

The Role of High Level Play as a Predictor Social Functioning in Autism

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Abstract Play and social abilities of a group of children diagnosed with high functioning autism were compared to a second group diagnosed with a variety of developmental language disorders (DLD). The children with autism engaged in fewer acts of high level play. The children with autism also had significantly lower social functioning than the DLD group early in the play session; however, these differences were no longer apparent by the end of the play session. In addition, a significant association existed between play and social functioning regardless of diagnosis. This suggests that play may act as a current indicator of social ability while providing an arena for social skills practice.

Keywords Autism · Pretend play · Social functioning

Introduction

With the increasing numbers of children diagnosed with autism (Center for Disease Control 2007) comes a stronger need for establishing successful intervention programs. It is essential to know what skills these interventions should target to optimize chances for improvement. An area as

basic as children's play could be an important focus for intervention as it has been shown to have an important relationship with social, cognitive, symbolic, and linguistic development (Casby 2003).

Numerous studies have shown that children with autism show limited pretend play skills (Libby et al. 1998; Baron-Cohen 1987; Jarrold et al. 1996). When symbolic play is present, it is often rigid, repetitive, and stereotyped, without the complexity and creativity seen in the play of typically developing children or those with general cognitive deficits (Sigman and Mundy 1987). However, even children with autism who have relatively low verbal mental ages (i.e., under two years) have been found capable of producing some pretend play (Libby et al. 1998). In addition, there is increasing evidence that children with autism can produce symbolic play when they receive appropriate prompts (Whyte and Owens 1989). For example, studies that have employed an "elicitation" condition in which individuals are instructed to produce a certain pretend play act have found that children with autism perform as well as appropriately matched controls (Charman and Baron-Cohen 1992; Jarrold et al. 1996; Lewis and Boucher 1988, 1995). However, even their elicited play has fewer novel acts of pretend play compared to controls (Jarrold et al. 1996; Lewis and Boucher 1995). Wainwright and Fein (1996) found that pre-school children with autism who had a nonverbal IQ within the normal range showed the same level of pretend play as did children with developmental language disorder (DLD) and typical children early in a spontaneous play session. However, later in the play session, after a little more than 10 min with an unfamiliar adult, the children with autism engaged in significantly less symbolic play than did the DLD and typically developing children. This finding supports the idea that children with autism have the ability to engage in pretend play, but that

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they are unable or uninterested in sustaining it. Similarly, Jarrold (2003) theorized that individuals with autism are capable of producing some pretend play, but may have an internal reluctance or a lack of incentive to carry it on for an extended period of time.

In typical development pretend play continues to develop until about age seven, at which point rule-oriented play is added to the child's repertoire (Piaget 1962). Thus, play in older children is characterized by engaging in both pretend and rule-oriented play simultaneously. Though played according to formal rules, games and sports of older children often involve imaginary components (Singer 1973). For example, sports and games with rules may be amplified by acting them out as Olympic contests involving imaginary players with various personalities.

There is likely a bidirectional relationship between the skills of play and social functioning. The impact of these relationships may be more easily seen in children with autism because of their social and play deficits. Because play, especially in its more developmentally sophisticated stages (pretend and rule based play), has an inherently social quality, the overarching social deficits seen in children with autism likely contribute to the deficits found in their pretend play. Harris (1993) suggests that the social disinterest associated with autism would lead to a decreased interest in emotional or social pretend play. Reciprocally, Fein (1981) theorized that pretend play is an arena in which children can act out interactions they experience in every day social situations. This suggests that the decreased play skills seen in children with autism result in a reduction of opportunities to practice social skills. When engaging in play with others, children relate to another person in ways reflective of real life interactions. Roles may reflect social relationships such as parent–child, or doctor–patient (Fein 1981). Both pretend and rule-based play provide mechanisms for the practice of the social interactions that help to form and sustain relationships with other children and adults. Therefore, these later developing forms of play that require a child to assume roles and/or follow rules or conventions, may aid in the development of role reversal and empathy.

