Published in final edited form as:
J Autism Dev Disord. 2010 June ; 40(6): 665–676. doi:10.1007/s10803-009-0914-1.

Early Interests and Joint Engagement in Typical Development, Autism, and Down Syndrome

Lauren B. Adamson, **Deborah F. