not possible with more traditional methods. However, eye tracking technology can also be expensive and requires highly trained administrators.

Another common method for assessing levels of joint attention is through observation. Much like the early research in ASD symptomology, retrospective review of home videos have been used to measure joint attention skills (Clifford & Dissanayake, 2008; Poon, Watson,

Baranek, & Poe, 2012). Retrospective video review can provide important insight into a child's early development, but researchers are limited by the availability and quality of these videos. However, direct observation may provide valuable information about a child's abilities.

Other studies employed loosely structured play interactions with an experimenter or a parent (Naber et al., 2008; Roos, McDuffie, Weisner, & Gernsbacher, 2008). This method provides a more naturalistic situation than the more structured assessments, and does not require advanced training for administration. This allows for flexibility when working with potentially difficult populations like children with ASD. Play based measures and naturalistic observations can often be easier methods of assessment for children that are more impacted by ASD or developmentally unable to complete more structured assessments.

Overall, studies of joint attention in children with ASD have generally been successful in using a variety of assessment structures. However, few studies have closely examined the validity of these alternate methods in relation to the ESCS. One study did compare joint attention scores from an unstructured play interaction with scores from the ESCS and found high correlation of scores between the two measures (Roos et al., 2008). While these findings do provide evidence of convergent validity between the two methods' ability to measure joint attention, the authors were unable to explore discriminant validity.

One method for exploring construct validity by addressing both convergent and discriminant validity is through the use of a multitrait-multimethod matrix (MTMM, Campbell & Fiske, 1959). Comparing correlation coefficients of multiple traits across multiple methods of measurement can provide evidence that a given trait is accurately measured across methods. In the current study, the measurement of joint attention in structured and unstructured play is compared to measurement of joint attention in the ESCS. We hypothesize that joint attention, as

defined by the ESCS, can be accurately measured in structured and unstructured play settings. Furthermore, measures of joint attention can be discriminated from measures of a qualitatively different behavior across the ESCS, structured play, and unstructured play.

## **Method**

### **Participants**

Participants were originally enrolled in a larger ASD intervention study. The current study is a secondary analysis of data from 28 participants, collected prior to their participation in the intervention. The goals of the original study were to compare two models of parent training and to examine the process of disseminating an evidence-based intervention in underserved community settings. Families identified as underserved (limited access to intervention) and with a child 2 to 5 years of age with a previous diagnosis of ASD, as determined by the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, & Risi, 1999), were targeted for recruitment. Diagnosis was then confirmed with an independent administration of the ADOS. All participants also needed to achieve an age equivalency of 12 months or higher in fine motor and visual reception on the Mullen Scales of Early Learning (Mullen, 1995). Children with an identified comorbid disorder or a history of seizures were excluded from the study. For the current study, data were taken from entry assessments administered to participants prior to receiving intervention.

### **Procedure**

As part of the original intervention study, participants were seen for entry assessments, which included the Early Social Communication Scales, a structured play assessment, and an unstructured caregiver-child play interaction. Each assessment was videotaped and later coded by blind raters. The order of administration varied per subject. For the current study, the

structured play assessments were re-coded for joint attention skills and then compared with joint attention codes from the ESCS and the unstructured caregiver-child interaction.

## **Measures**

**Early Social Communication Scales (ESCS; Mundy et al., 2003):** A structured table top assessment, the ESCS is designed to elicit IJA, RJA, and requesting behavior. Sitting across from a child at a table, an experimenter engages the child with a variety of play activities including wind-up toys, a balloon, a car, a ball, and tickle songs for 15 to 20 minutes. The experimenter also periodically points to pictures in a book and around the room to elicit RJA. ESCS sessions are videotaped and later coded for specific joint attention skills. The specific skills coded are coordinated looks, alternating gazes, points, gives, shows, and language. Skills can also be coded in combination with language and/or eye contact (eg. a point with language, or a give with eye contact and language).

**Structured Play Assessment (SPA; Ungerer & Sigman, 1981):** The SPA is a play-based assessment designed to measure a child's level of play. An experimenter sits across from the child and presents one of five different toy sets individually until the child has had an opportunity to play with each set. The five sets include the following toys: set one contains a puzzle, shape sorter, and nesting cups; set two contains a tea set, dolls, and blocks; set three contains a phone, a brush, a mirror, and dolls; set four contains a furniture set and dolls; set five contains animal figures, blocks, a car, and a barn. Altogether, the SPA lasts approximately 10 to 15 minutes. Unlike the ESCS, the experimenter provides as little prompting as possible, does not make any bids for joint attention, and allows the child to play with the toys as they please. SPA sessions are videotaped and later coded for play levels displayed by the child. Individual play

acts are tracked and used to assess the child's play level. The play levels of interest include indiscriminate acts, discriminate acts, combination play, pre-symbolic play, and symbolic play.

