A comparison of contexts for assessing joint attention in toddlers on the autism spectrum

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Abstract

Young children on the autism spectrum often demonstrate atypical joint attention behaviors (Chawarska et al., 2007; Filipek et al., 1999; Mundy et al., 1986; 1990; 1994; Osterling and Dawson, 1994), and atypical joint attention has been posited to serve as an early indicator of autism (Dawson et al., 2004). Various lines of research have explored the association between atypical joint attention and concurrent or subsequent diagnoses of autism. For example, parent report data have indicated that children with diagnoses on the autism spectrum differ significantly from children with developmental delays in the use of referential eye contact, showing and pointing to objects, following the points of others, and communicative vocalizations (Wimpory et al., 2000). Retrospective reviews of early home videotapes have indicated that infants who later received diagnoses on the autism spectrum demonstrated fewer instances of pointing or showing objects to others, orienting to their names, and looking at others when compared with infants with typical development (Mars et al., 1998; Osterling and Dawson, 1994; Osterling et al., 2002). Prospective data from younger siblings of children with autism have revealed that, by 12 months of age, younger siblings later diagnosed with autism differed from other siblings in their rate of eye contact, responding to their names, and pointing (Zwaigenbaum et al., 2005). Thus, some researchers consider atypicalities in joint attention to represent a core feature of autism in young children (Charman, 2003; Mundy and Burnette, 2005).

In clinical and research settings, structured measures such as the Early Social Communication Scales (ESCS: Mundy et al., 2003) are commonly used to provide a metric of joint attention. However, there is limited information about the extent to which joint attention assessed with structured measures relates to joint attention assessed in less structured contexts. Measurement of joint attention behaviors in multiple contexts, including more naturalistic contexts, has the potential to inform our understanding of the range of joint attention behaviors in children on the autism spectrum and to facilitate the comparison of these behaviors across clinical and typical populations. In other words, evaluating joint attention behaviors under varying contextual constraints increases the probability of obtaining a valid index of these skills. The goal of the current study is to provide an initial comparison between the quantification of joint attention behaviors

coded within a naturalistic play context and the quantification of similar behaviors coded within a commonly used structured assessment. To provide an adequate range of joint attention behaviors we chose young children on the autism spectrum to be our research participants.

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Responding to and initiating joint attention

Two joint attention behaviors that have been of particular interest to autism researchers are responding to and initiating joint attention (RJA and IJA, respectively). RJA refers to the child's use of attention-following behaviors, such as head turns and eye gaze to follow the visual focus of a communicative partner (Scaife and Bruner, 1975). IJA refers to the child's use of attention-directing behaviors, such as pointing or showing to coordinate attention with a social partner with reference to an object or event (Mundy et al., 1986).

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Structured assessments for quantifying joint attention

Joint attention is often quantified using structured assessment procedures that incorporate specific activities and prompts to elicit behaviors of interest. Metrics for these joint attention behaviors include proportions or frequencies of instances with which targeted behaviors are observed. Two structured measures that are frequently used to quantify joint attention include the Early Social Communication Scales (ESCS: Mundy et al., 2003; Seibert et al., 1982) and the Communication and Symbolic Behavior Scales (CSBS–DP:Wetherby and Prizant, 2002). The ESCS was designed to measure joint attention and related behaviors in typically developing toddlers (Morales et al., 2000; Mundy and Gomes, 1998; Mundy and Willoughby, 1996), and the CSBS was developed to evaluate verbal and non-verbal communication in children at risk for communication and language impairments.

Another semi-structured assessment recently developed specifically for use with children with autism is the Social Communication Assessment for Toddlers with Autism (SCATA: Drew et al., 2007). The SCATA was designed to be sensitive to earlier emerging forms of social communication that can be measured in very young children with autism. Thus, the SCATA includes a much broader range of behaviors than are included in either the ESCS or the CSBS.

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Variations in measurement of RJA and IJA

In the following paragraphs, the range of behaviors that are considered to represent RJA and IJA across these three measures will be reviewed briefly, by way of comparison to the coding scheme we developed to capture joint attention in a more naturalistic setting (i.e. a context in which communicative interactions are not specifically elicited). This comparison also highlights the variations in definition of IJA and RJA within the literature.

According to the ESCS, joint attention behaviors are those non-verbal behaviors used by a child to monitor and respond to an interaction partner's solicitation of attention (RJA) or to solicit the attention of an interaction partner (IJA: Mundy et al., 2003). As defined in the ESCS manual, RJA refers to a child's ability to follow the tester's line of regard or pointing gesture. RJA is elicited by the examiner with two ESCS activities: (1) the examiner points proximally to a page of a picture book, and (2) the examiner looks and points distally toward a poster on the wall, while calling the child's name. RJA is quantified as the proportion of examiner's solicitations to which the child responds, as evidenced by the child turning his or her head and/or shifting gaze toward the examiner's line of regard or toward the examiner's pointed finger.