Typically developing children have a variety of avenues available to them to learn how to be social. They are able to form reciprocal relationships with peers as well as cooperate and be part of a social group. They also have a natural desire to observe and be around other children. These characteristics provide children a large number of opportunities to acquire and hone social abilities. Connolly and Doyle (1984) examined the relationship between pretend play and indices of social competence in 91 typically developing pre-school children aged three to five years. The amount and complexity of fantasy play predicted teacher ratings of peer social skill, popularity,

affective role taking, and a behavioral summary score reflecting positive social activity, independent of age, sex and IQ. Further social fantasy play was the strongest predictor of skills and competencies apparent in the children's social interactions within the peer group. Children with autism, by comparison, are less likely to engage in this type of play, and therefore they lose the opportunity to practice these forms of social interactions. Because of the potential practice opportunities for social interactions, the systematic development of pretense and rule based play may be of greater developmental importance to children with autism as compared to children without the disorder because it can serve as a mechanism to facilitate social relatedness.

Several studies provide support for the idea that play may be useful in predicting social outcomes in children with autism. Wainwright and Fein (1996) found an inverse relationship between the amount of symbolic play and level of social impairment in 153 children with autism as assessed by the Wing Autistic Disorder Interview Checklist (Wing 1981) and the socialization domain of the Vineland Adaptive Behavior Scales (Sparrow et al. 1984). However, this study relied on parental report of social functioning rather than direct observation of a child's social relationships. It is important to examine the relationship that might exist between children's developmental level of spontaneous play and the social relations that they sustain in children with autism using direct observational methods. Associations between play and social functioning would suggest that facilitation of play, even into school age, could be an important area of focus in order to further enhance the social abilities of children with autism.

The purpose of the current study was to (a) compare the observed play and social abilities of a group of high functioning children with autism with a group of children diagnosed with a variety of developmental language disorders (DLD); and (b) to investigate the relationship between developmentally sophisticated play and concurrent social functioning in these two groups of children. It was hypothesized that children with autism would show lower amounts of pretend play as well as more sophisticated rule based play compared to the children with DLD. It was also hypothesized that the presence of higher levels of play would be predictive of better social functioning and that this relationship would be moderated by diagnosis such that the association would be stronger for the autism group than for the DLD group. This moderating effect was expected because the features of autism limit these children to fewer avenues of social practice than children diagnosed with language disorders thereby making play a more critical contributor to social learning for the children with autism.

Method

Participants

Data were collected as part of the Autism and Language Disorders Nosology Project, which was a longitudinal multi-site study focusing on classification of children with autism, developmental language disorders (DLD), and non-autistic low IQ; a detailed description of which can be found in Rapin (1996). Participants in the large-scale study were recruited by referrals for assessment or treatment of communication difficulties. Schools and programs for special needs children were also solicited. Children came from six geographic sites within the U.S. where the investigators were located. Not all sites recruited children from each of the diagnostic categories. Further, there were differences between sites in terms of the average SES of recruited families.

Participants included in the present study were 63 children, selected from the larger sample. The high-functioning autism group (HFA) ($n = 30$) was chosen based on diagnosis, nonverbal IQ, and the availability of a school-age play session. A corresponding number of DLD children ($n = 33$) were randomly selected from a pool of 182 available subjects. The HFA and DLD samples were matched on age and gender. Eighty percent of the children were male. This is comparable to the larger study (Rapin 1996) and is consistent with the approximate 4:1 ratio of male to female in the autism population (Yeargin-Allsopp et al. 2003). Although children were not specifically matched for SES, age or nonverbal IQ the groups overall were comparable on these variables (Table 1). As indicated by the IQ scores, both groups were functioning at age level on a nonverbal dimension.

Children in the autism group (HFA) were initially identified by a professional during preschool as being impaired in social and communicative functioning. Their diagnosis was established first through screening for social impairment using the Wing Autistic Disorder Interview Checklist (WADIC) (Wing 1981) and then through face to face evaluation by a child psychiatrist who determined a DSM-III-R diagnosis of Autistic Disorder (Rapin 1996). Cognitive functioning was evaluated using the Stanford-Binet 4th edition (Thorndike et al. 1986). Children in the high functioning group had a score of greater than 80 on the Abstract/Visual Reasoning Scale.