**Unstructured Caregiver Child Interaction:** The caregiver child interactions is a ten minute videotaped play interaction between the child and a primary caregiver. The child and caregiver are provided a standard set of toys that includes pop up toys, cars, puzzles, shape sorters, a bus with figures, and a ball. No specific instructions are provided other than for the child and caregiver to play with the toys. Unlike the ESCS, the parent is not instructed to make specific bids for joint attention. Also, no restrictions are made on which toys are available to play with at any given moment. The caregiver and child are free to choose whichever toy(s) to play with for as long as they want within the ten minute interaction. The videotapes are later coded for parent strategy use, engagement, play level, communication, requesting behavior and joint attention.

### **Coding**

**Joint Attention:** Coding for IJA is based on the guidelines established by Mundy and colleagues for the ESCS (2003). The skills coded include coordinated joint looks (a 3 point look from object to experimenter, and back to object), alternate gazes (a 2 point look from experimenter to object), points, gives, shows, and language. Furthermore, children can display a combination of these skills (e.g., a point with eye contact and language). Skills are differentiated if displayed in isolation, as a combination of two skills, or a combination of three skills.

Altogether, 17 skills/skill combinations are coded as IJA in the ESCS. For the current study, the same coding system is used to code the SPA for IJA. In the MCX, only IJA involving gestures (points, gives, and shows) and language will be coded. Due to the unstructured format of the MCX, accurate coding of joint attention eye contact is difficult to distinguish on the videotapes.



**Behavior Regulation:** Child initiated behavior regulation (IBR) is also coded in the ESCS. IBR is often referred to as requesting behavior. In form these behaviors are similar to joint attention behaviors, but are differentiated as they perform a different function. Where joint attention behaviors are used to share the experience of an object or event, IBR is used to obtain a desired object or action. Coding of IBR is based on the guidelines established by Mundy and colleagues for the ESCS (2003). The skills coded include eye contact (indicating desire for an object or action), points, gives, reaches, and language. Like IJA, IBR skills are differentiated if displayed in isolation, as a combination of two skills, or a combination of three skills. Altogether, 15 skills/skill combinations are codes as IBR in the ESCS. In the current study the same coding system is used to code the SPA for IBR. Again, the MCX is not coded for eye contact, so only IBR involving gestures and language will be coded.

### **Reliability**

Re-coding of the SPA's was completed by the primary author. A random selection of 10 SPA's was re-coded by a research assistant to establish inter-rater reliability. Interclass correlations were computed following the guidelines set by Shrout and Fleiss (1979) to determine reliability. Inter-rater reliability was strong between coders for both IJA (ICC = .94) and IBR (ICC = .77).

### **Analytic Plan**

To determine the relationship between IJA measured in the SPA, ESCS, and MCX, correlational analysis was conducted. In order to compare IJA across the three measures, IJA frequencies were converted into rates per minute. A priori power analysis shows that the sample of 28 subjects has sufficient power (.99) to detect the predicted effect size of .66, based on prior findings from Roos et al. (2008). Correlation coefficients were examined using a multitrait-

multimethod matrix (MTMM). An MTMM allows us to examine the convergent and discriminant validity of measuring a given trait across different methods (Campbell & Fiske, 1959). The methods of interest are the ESCS, SPA, and MCX. The traits to be compared are IJA and IBR, as coded in all three measures.

## Results

Composite scores of child initiated joint attention (IJA) and child initiated behavior regulation (IBR) were calculated for each of the three measures by totaling gestures and language used to initiate joint attention or behavior regulation. Totals for IJA and IBR were then converted to rates per minute to account for varying duration of administration across the three assessments. Means, standard deviations, and ranges for all study variables are presented in Table 1. Visual inspection of the data showed that the rates of IJA and IBR in all three measures were positively skewed, potentially violating the assumption of normality. Shapiro-Wilk tests confirmed non-parametric distributions for IJA in the ESCS (S-W = .870,  $df = 28$ ,  $p = .002$ ), SPA (S-W = .774,  $df = 28$ ,  $p < .001$ ), and MCX (S-W = .755,  $df = 28$ ,  $p < .001$ ). Non-parametric distributions were also confirmed for IBR in the ESCS (S-W = .909,  $df = 28$ ,  $p = .019$ ), SPA (S-W = .521,  $df = 28$ ,  $p < .001$ ), and MCX (S-W = .574,  $df = 28$ ,  $p < .001$ ). Due to the non-parametric nature of the data, Spearman's Rho was used to calculate correlations between rates of IJA across the three different measures. Correlation analyses show strong positive correlations for rates of IJA between the ESCS and the SPA ( $r(26) = .67$ ,  $p < .001$ ), as well as the ESCS and the MCX ( $r(26) = .61$ ,  $p = .001$ ). Children that tended to have high rates of initiating joint attention in the ESCS also had high rates of initiating joint attention during structured and unstructured play.