The ESCS metric for IJA reflects the frequency with which a child uses eye contact, pointing and/or showing to solicit the attention of a social partner relative to objects or ongoing events. IJA behaviors include the child's use of eye contact with the examiner while the child is holding an inactive toy, the alternation of eye gaze between an activated toy and the examiner's eyes (i.e. a two-point gaze shift), the use of proximal or distal finger points (with or without eye contact), and the use of showing gestures with eye contact. The majority of IJA behaviors within the ESCS are coded within the context of structured activities initiated by the examiner such as manipulating wind-up toys, or observing various 'object spectacles' including balloons and hand-operated toys.

The definitions of IJA and RJA that were employed within the coding scheme for the naturalistic play context overlapped considerably with those found within the ESCS protocol, with slight variation. For example, within the naturalistic play context, eye contact with the examiner while the child touched, moved, or manipulated an object, two- and three-point shifts of eye gaze from object or event to the examiner, as well as pointing and showing gestures, were considered IJA behaviors if these behaviors were judged to share interest or attention with an adult. IJA behaviors in both the ESCS and our naturalistic play context did not require action on the adult's part beyond participating in the interaction. However, in contrast to the ESCS, the coding scheme for the naturalistic play context required that a child's proximal finger point be accompanied by eye gaze to be considered IJA. Although the ESCS uses shared attention to a picture book to elicit proximal pointing, no such situational press was available within the

naturalistic play context. The requirement for eye gaze to accompany proximal finger points during the naturalistic play context was adopted to distinguish communicative proximal finger pointing from exploratory or self-directed pointing.

The CSBS classifies IJA behaviors as a type of communication act; communicative acts are defined as gestures, vocalizations, or verbalizations directed toward another person to meet a communicative function. To be coded as IJA within the CSBS, the child's behavior must direct another person to look at an object or event. The child also may use IJA to request information or clarification about an event, an object, or a previous utterance. Contact gestures such as touching the adult or moving the adult's hand are also considered communication acts. Eye gaze alone is not considered a communication act. Given the unstructured nature of play contexts, the use of eye gaze to the examiner was likewise considered IJA within our naturalistic play context only if this behavior was accompanied by a vocalization, positive affect, or a gesture that clearly directed the adult to look at an object or event.

IJA behaviors are also coded in the SCATA. Drew and colleagues (2007, p. 649) devised the SCATA to provide a downward extension of what they termed 'landmark' joint attention behaviors of gaze monitoring, gaze switching, and pointing. Thus, according to the SCATA, behaviors directed toward the examiner such as bringing an object to the examiner to show or to dump, and proximal points (index finger point that touches object), are coded as instances of proto-joint attention gestures; such acts are also considered IJA in the play sample coding scheme that was employed for the current study, if the context supported the interpretation of these acts as being used for the pragmatic function of sharing interest, attention or positive affect. Examples of behaviors that were coded as IJA included showing objects to the examiner, proximal pointing, or smiling while looking at the examiner.

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Rationale and research questions

Although joint attention behaviors have been frequently investigated in children with autism, the extent to which the occurrence of these behaviors varies across testing contexts has not been well examined. As such, it is not clear whether a protocol of structured activities is necessary to adequately sample joint attention for this group of children. In addition, the ability to measure joint attention behaviors in more than one context may allow researchers to obtain more representative samples of behaviors. Finally, the ability to measure joint attention behaviors from extant video recordings of other groups of children, collected originally for a variety of purposes, would broaden comparisons that can be made across diagnostic groups.

To explore the assessment of joint attention in multiple contexts and to facilitate the future comparison of children on the autism spectrum with other groups of children, we sought to implement a coding system based on operational definitions of IJA and RJA that have been employed in previous studies. In the current study we compared the frequency of initiating joint attention (IJA) and the proportion of responding to joint attention (RJA) during an examiner–child play session with similar IJA and RJA behaviors as measured during administration of the Early Social Communication Scales (ESCS: Mundy et al., 2003; Seibert et al., 1982). We selected the ESCS from among the available measures of joint attention due to its frequent use with children on the autism spectrum, its structured nature, and its relatively simple methods of administration.