The developmental language disorder (DLD) group included children with a significant language disorder defined as a deficient score on the Test of Early Language Development (TELD; Hresko et al. 1981) or the Sequenced Inventory of Communication Development (revised edition) (Hedrick et al. 1984; Rapin 1996), who did not have

Table 1 Demographic characteristics of participants ($n = 63$)

	Mean	SD	<i>t</i>	<i>p</i>
Socioeconomic status ^a				
HFA	2.62	1.12	007	.99
DLD	2.90	1.03		
Age ^b				
HFA	99	5.2	-.25	.80
DLD	102	7.5		
Non-verbal IQ ^c				
HFA	99.04	19.21	-1.00	.32
DLD	99.00	20.32		
	HFA (%)		DLD (%)	
Race				
Caucasian	67		83	
African American	20		33	
Latino	10		0	
Asian American	0		3	
Other	3		3	
Child's gender				
Male	80		80	

^a Measured according to the Hollingshead (1975) index from pre-school age testing point

^b Age at school-age testing in months

^c School-age non-verbal IQ score was measured by the abstract/verbal reasoning subtest of the Stanford-Binet

autism. The DLD group met the same cognitive functioning criteria as the HFA group.

Procedure

As part of the larger study many participants were evaluated at both ages seven and nine years. For the current study, a child's evaluation at either seven or nine was used so that both ages could be represented. As part of the evaluation, children completed a 25-min videotaped session which included working with a puzzle box for approximately 10 min, followed by a 15-min semi-structured play session with an unfamiliar examiner. During the first 5 min of the puzzle box period the child worked alone but during the second half of the puzzle time the examiner, an unfamiliar adult, worked with the child. The examiner and the child then transitioned to playing with age appropriate toys. The puzzle box portion of the session was not examined in the current study. During the play portion of the session the examiner was non-directive in the first 5 min, and over the remaining 10 min gradually intensified attempts to elicit age appropriate play ranging from symbolic and imaginary play to rule-oriented types of games. The examiner attempted to follow the child's lead whenever possible.

Coding of Play

Pretend play was coded by trained observers from the 15-min videotaped play session. Observers were blind to each child's diagnosis. Because the play was preceded by the puzzle solving session coders watched the entire 15 min of play, assuming that the typical "warm up" to the examiner would have taken place during the puzzle session. The children's play was categorized based on the developmental level of the activity. The different categories of play were as follows: sensorimotor (a) functional (b) low level symbolic (c) high level symbolic (d) and games or conversation (e) (see "Appendix 2" for a definition of these categories). A frequency score was assigned based on amount of time a child spent playing in each category (0—never, 1—less than 1 min, 2—1–5 min, 3—more than 5 min). These timeframes were reliably estimated by the coders but not specifically timed. An overall play score was computed by multiplying the rank (1–5) of each play category by its frequency (0–3) and then summing these products. 25% of the tapes were watched by two raters. Inter-rater reliability for the five play categories and frequency ratings ranged from .80 to .95.

Coding of Social Functioning

A coding system was developed to analyze the children's social behavior. The social coding system was originally established by observing the play of children at a variety of ages and levels of social functioning. It was also based on existing systems reported in the literature (Behavior Coding System, Hauck et al. 1995; Autism Diagnostic Observation Schedule, Lord et al. 2000). Two 3-min segments (3–6 and 8–11 min) of the child's videotaped play session were coded to examine social functioning. These segments were chosen to represent the child's social functioning after a brief "warm up" period but still early in the time with the adult as well as a comparatively late segment. The social coding system was designed to measure both the frequency of social behaviors as well as the overall quality of social behavior. To measure the frequency of behaviors, the coder counted the number of times the child engaged in each behavior (see "Appendix 3" for social behavior coding manual). Additionally, an overall social rating score was awarded based on a qualitative judgment about each child's general level of social functioning during the particular segment. This score was based on a five-point scale with a score of five representing a child who was socially adept, using a full range of behaviors to communicate needs and interests to the adult. In pilot testing of the coding system this 1–5 scale was found to capture the variability that existed across children. The scale was limited to five points because additional discriminations between categories did

not result in greater coding reliability. A score of one represented a child who appeared largely inept in social strategies (e.g., withdrawing or continuously demanding attention) while a score of five represented a child who was socially adept nearly all of the time (see "Appendix 3"). Inter-rater reliability was established before social coding began with correlation coefficients of .82–.95 for all variables used in the analyses. 25% of the tapes were coded by two raters in order to monitor for inter-rater drift.

Results

The relationships among demographic variables, play, and social functioning were examined (Table 2). IQ was significantly correlated with the Overall Social Rating (segment 1— $r = .44$, $p < .01$; segment 2— $r = .46$, $p < .01$). Because of this significant correlation, IQ was entered as a covariate in the subsequent regression analysis although its presence as a covariate did not influence the outcome.