To explore the construct validity of measuring IJA in the SPA and MCX, correlations were compared using a multitrait-multimethod matrix (MTMM). Convergent validity is established by the correspondence of a trait across different methods of measurement (monotrait-heteromethod). Discriminant validity is established through the independence of different traits within a given method of measurement (heterotrait-monomethod) and across different methods of measurement (heterotrait-heteromethod). In the current study, the traits of interest are IJA and IBR measured across the ESCS, SPA, and MCX. An MTMM of correlation coefficients comparing rates of IJA and IBR across the ESCS, SPA, and MCX are presented in Table 2. Strong positive correlations were found with the monotrait-heteromethod measures of IJA in the SPA (.67) and the MCX (.61). In comparison, heterotrait-monomethod correlations of IJA and IBR in the SPA (.45) and MCX (.46) were weaker. Heterotrait-heteromethod correlations within the SPA (.46, .32) and MCX (.40, .32) are also much weaker than the monotrait correlations. These findings show a high convergence of IJA as measured in the three different assessments. Furthermore, comparisons of IJA and IBR within and between measures show a clear distinction in each assessment's ability to capture IJA. Altogether, this pattern of findings suggests convergent and discriminant validity in measuring IJA in both the SPA and MCX.

## **Discussion**

The findings from this study suggest that structured and unstructured play interactions can be effectively utilized to measure child initiated joint attention (IJA) skills in young children with Autism Spectrum Disorders (ASD). Rates of IJA collected from children with ASD during a structured play assessment (SPA) and an unstructured caregiver-child play interaction (MCX) correlate highly with rates of IJA displayed in the gold standard assessment of joint attention in young children, the Early Social Communication Scales (ESCS). These findings mirror previous

work comparing joint attention in the ESCS and naturalistic play interactions (Roos et al., 2008), where strong correlations of joint attention across different contexts suggests convergent validity of these measurements. However, demonstrating convergent validity alone is not sufficient in establishing the construct validity of measuring joint attention across contexts. The current study takes steps to address this by providing evidence of discriminant validity in addition to convergent validity. In addition to examining IJA across different measurements, a second variable was examined as a point of comparison. Child initiated behavior regulation (IBR), behaviors used to obtain an object or action, were measured across the ESCS, SPA, and MCX. To demonstrate discriminant validity, rates of IJA and IBR should not be as strongly correlated within a given measure (monomethod) or across measures (heteromethod). Our findings clearly support this as correlations of IJA across the measures are stronger than correlations between IJA and IBR, both within and across measures.

These findings have several implications for research and clinical uses, particularly when working within the ASD population. Joint attention is a core deficit in children with ASD, and the measurement of joint attention skills is essential in the phenotyping and treatment of these individuals. The ability to utilize various assessment structures as opportunities to observe and measure joint attention can provide researchers and professionals greater confidence in the accuracy of their assessment of children with ASD and their skills.

During the SPA, assessors are not allowed to provide prompting or specific feedback so as to accurately elicit spontaneous play. Similarly, the majority child IJA during the SPA is going to be spontaneous. Just as in the ESCS, assessors can and do respond to child IJA. Typically, the responses are generic yet positive statements. For example, if a child points to a toy and labels it, the assessor may respond “you’re right” or “I see that!” These statements are

purposefully generic so as not to inadvertently model new language for child. While these generic, yet positive interactions allow for opportunities for spontaneous display of IJA, they also tend to create a less natural interaction between the child and the adult.

In the MCX, caregivers are not instructed to interact with or respond to the child in any particular way. As a result, there are many instances where the caregiver will prompt the child to play with or label the various toys. Therefore, opportunities for spontaneous IJA are less consistent. However, since the interaction is with a caregiver, it is much more natural for the child. That familiarity may lead a child to display their IJA skills just as frequently as they would during the more structured assessments. For example, a child may point to a toy and say “a bus!” During the structured assessments, the assessor would respond with a generic statement or merely repeat the child. During the MCX a caregiver may respond in a variety of ways. The caregiver may model new language such “no, that’s an ambulance.” Frequently, caregivers may respond with a question such as “what color is the bus?”

Gathering information across a variety of settings provides a more complete picture of a child’s skills. The play based nature of the assessments used in the current study also lends themselves well to measurement of children. The use of a developmentally diverse range of toys helps to motivate children to interact during these settings. The fact that neither the structured (SPA) or unstructured play (MCX) are designed to specifically elicit joint attention skills is particularly interesting considering the high correspondence in rates of joint attention displayed when compared to the ESCS.