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Method

Participants

A sample of 20 toddlers on the autism spectrum (16 boys, four girls, mean age = 33.2 months, range = 30–38 months, SD = 2.25 months, mean level of maternal education = 15.74 years, range = 12–20 years, SD = 2.4 years) was obtained from central and southern Wisconsin. All participants met criteria for autism spectrum via the Autism Diagnostic Observation Schedule–Generic (ADOS–G: Lord et al., 2000). As summarized in Table 1, 18 participants also completed the Preschool Language Scale–3 (Zimmerman et al., 1992) and the Bayley Scales of Infant Development: II (Bayley, 1993). Children in the sample demonstrated a range of performance on standardized measures of language and cognition with mean performance on all measures in the below-average range.

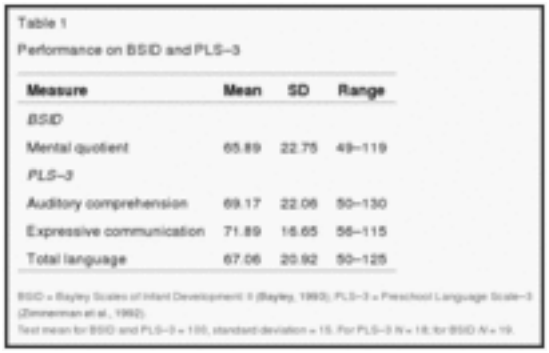

Table 1

Performance on BSID and PLS–3

Measure	Mean	SD	Range
BSID			
Mental quotient	65.89	22.75	49–119
PLS–3			
Auditory comprehension	69.17	22.06	50–130
Expressive communication	71.89	16.65	56–115
Total language	67.06	20.92	50–125

BSID = Bayley Scales of Infant Development: II (Bayley, 1993); PLS–3 = Preschool Language Scale–3 (Zimmerman et al., 1992).

Test mean for BSID and PLS–3 = 100, standard deviation = 15. For PLS–3 N = 18; for BSID N = 19.

Procedure

All assessments were completed in the children's homes as part of a larger project. The same examiner administered the Early Social Communication Scales (ESCS: Mundy et

al., 2003; Seibert et al., 1982) and engaged in the play sample with the child. The ESCS and play samples were administered as part of a standardized research protocol for a larger investigation of language skills in young children on the autism spectrum. Within this protocol, the ESCS was included in the first evaluation session and the play sample was included in the second session. The mean number of days between the first and second testing sessions was 6.4 (SD = 7.17, range = 0–21). Although the broader project was not designed with the specific intent of comparing these two measures, the data lent themselves to this analysis. The possibility of a sequence effect cannot be entirely ruled out given the lack of counterbalancing of the measures. One possibility is that the sequence effect would reveal itself in some systematic relationship between the magnitude of observed scores and the magnitude of the residuals. However, examination of the distribution of the residuals relating the first and second variables showed no systematic pattern. If there is a sequence effect, it is a constant effect across low, medium, and high scores. All assessments were videotaped and coded using ProcoderDV software (Tapp, 2003), and data were tabulated using Multiple Option Observation System for Experimental Studies (MOOSES) software (Tapp et al., 1995).

Naturalistic examiner–child play sample

A 15 minute child-directed play sample was obtained using a standard set of toys including a doll house, figures resembling various family members, a cat, a dog, and an assortment of dollhouse furniture (e.g. beds, chairs, high chair, swing, potty, changing table, crib). Although the set of toys remained consistent across children in the study, the play sample was considered naturalistic in the sense that there were no specific presses or activities included to elicit specific joint attention behaviors. During the play session, the examiner would casually attempt to engage the child in interactions that focused on the available figures and materials, but she did not present specific prompts or structured activities for the elicitation of joint attention. The examiner typically followed the child's lead in play and provided simple play schemes in which the child could choose to participate. The examiner's language primarily consisted of comments related to the activities, with limited use of direct yes/no questions. This style of play and language was used to facilitate spontaneous interaction while minimizing the communicative demands that were placed on the child.

Early Social Communication Scales (ESCS)

The ESCS utilized a standard set of toys (e.g. wind-up toys, hand-operated toys, party hat, book, ball, comb, sunglasses and clear plastic jar) and was administered according to the manual and supplemental training videos. The ESCS protocol provided opportunities for the child to initiate and respond to bids for attention as well as initiate and respond to specific behavioral requests (e.g. 'Give it to me'). Practical modifications were made to

the ESCS protocol to accommodate the constraints of implementation in participants' homes. For example, objects already present in the environment were used for distal pointing tasks instead of a standard set of wall posters, and family tables and chairs were used during administration.