Generation of Play Scores Used in Analyses

Table 3 presents the correlations between the Overall Play Score and the specific categories of coded play. Although

Table 2 Bivariate correlations of demographic and primary study variables ($n = 63$)

	1	2	3	4	5
1. SES	–	–.14	–.03	.01	.04
2. School-age IQ		–	–.06	.44**	.46**
3. Age at school-age testing			–	.13	.15
4. Overall school-age social score (segment 1)				–	.90**
5. Overall school-age social score (segment 2)					–

** $p < .01$

Table 3 Correlations between overall play score and play variables ($n = 58$)^a

	1	2	3	4	5	6
1. Sensorimotor	–	.005	.052	–.13	–.20	–.24
2. Functional		–	.02	–.13	–.08	.18
3. Low level symbolic			–	.15	–.39**	.35**
4. High level symbolic				–	–.40**	.42**
5. Games/conversation					–	.41**
6. Overall play score						–

Some of the play sessions, although originally recorded, were unavailable due to poor video quality or unavailable video tapes. These missing data are noted throughout the results as seen by small fluctuations in sample sizes

** $p < .01$

the Overall Play Score was significantly related to the higher-level play variables in both groups (e.g., symbolic play and rule based play), the moderate correlations indicate that these variables capture somewhat different information. Therefore, each of these play variables was examined for group differences; however, the Overall Play Score was chosen for the regression analyses because of the significant correlation between that variable and the higher-order play variables. This choice helped to reduce the number of variables used and therefore protect the power of the analysis.

Group Differences in Play

It was hypothesized that children with autism would produce play that was characterized by developmentally lower types of play compared to the DLD children. The autism group spent significantly less time engaged in games and conversation compared to the DLD group, $t(54) = -2.02, p = .05$. Not only was the amount of time spent less but significantly fewer children with autism engaged in this level of play at all. Eighty-nine percent of the DLD children engaged in games or conversation for at least some of the play session, while only 69% of children with autism did so ($\chi^2 = 7.58, p = .05$). Group differences in functional, symbolic and overall play scores were not significant. Table 4 illustrates the percentage of children in each group based on time spent in each play level.

Table 4 Percent of subjects who engaged in each category of play during the play session ($n = 56$)

	None	<1 min	1–5 min	5+ min
Sensorimotor (%)				
HFA	97	3	0	0
DLD	100	0	0	0
Functional (%)				
HFA	10	17	41	31
DLD	11	19	37	33
Low symbolic (%)				
HFA	24	14	41	21
DLD	33	19	22	26
High symbolic (%)				
HFA	38	17	31	14
DLD	52	15	30	4
Games or conversation (%)				
HFA	31	21	21	28
DLD	11	7	48	33

Play scores are based on the entire 15-min play session

Generation of Social Functioning Scores Used in Analyses

There was a high degree of inter-correlation (Table 5) between most of the social functioning variables and the Overall Social Rating scores (Qualitative). Therefore variables were reduced in order to represent unique aspects of social functioning. Only two quantitative social variables (Ask a Question and Shared Enjoyment), and the Overall Social Rating (Qualitative) were used to represent social functioning.

Means and standard deviations for the social variables for the HFA and DLD groups are presented in Table 6. Because a significant difference was found across both groups between the Overall Social Rating in segment 1 and segment 2 of the play session, the two segments were analyzed separately. There were no significant differences between segments 1 and 2 for the quantitative social variables, and therefore, the means for these variables represent the number of times that the children displayed each behavior averaged over the two time segments.

Group Differences in Social Functioning

The DLD group scored significantly higher in Overall Social Rating in Time Segment 1 (3–6 min) of the play session than the HFA group ($t(58) = -1.99, p = .05$). In Time Segment 2 (8–11 min), although the DLD group continued to be rated higher in Overall Social Score ($M = 3.90, SD = .89$) compared to the autism group ($M = 3.60, SD = .77$), the difference was no longer significant, $t(58) = -1.40, p = .17$. There were no significant differences between the groups in the two quantitative measures, shared enjoyment or amount of questions asked.

Relationship Between Play and Social Functioning

The relationship between play and social functioning was evaluated using hierarchical regression analysis (Table 7). The Overall Play Score and diagnosis were entered in the first

Table 5 Bivariate correlations of social functioning variables ($n = 63$)

	1	2	3	4	5	6
1. Overall social rating (3–6 mins)	–	.90**	.65**	.67**	.21	.24
2. Overall social rating (8–11 mins)		–	.64**	.66**	.22	.25
3. Responses			–	.76**	.12	.39**
4. Sustained interaction				–	.29*	.45**
5. Shared enjoyment					–	-.18
6. Ask a question						–

* $p < .05$, ** $p < .01$

Table 6 Descriptive data for social functioning variables ($n = 30$ per group)

	Mean	SD	t	p
Overall social rating (segment 1)				
HAD	3.50	.82	-1.99	.05
DLD	3.93	.87		
Overall social rating (segment 2)				
HAD	3.60	.77	-1.4	.17
DLD	3.90	.89		
Shared enjoyment				
HAD	1.97	2.12	-1.44	.16
DLD	3.30	4.60		
Ask a question				
HAD	3.37	3.88	1.20	.23
DLD	2.33	2.67		

Refer to “[Appendix 3](#)” for definitions of these behaviors

Table 7 Hierarchical regression analyses for play and diagnosis as predictors of social functioning

Predictor	F	p	R	R^2	ΔR^2	β	p
<i>Dependent variable = overall social rating segment 1 (n = 56)</i>							
Step 1							
Play ^a	13.11	.001*	.579	.335	0	.493	.001
Diagnosis					.262	.025	
Step 2							
Play × diagnosis	8.73	.001*	.583	.339	.004	-.324	.576
<i>Dependent variable = overall social rating segment 2 (n = 56)</i>							
Step 1							
Play ^a	12.54	.001*	.570	.325	0	.523	.001*
Diagnosis					.184	.113	
Step 2							
Play × diagnosis	8.65	.001*	.581	.337	.012	-.552	.343

^a Overall play

* $p < .05$

step of the analysis followed by the interaction of the play score and diagnosis. The Overall Social Rating scores for each of the two segments were evaluated independently. The Overall Play Score predicted the Overall Social Rating in Segment 1 of the play session [$(2, 52) = 13.11, p < .001$] and in Segment 2 of the play session [$F(2, 52) = 12.54, p < .001$]. The relationship between the child’s level of play and Overall Social Rating was not moderated by diagnosis for either segment of the play session.

Discussion

The purpose of this study was to examine the play and social abilities of high functioning children with autism

compared to developmentally language disordered children of comparable age and nonverbal abilities. Consistent with the fact that a core deficit of autism is restricted social engagement it was expected that the children diagnosed with autism would show impaired play skills compared to children with DLD. This was true in part. While no significant differences were found between the groups in their functional play, symbolic play, or overall play score, the autism group participated in games and conversation (a developmentally sophisticated level of play) significantly less than the DLD group. The lack of significant differences within the categories of functional and symbolic play identify that the children diagnosed with autism can and do engage in these types of play at least as much as the DLD group. While it is often expected that children diagnosed with autism will have very limited symbolic play in their spontaneous repertoire, the lack of differences between these groups may be accounted for by the fact that DLD group is spending less play time in pretense play and much more time in rule based games and conversation therefore leaving the two groups with equal amounts of symbolic activity. It is not possible to know this definitively from these cross sectional data. However, the significant difference between groups in the conversation/rule play category supports this possibility. This finding is noteworthy given that the predominant activity of children at school-age is to engage in games or conversation as opposed to the pretense play seen in younger children. To play a game or engage in a conversation successfully, one must be able to participate in reciprocal turn-taking with another person. The fact that the autism group engaged in games and conversation significantly less than the DLD group suggests that their diminished social skills impact their ability to participate in these types of social activities.