Another strength of the ability to use structured and unstructured play interactions for the assessment of joint attention is the flexibility it affords when assessing difficult populations. Children with ASD, particularly those more impacted by the disorder, often have difficulty

sitting and attending for extended periods of time. Highly structured assessments, like the ESCS, may be difficult for some of these children to complete. Another difficult population to assess is infants. As research in ASD moves toward identifying early indicators, appropriate assessments must be developed and altered to address their developmental appropriateness. In the cases of highly impacted children and infants, these children may not be able to sufficiently display their full range of abilities within traditional structured assessments. Findings from the current study provide support for the use of alternate methods to assess skills like joint attention in difficult populations. A play based measure like the SPA places far less demands and has more flexibility in regards to administration. Even more promising in this regard are the observations of unstructured play interactions. The MCX used in the current study placed almost no demands on the child, being used primarily as an observation of caregiver-child play. Finding that scores of IJA in both measures correspond highly with IJA scores in the ESCS is very promising for researchers and professionals working with highly impacted or very young individuals.

In a broader sense, the findings from this study add to a growing literature supporting the increased use of more ecologically valid methods of measurement. Research often relies on highly controlled and obtrusive assessment of skills and traits. The ESCS and SPA are examples of such assessments. Although the caregiver-child interaction (MCX) used in this study was also administered in a research lab setting, it can represent a more familiar setting for the child. As measurement techniques continue to develop, future studies can examine the utility of measurement in a variety of settings such as the home and school.

### **Limitations**

Although the pattern of findings in this study clearly suggest convergent and discriminant validity for measuring child initiated joint attention within structured and unstructured play, there

are limitations that should be addressed in future studies. The skills reported in the current study were child initiated bids for joint attention (IJA). However, another aspect of joint attention is child response to bids of joint attention from another person (RJA). Within the ESCS, bids for joint attention from the assessor are included to specifically elicit RJA from the child. Due to the protocol of the SPA, assessors provide very little feedback to the child, therefore there are no opportunities for RJA from the child. Similarly, the unstructured nature of the MCX does not include specific bids for RJA. Future studies should address the measurement of RJA in unstructured play settings.

Another limitation of the current study is we were unable to test the effect of interactant across the three measures. Both the structured assessments were administered by trained assessors, unfamiliar to the child, while the unstructured interaction was conducted with the child's primary caregiver. It is possible that familiarity with the interactant directly influences joint attention behavior in the child. However, because the current study was a secondary analysis of data, interactant effects could not be directly tested. As noted above, mean rates of IJA were higher in the MCX than in both the ESCS and SPA. Due to the small sample size, we lacked the power to test the significance of this difference. Also, it is unclear if this difference may be explained by level of structure or familiarity with the interactant. Future studies can further examine the effects of structure and familiarity with the interactants in measuring joint attention.

## **Conclusion**

Joint attention is an important aspect of development, particularly among children with ASD. It is critical that researchers and professionals are able to accurately assess joint attention skills among these children. The results from this study add to a growing amount of evidence

suggesting the utilization of varying assessment structures to measure joint attention skills in children with ASD. This is particularly helpful for children that are more impacted by the disorder, or are too young to participate in traditional assessment structures. By including observations from a variety of settings, we may be able to provide these children the opportunities needed to accurately display their full capabilities.



**Table 1**Descriptive Statistics for ESCS, SPA, and MCX variables ( $n = 28$ )

Variable	Mean	SD	Range
ESCS			
IJA	.44	.42	.00 – 1.23
IBR	.58	.45	.00 – 1.48
SPA			
IJA	.42	.80	.00 – 3.32
IBR	.16	.31	.00 – 1.59
MCX			
IJA	1.05	1.38	.00 – 4.40
IBR	.14	.27	.00 – 1.30

ESCS = Early Social Communication Scales (Mundy et al., 2003)

SPA = Structured Play Assessment (Ungerer &amp; Sigman, 1981)

MCX = Caregiver-child Play Interaction

IJA = child initiation joint attention expressed as rate per minute; IBR = child initiated behavior regulation expressed as rate per minute.

**Table 2**

Multitrait-multimethod matrix for child initiated joint attention and behavior regulation

	ESCS		SPA		MCX	
	JA	BR	JA	BR	JA	BR
ESCS						
JA	( )					
BR	.319	( )				
SPA						
JA	.672**	.323	( )			
BR	.459*	.564**	.448*	( )		
MCX						
JA	.606**	.324	.724**	.459*	( )	
BR	.403*	.522**	.209	.371	.460*	( )

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