Scoring

IJA and RJA behaviors were coded from videotapes for both the play samples and the ESCS. Each measure was coded by trained laboratory members, who were blind to the participants' levels of IJA and RJA on the other measure. Play samples were coded by a doctoral student in communicative disorders (first author). Training for the play sample coding was provided by a postdoctoral fellow with extensive experience in coding joint attention behaviors (second author). ESCS videotapes were coded by an honors undergraduate student in communication disorders and psychology. Training for the ESCS coding was completed using training videos and materials provided by the lead author of the ESCS (Mundy et al., 2003) as well as instruction from an experienced ESCS examiner (second author). The second author served as the gold standard for reliability for both the ESCS coding and the play sample coding.

The play samples were coded using a coding scheme developed by the second author. A 10 minute segment of each 15 minute play sample was coded using the process described below. Coding of the play samples began 1 minute after the initiation of the examiner–child interaction and continued for 10 minutes. In the case of samples in which 10 consecutive minutes of play were not available, segments were combined to achieve a 10 minute sample. Administration of the entire ESCS protocol was coded according to the instructions provided in the 2003 version of the ESCS manual. The mean length of ESCS session was 16:15 minutes (range = 8:53–24:42 min, SD = 3:28). Although administration time for the ESCS varied, in contrast to the fixed duration of the play sample, calculation of bivariate correlation coefficients failed to reveal a significant association between the frequency of IJA behaviors during the ESCS and the length of the ESCS session. Thus, a frequency measure for IJA, rather than rate, was used in all analyses.

Initiating joint attention (IJA)

IJA behaviors were coded from 10 minute segments of videotaped examiner–child play samples using coding definitions for initiating joint attention that have been used in previous studies (McDuffie et al., 2005;2007). IJA was coded from the videotaped administration of the ESCS using the definitions provided in the 2003 version of the ESCS manual, without distinguishing between low- and high-level IJA behaviors. Table 2 provides a comparison of behaviors that were coded as IJA during the play samples and

the ESCS to illustrate the substantial similarities as well as the subtle differences between the two coding systems. In addition, specific definitions of terms for coding in both contexts are presented in Table 3.

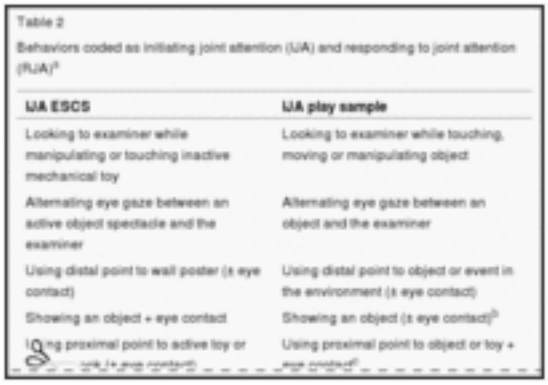

Table 2

Behaviors coded as initiating joint attention (IJA) and responding to joint attention (RJA)[a]

IJA ESCS	IJA play sample
Looking to examiner while manipulating or touching inactive mechanical toy	Looking to examiner while touching, moving or manipulating object
Alternating eye gaze between an active object spectacle and the examiner	Alternating eye gaze between an object and the examiner
Using distal point to wall poster (± eye contact)	Using distal point to object or event in the environment (± eye contact)
Showing an object + eye contact	Showing an object (± eye contact)[b]
Using proximal point to active toy or	Using proximal point to object or toy +

Table 2

Behaviors coded as initiating joint attention (IJA) and responding to joint attention (RJA)[a]

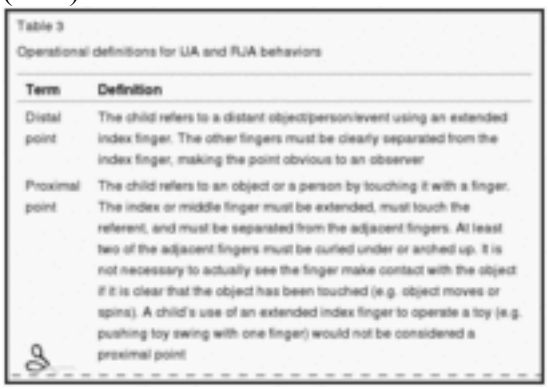

Table 3

Operational definitions for IJA and RJA behaviors

Term	Definition
Distal point	The child refers to a distant object/person/event using an extended index finger. The other fingers must be clearly separated from the index finger, making the point obvious to an observer
Proximal point	The child refers to an object or a person by touching it with a finger. The index or middle finger must be extended, must touch the referent, and must be separated from the adjacent fingers. At least two of the adjacent fingers must be curled under or arched up. It is not necessary to actually see the finger make contact with the object if it is clear that the object has been touched (e.g. object moves or spins). A child's use of an extended index finger to operate a toy (e.g. pushing toy swing with one finger) would not be considered a proximal point

Table 3

Operational definitions for IJA and RJA behaviors

As presented in Table 2, coded IJA behaviors were largely similar between the play sample coding scheme and the ESCS. For example, both measures include using eye contact with an adult while manipulating a toy or an object, using eye contact with an adult to reference an event or object that neither is touching, distal pointing to objects and events with or without eye contact, and using showing behaviors by raising objects toward the adult's face. It is also important to note that, for both the ESCS and play sample, the decision to code a child-initiated behavior as IJA was based on the perceived declarative pragmatic function of the child's behavior (i.e. to share affect or attention) relative to the ongoing social context of the interaction. Coded IJA behaviors included distal pointing, looking to the examiner while touching an object, and showing an object to the examiner. Instances of the following behaviors in conjunction with eye contact also were classified as IJA: proximal pointing, vocalizing (non-word) and exhibiting positive affect/smiling. IJA behaviors were differentiated from requests in that IJA behaviors did

not require action on the part of the examiner beyond participating in the interaction. Requesting behaviors were not included in our analyses.

It is important to note that although the underlying construct and definition of IJA was ultimately the same between contexts, the specific behaviors that were included in the play sample coding scheme varied slightly from that of the ESCS. These differences were incorporated into the play sample coding in order to facilitate the judgment of child behaviors as IJA in this less structured context. For example, the ESCS does not require eye contact with the examiner while using a proximal point to pictures within a structured book-sharing activity in order for a proximal point to be considered IJA. However, the available set of toys that were used for the play samples did not incorporate an activity such as book-sharing, in which shared attention to the examiner was built into the context. As such, during the play samples, a child was required to use eye contact in conjunction with proximal pointing to an object in order for it to be counted as an instance of IJA. Within the play sample coding, the use of eye contact was considered an indicator that the proximal pointing gesture was intended to share attention with the examiner and was not merely independent exploration of an object on the part of the child.

In a similar manner, eye gaze that was combined with positive affect or smiling was also considered IJA within the play sample coding, based upon definitions of IJA that include positive affect as an indicator of shared social attention with a communication partner (Mundy and Burnette, 2005; Mundy et al., 1986). While smiling or looking in isolation was not considered IJA, the combination of IJA with eye contact was considered an indicator that the behavior was socially directed. Positive affect was not coded within the ESCS protocol.

The play sample coding definitions for IJA also included the use of non-word vocalizations in conjunction with eye contact to share attention to an object or event, in order to provide a continuous measure of non-verbal communication skills. Given that the play sample scenario did not automatically provide situations in which the coding of a child's behavior was facilitated by a structured activity, the more stringent requirement of vocalizing in conjunction with eye contact was applied to differentiate socially directed initiating that shared attention with the examiner from independent vocal play and exploration. Non-word vocalizations were not explicitly coded within the ESCS protocol.

The final difference between the two coding schemes concerns the use of 'showing' gestures. Within the naturalistic play sample coding scheme, the showing gesture was considered to represent a prototypical example of initiating joint attention, in which attention to the adult was implicit. As such, the play sample coding did not require the presence of eye contact to the examiner for this gesture to be considered an instance of

IJA (Mundy and Burnette, 2005). Within the ESCS, however, showing gestures required eye contact with the examiner.

Responding to joint attention (RJA)

For both the play samples and the ESCS, RJA was calculated as a proportion of child responses to examiner verbal and gestural attention-directing cues. Behaviors coded as RJA for both measures are listed in Table 2 and include behaviors in which the examiner used verbal directives and either distal or proximal pointing with the intention of directing the child to turn her/his head or look to correspond to the attentional focus of the adult. Whereas the underlying definition of RJA was the same in both the play sample and ESCS contexts, the two measures differed in the use of direct elicitation. The play sample, by definition, did not specifically require the examiner to provide prompts for RJA. As such, behaviors that were classified as RJA within the course of play with the doll house and figurines included those instances in which a child demonstrated head-turning or gaze-shifting in response to the verbal and gestural attention-directing cues that the examiner provided as part of a naturalistic interaction. Similar to the ESCS measure of RJA, the examiner and child were required to be focused on different locations at the initiation of the adult prompt for RJA during the play sample, to increase the likelihood that the child's head turn or gaze shift was, indeed, a response to the words and actions of the examiner and not simply the result of the child's independent interests. Examples of examiner verbal prompts within the play sample context include pointing to a toy while saying, 'The other baby is over there', or lifting up a toy while saying, 'I found a puppy.' In contrast, the ESCS elicits RJA using two activities with specific behavioral prompts: distal pointing to four regions around the room while calling the child's name, and proximal pointing to pictures within a book. Table 4 illustrates the specific metrics that were used for coding IJA and RJA behaviors within each assessment context.

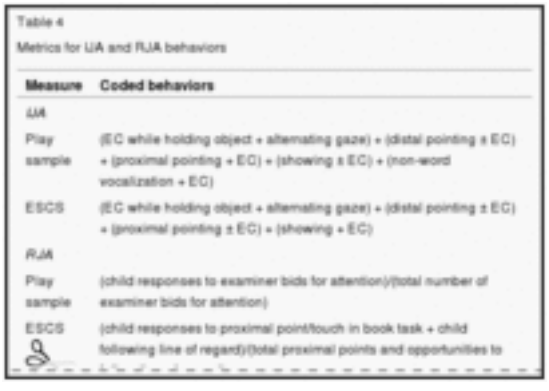

Table 4

Metrics for IJA and RJA behaviors

Measure	Coded behaviors
IJA	
Play sample	(EC while holding object + alternating gaze) + (distal pointing ± EC) + (proximal pointing + EC) + (showing ± EC) + (non-word vocalization + EC)
ESCS	(EC while holding object + alternating gaze) + (distal pointing ± EC) + (proximal pointing ± EC) + (showing + EC)
RJA	
Play sample	(child responses to examiner bids for attention)/(total number of examiner bids for attention)
ESCS	(child responses to proximal point/touch in book task + child following line of regard)/(total proximal points and opportunities to

Table 4

Metrics for IJA and RJA behaviors

Reliability

Interobserver reliability for 20 percent of the play sample coding and 20 percent of the ESCS coding was calculated using g-coefficients. According to Suen and Ary (1989), g-coefficients with values above 0.6 are considered acceptable. Reliability between two coders across four randomly selected samples was uniformly above 0.85 for both the naturalistic play sample coding and the ESCS coding.

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Results

Table 5 displays the mean scores and ranges for IJA and RJA within each measurement context. Paired sample t-tests revealed that the ESCS elicited more instances of IJA ($t(19) = 3.84$, $p = 0.001$). In contrast, the play sample context provided more instances of RJA ($t(19) = 2.56$, $p = 0.019$). These findings support the use of multiple contexts for the observation and sampling of joint attention behaviors.

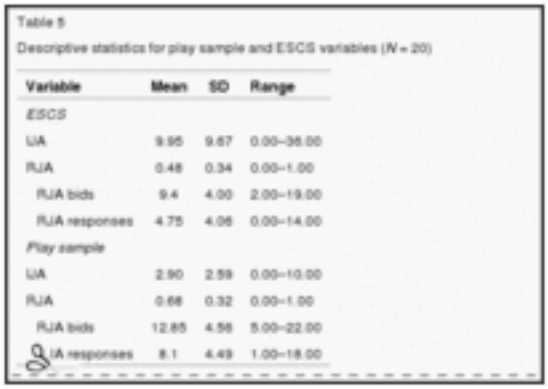

Table 5

Descriptive statistics for play sample and ESCS variables ($N = 20$)

Variable	Mean	SD	Range
ESCS			
IJA	9.95	9.67	0.00–36.00
RJA	0.48	0.34	0.00–1.00
RJA bids	9.4	4.00	2.00–19.00
RJA responses	4.75	4.06	0.00–14.00
Play sample			
IJA	2.90	2.59	0.00–10.00
RJA	0.68	0.32	0.00–1.00
RJA bids	12.85	4.56	5.00–22.00
IA responses	8.1	4.49	1.00–18.00

Table 6 summarizes findings from Pearson correlation analyses, which indicate that both IJA and RJA derived from the play samples and from the ESCS were significantly and positively correlated. These findings suggest that the use of behavioral coding from the naturalistic examiner–child play samples captured IJA and RJA in a manner that was similar to that within the structured ESCS context.

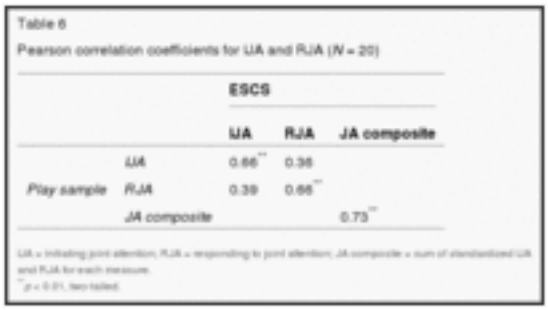

Table 6

Pearson correlation coefficients for IJA and RJA ($N = 20$)

		ESCS		
		IJA	RJA	JA composite
Play sample	*IJA*	0.66**	0.36	
	RJA	0.39	0.66**	
	JA composite			0.73**

IJA = initiating joint attention, RJA = responding to joint attention, JA composite = sum of standardized IJA and RJA for each measure.

** $p < 0.01$, two-tailed.

Pearson correlation coefficients for IJA and RJA ($N = 20$)

A composite measure for joint attention was calculated within each context, ESCS and examiner–child play sample, by summing IJA and RJA which were transformed to *z*-scores. The ESCS and play sample composite scores were significantly and positively correlated, further supporting the use of naturalistic play sample coding for capturing these behaviors in a manner similar to highly structured measures.

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Discussion

The results of this study provide empirical support for the use of a naturalistic play sample context for the assessment of IJA and RJA behaviors of toddlers on the autism spectrum. Significant positive correlations were found between IJA, RJA, and composite measures coded within naturalistic play samples and the ESCS protocol. The correlation between measures of RJA in both contexts is especially interesting when one considers that the examiner–child play context was not constructed in such a way as to specifically elicit child responses to bids for joint attention from the examiner. The decision to use one or both sampling contexts to index joint attention in toddlers on the autism spectrum is best determined on the basis of the specified research objectives or clinical assessment goals. Though significant correlations existed between the play sample and ESCS contexts, the differences in the number of IJA behaviors as well as differences in the levels of RJA that were observed across the contexts support the use of sampling in multiple environments to obtain a richer picture of a child's use of joint attention skills.

According to one view, the significant correlations between IJA and RJA behaviors within both the ESCS and play samples could be interpreted as evidence that the behaviors that are captured by the structured protocol of the ESCS are indeed similar to those that we captured in a less structured adult–child play situation, providing support for the clinical application of this structured measure. While an interesting possibility, to fully support this idea additional comparisons of responses within the ESCS to play samples in other naturalistic contexts are needed.

The association between IJA and RJA behaviors within the ESCS and play samples also provides support for the use of our play sample coding scheme. Clinicians and researchers might choose to use a context such as a play sample to facilitate the assessment of joint attention behaviors in particular children who find participating in highly structured measures less appealing. In addition, when considering real-life limitations in family and professional resources, a multi-purpose measure such as a language or play sample that captures joint attention in addition to traditional speech and language information could streamline the assessment process for children and families.

Further, the application of this type of coding scheme has the potential to enhance a diagnostician's overall picture of a child's use of joint attention behaviors across situations if used in conjunction with structured measures or across multiple play situations.

The coding of joint attention behaviors within a play sample context can also be readily applied to a variety of research questions. For example, this type of coding will provide researchers the opportunity to explore the relationship between joint attention and communication skills in populations for whom sampling of joint attention measures may not typically be obtained, such as late talkers, children with Down syndrome, fragile X syndrome, or Williams syndrome. Similarly, the use of play sample coding will also allow for the*post hoc* analysis of language and play samples that were not initially collected with the goal of measuring joint attention. As such, comparative analyses of IJA and RJA will be possible across other populations to inform theoretical debates regarding the potential role of joint attention in communication development.

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References

1. Bayley N. Bayley Scales Of Infant Development: II. New York: Cambridge University Press; 1993.
2. Charman T. Why Is Joint Attention A Pivotal Skill In Autism? Philosophical Transactions Of The Royal Society Of London Series B. 2003;358:315–324. [PMC free article] [PubMed]
3. Chawarska K, Klin A, Paul R, Volkmar F. Autism Spectrum Disorder In The Second Year: Stability And Change In Syndrome Expression. Journal Of Child Psychology And Psychiatry. 2007;48:128–138. [PubMed]
4. Dawson G, Toth K, Abbott R, Osterling J, Munson J, Estes A, Law J. Early Social Attention Impairments In Autism: Social Orienting, Joint Attention And Attention To Distress. Developmental Psychology. 2004;40:271–283. [PubMed]
5. Drew A, Baird G, Taylor E, Milne E, Charman T. The Social Communication Assessment For Toddlers With Autism (Scata): An Instrument To Measure The Frequency, Form And Function Of Communication In Toddlers With Autism Spectrum Disorders. Journal Of Autism And Developmental Disorders. 2007;37:648–666. [PubMed]
6. Filipek P, Accardo P, Baranek G, Cook E, Dawson G, Gordon B, Gravel J, et al. The Screening And Diagnosis Of Autism Spectrum Disorders. Journal Of Autism And Developmental Disorders.1999;29:439–484. [PubMed]
7. Lord C, Risi S, Lambrecht L, Cook E, Leventhal B, Dilavore P, et al. The Autism Diagnostic Observation Schedule-Generic: A Standard Measure Of Social And Communication Deficits Association With The Spectrum Of Autism. Journal Of Autism And Developmental Disorders.2000;30:205–223. [PubMed]
8. Mars AE, Mauk JE, Dowrick PW. Symptoms Of Pervasive Developmental Disorders As Observed In Prediagnostic Home Videos Of Infants And Toddlers. Journal Of Pediatrics. 1998;132:500–504.[PubMed]
9. Mcduffie A, Yoder P, Stone W. Prelinguistic Predictors Of Vocabulary In Young Children With Autism Spectrum Disorders. Journal Of Speech, Language, And Hearing Research. 2005;48:1080–1097. [PubMed]
10. Mcduffie A, Turner L, Stone W, Wolery M, Yoder P, Ulman T. Developmental Correlates Of Different Types Of Motor Imitation In Young Children With Autism Spectrum Disorders. Journal Of Autism And Developmental Disorders. 2007;37:401–412. [PubMed]
11. Morales M, Mundy P, Delgado CEF, Yale M, Messinger D, Neal R, et al. Responding To Joint Attention Across The 6-Through 24-Month Age Period And