There was also an expectation that because of the general social impairments associated with the diagnosis of autism, these individuals would score lower on measures of social functioning as compared to the DLD group. The autism group did score significantly lower than the DLD group in Overall Social Rating early in the play session (3–6 min). However, after a longer period of time in play with the examiner (8–11 min), the difference between the groups in overall social score was nonsignificant. It is possible that this finding is related to the examiner’s influence. The examiner was instructed to increase bids for age appropriate play throughout the session if the child was not initiating pretense or game play. This instruction remained the same regardless of the child’s diagnosis suggesting that whatever effect the examiner had would be relatively equally represented across the two diagnostic groups. However, because the examiner’s behavior was not evaluated in this project it is not possible to know the extent to which the examiner provided scaffolding and the

degree to which this changed the child's behavior. While we can not be certain of the cause, the finding that the autism group's social functioning increased to meet that of the DLD group suggests that the children with autism "warmed up" socially, becoming more comfortable with an unfamiliar examiner as the session progressed. It is interesting that over such a short period of time (3 min vs. 8 min into the play session), the behavior of the children with autism matched that of the DLD children well enough that there was no longer a significant difference. The examiners may have played a role in this by providing a model for social interaction that the children could use as the play session progressed. The fact that the children with autism had IQ scores within the normal range may also have contributed to this circumstance.

It was expected that play would predict social functioning. This relationship was found to be significant, such that children with lower play skills tended to have lower social rating scores. Of note, this relationship was not moderated by diagnosis, suggesting that play serves as a more general marker of current social development for children in general rather than a more specific marker for children with a diagnosis of autism. This finding is consistent with Connolly and Doyle (1984) who found a concurrent relationship between play and social competence in pre-school age children. Vygotsky (1978) conceptualized certain areas of development as providing platforms for other areas of development. He specifically identified play as one of these areas, and the finding that current play predicts current social functioning is consistent with his ideas. It suggests that play provides an opportunity for children to practice social scripts and influences how they interact with the world. Thus, play may serve a purpose in the immediate time frame, acting as a mechanism for practice of broader social skills. The current study's data leads to the question of whether social development for children with autism might be facilitated by promoting their play skills, thereby making use of the existing strong relationship between play and social skill sets. It is important to note that this study did not have independent behavioral coders for play and social functioning so it is possible that the relationship found here was somewhat inflated. Replication of these data would benefit from independent coding.

A value of the current study rests in the direct measure children's social functioning in a spontaneous circumstance (Connolly and Doyle 1984). It is typical to rely on parent and teacher report about these abilities and these reports may not be accurate. However, finding ways to measure differences in children of normal IQ with and without autism can be difficult. Results from this study suggest that merely counting the number of times children engage in certain behaviors may not distinguish differences

between two groups of children who function at a near-normal level. In addition, it is hard to count reliably small, subtle behaviors from videotape or a live setting. However, despite the lack of countable social differences found in the current study, two coders, both of whom were blind to diagnosis and one of whom did not have experience with autism, were able to reliably distinguish between the two groups of children on the dimension of social ability. The variable that best captured these differences was the qualitative overall social rating. Thus, an overall qualitative rating of children's behavior seems to be more useful when doing social coding in a population of high functioning children with autism. The children with autism in this study displayed all of the components necessary for social interaction but did not seem to put the components together in a way that created a typical presentation. Therefore, it is not that the individual pieces of social interaction are missing, but rather the way the pieces come together to produce the whole picture of social relatedness is different in these children. This suggests that social ability is more than just the sum of many parts.

Finally, the lack of significant social differences over the duration of the play session may indicate that a one-on-one interaction with an adult, in a quiet setting, with minimal demands, may be an optimal setting for children with autism to display their social competence. It should not be assumed that social functioning would have been comparable between the two groups tested here if they were evaluated in social situations such as peer dyads or settings with larger groups of children. Further research is necessary to evaluate the relationship between play and social outcomes in situations that may be more challenging for the child with autism. The structure of the play session was similar to the way interventions and assessments are conducted with children with autism — one-to-one and with an adult familiar with the characteristic deficits of the disorder. The current findings suggest that this structure may maximize a child's social skills, at least for high functioning children, providing a less than complete picture of the level of functioning of a particular child would or could sustain in more challenging, every day settings. Further research using spontaneous activities in these more challenging settings could help to inform treatment models for social skills training. Finally, many interventions for children with autism break tasks down to teach social skills in their component parts. This study suggests that high functioning children with autism may already have the component parts available in their repertoire but are not successful at putting the parts together in a meaningful whole. These data do not argue against play as an intervention strategy, but rather suggest that play interventions should be thought of in a different way and expanded to include a variety of situations and settings.

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Appendix 1: List of Toys

Toys used in play session

Actionfigures	Doll house	Musical	Toy truck
Baby doll	Duplo blocks	Nerf ball/hoop	Velcro dart game
Ball	Etch-a-sketch	Ninja turtles	Wind up toy
Barbie doll	Leggos	Puppets	Wooden blocks
Books	Markers	Tea set	Other
Bubbles	Match box cars	Telephones	
Dinosaurs	Microphone	Transformers	

Appendix 2: Definitions of Play Categories

Sensorimotor

Behavior that appears to be taking place solely to stimulate the sensory or motor system (e.g., waving/banging toys, general exploration of toys).

Functional/Constructional

Using toys in the way that they are intended to be used without pretense (e.g., rolling a car while giving no indication that the car is representing a car that can transport people); Building or putting items together.

Low Level Symbolic

Animating objects or agents such as arranging furniture in the dollhouse as if it were a house with a family; animating dolls to act as people who can walk and talk.

High Level Symbolic

Substitution—using an object to stand in for an item in pretense play (e.g., a block for a phone).

Imaginary—when the pretense does not require actual items for support (e.g., imagining tea in a pot, food on a plate, or made-up characters).

Thematic—when a story-line emerges; putting two or more symbolic episodes together (e.g., playing house, acting out a scene with dinosaurs).

Games or Conversation

Games—any play where rules are established and some form of turn-taking is assumed (e.g., playing with the nerf ball and hoop or dartboard).

Conversation—Counted whenever the child engages in conversation with the adult.

Appendix 3: Coding Manual for Social Functioning

Categories modeled after ADOS (Lord et al. 2000) and the Behavior Coding System (Hauck et al. 1995; Jackson et al. 2003).

The coding system seeks to measure the amount and quality of social overtures, social responses, and sustained interactions, as well as several other behaviors.

Minutes 3–6 and minutes 8–11 will be coded

Time zero will start at the point at which the examiner indicates a shift from the puzzle box to the play session, with a comment such as “Let’s see what toy we have to play with.” Coding should start 3 minutes from that point.

In general, only code behaviors if they are social in nature, i.e., directed to the examiner in some way. If the child is playing by himself or talking to himself, do not code.

On the score sheet, mark each time the child displays one of the following behaviors by making a tally mark on the line provided.

Social overtures Focus on the quality of the child’s attempts to initiate social interaction with the examiner. It looks at how the child uses verbal and nonverbal means to make social overtures or initiate social interaction with the examiner. Generally, if the child starts the sequence, code the behavior as an **overture**.

Initiation of joint attention The child’s attempt to draw the examiner’s attention to an object by either verbally or non-verbally indicating the object. For example, pointing, showing an object to the examiner, or saying, “look at that!”

Social response When the child responds to what the examiner says with an appropriate comment.

Shared Enjoyment

Smile/laugh A smile will be defined as a movement of the mouth that turns the lips up either showing teeth or not. A laugh will be defined as a noise indicating pleasure or enjoyment. The smile or laugh should be either coordinated with gaze toward the examiner, be exhibited during the context of an interaction with the examiner, or be in

response to something the examiner says or does (even if child does not look at examiner). The smile or laugh must indicate pleasure in the interaction. A child smiling or laughing for no apparent reason or outside the context of an interaction should be excluded.

Looks at examiner's face Child looks at face of examiner *either while talking or not talking*. For example, looking while waiting expectantly for examiner's response, looking to see how examiner will react, checking in, etc.

Asks a question/seek information The child asking the examiner a question either relating to the current situation or not. As in the "give information" code, only score when child is asking about a new topic, different from what the asked about previously (if a child is perseverating on a topic or repeatedly asking the same questions, do not score again). For example "How does this work?" "Where did you get this?" "Do you have a green car?" Also code here is child asks "What?" or "What did you say?"

Request assistance The child indicates a need for help or assistance from the examiner in some way, either verbally or nonverbally. For example "I need help", "can you do this for me?" taking examiner's hand, giving examiner the item that child was struggling with.

Non-verbal behavior/gesture The child initiates or responds but in a non-verbal way, such as nodding, shaking his head, hand the examiner an object, shrugging, throwing the examiner a ball.

Give affection The child displays a physical or verbal sign of affection toward the examiner. For example, sitting on examiner's lap, hugging examiner, complimenting the examiner, saying "I like you" or a similar comment.