Early Language Acquisition. Journal Of Applied Developmental Psychology. 2000;21:283–298.
12. Mundy P, Burnette C. Joint Attention And Neurodevelopmental Models Of Autism. In: Volkmar F, Paul R, Klin A, Cohen D, editors. Handbook Of Autism And Pervasive Developmental Disorders.Hoboken, NJ: Wiley; 2005. pp. 650–681.
13. Mundy P, Gomes A. Individual Differences In Joint Attention Skill Development In The Second Year. Infant Behavior And Development. 1998;21:469–482.
14. Mundy P, Willoughby J. Lewis M, Sullivan MW. Nonverbal Communication, Joint Attention, And Early Socioemotional Development. Hillsdale, NJ: Erlbaum; 1996.
15. Mundy P, Sigman M, Ungerer J, Sherman T. Defining The Social Deficits Of Autism: The Contributions Of Non-Verbal Communication Measures. Journal Of Child Psychology And Psychiatry And Allied Disciplines. 1986;27:657–669. [PubMed]
16. Mundy P, Sigman M, Kasari C. A Longitudinal Study Of Joint Attention And Language Development In Autistic Children. Journal Of Autism And Developmental Disorders. 1990;20:115–128. [PubMed]
17. Mundy P, Sigman M, Kasari C. Joint Attention, Developmental Level, And Symptom Presentation In Autism. Development & Psychopathology. 1994;6:389–401.
18. Mundy P, Delgado C, Block J, Venezia M, Hogan A, Seibert J. A Manual For The Abridged Early Social Communication Scales (Escs) Coral Gables, FL: University Of Miami; 2003. Unpublished Manuscript.
19. Osterling J, Dawson G. Early Recognition Of Children With Autism: A Study Of First Birthday Home Videotapes. Journal Of Autism And Developmental Disorders. 1994;24:247–257. [PubMed]
20. Osterling JA, Dawson G, Munson JA. Early Recognition Of 1-Year-Old Infants With Autism Spectrum Disorder Versus Mental Retardation. Development And Psychopathology. 2002;14:239–251. [PubMed]
21. Scaife M, Bruner J. The Capacity For Joint Visual Attention In The Infant. Nature. 1975;253:265.[PubMed]
22. Seibert JM, Hogan AE, Mundy PC. Assessing Interactional Competencies: The Early Social-Communication Scales. Infant Mental Health Journal. 1982;3:244–258.
23. Suen H, Ary D. Analyzing Quantitative Behavioral Observation Data. Hillsdale, NJ: Erlbaum.; 1989.
24. Tapp J. Procoderdv (Computer Software And Manual) 2003 http://Kc.Vanderbilt.Edu/Pcdv/

25. Tapp J, Wehby J, Ellis D. A Multiple Option Observation System For Experimental Studies: Mooses. Behavior Research Methods, Instruments And Computers. 1995;27:25–31.
26. Wetherby A, Prizant B. Communication And Symbolic Behavior Scales-Developmental Profile™(Csbs-Dp™) Baltimore, MD: Brookes; 2002.
27. Wimpory DC, Hobson RP, Williams JMG, Nash S. Are Infants with Autism Socially Engaged? A Study of Recent Retrospective Parental Reports. Journal of Autism and Developmental Disorders.2000;30:525–536. [PubMed]
28. Zimmerman I, Steiner V, Pond R. Preschool Language Scale—3. Chicago, IL: Psychological Corporation; 1992.
29. Zwaigenbaum L, Bryson S, Rogers T, Roberts W, Brian J, Szatmari P. International Journal of Developmental Neuroscience. Vol. 23. Autism: Modeling Human Brain Abnormalities in Developing Animal Systems; 2005. Behavioral Manifestations of Autism in the First Year of Life; pp. 143–152. Special Issue. [PubMed]