Comment indicating pleasure or enjoyment The child says something to indicate pleasure in the *interaction with the examiner* such as "this is fun" or "I like this."

Partial response Child's response is within the context of the play interaction or conversation, but is not directly related to the pitch from the examiner. For example, during basketball activity, examiner says, "Are you Michael Jordan?" and child says, "I scored a basket!" Responses that have no language content should be coded as partial. If the child responds with a grunt, "uh-huh," "hmm," or some such noise, code as partial response.

Low level overture Minimal or immature efforts to engage with or respond to the examiner. For example, visually orienting toward the examiner (without looking at her face), echoing something the examiner said recently, neutral physical contact (contact that is not aggressive, affectionate or ritualistic), or ritualized interactions (a behavior that starts a preset specific interaction).

Avoidance/Move out of proximity: child moves 3 feet or more away from examiner or the child turns his/her back on the examiner.

Responses that Negate Social Interaction

Negative response A negative behavior in response to an overture from the examiner. For example, a display of aggression (hitting, kicking, biting), tantrums (crying, yelling, screaming), head banging or other self-injury, throwing things.

Reject/refuse Child pushes away or says no to examiner's bid in a way that negates the social interaction. For example, pushing a toy away, refusing examiner's attempt at play, turning away from the examiner.

No response Ignores or does not respond to examiner's social overture. For example doesn't answer a question, does not respond to examiner's bid at pretend play.

Sustained Interactions (Modified from Jackson et al. 2003)

Interactions will be considered sustained when a child makes *at least two* responses to the examiner in a series of related behaviors. *After the child has made two overtures or responses* related to the same play interaction or conversation, make a check mark. Then make a tally mark for each subsequent response that the child makes (that is within the same exchange). Only mark the *child's overtures and responses*, not the examiner's. If there is a shift in theme, mark it as a new exchange. A shift in theme in either play or conversation will be defined as beginning play with a new toy or activity, or talking about a subject that is unrelated to the previous topic of conversation. A new exchange can also be scored if there is a pause in the conversation lasting at least ten seconds. For example, if the child and examiner are talking about what they are building with legos, and then ten seconds of silence passes, and then the conversation (even if about the same topic) resumes, this will be counted as a new exchange.

Check off whether the interaction consisted of only play, only conversation, or both play and conversation

Sub-Categories

Play interactions Any type of reciprocal play with the examiner (functional, fantasy, game, rule-based, or other). The child must be actively involved in a back-and-forth exchange with the examiner—directing her actions, commenting, turn taking, etc.

Conversations An exchange of information between the child and examiner with at least two contributions from the child relating to the same topic. The utterance from the child may be a request, comment, question, answer, or a single-word response as long as it pertains to the same topic.

If a conversation occurs during the play interaction that is unrelated to the play (e.g., talking about school while building with legos), then count as a conversation. If the conversation is a narration of the play (such as making figures talk to each other), or is directly related to the play or toy objects being used (such as “I’m going to use a blue lego now”), then count as play interaction.

All behaviors listed in the scoring sheet should be counted under sustained interactions with the exception of avoidance, reject/refuse and no response.

Overall Social Rating Scale

5 = The child appears all or most of the time to be socially adept. He/she initiates socially with the examiner and uses a full range of appropriate behaviors to communicate need and interest. His/her response is consistent and the content is socially appropriate.

4 = The child appears intermittently very socially adept. He/she has several episodes of sophisticated social interaction and is generally responsive to the examiner. At times, the interaction may be somewhat immature or the child may miss some of the social bids that the examiner makes. In general, the child appears competent.

3 = The child shows at least one instance of social sophistication. He/she at times initiates social interchanges, and at times is responsive to the examiner. However, at other times his/her social interactions are more sparse, bland, repetitive, silly, aggressive, or immature and his/her response is unusual in its content (noncompliance, odd response, negativistic).

2 = The child shows a few brief episodes of social interchange; but is mostly demanding, reproachful, withdrawn, or socially unexpressive. The child responds to the examiner in a very immature way, such as orienting to the examiner, moving to work in parallel with her, etc. These responses are infrequent and may be insufficient or odd.

1 = The child appears largely inept in his/her social strategies. He/she either withdraws from interaction or demands attention continuously in a perseverative, unmodulated way. He/she may resist all interaction from the examiner refusing to verbally or physically respond whenever the examiner makes an attempt at social interaction.

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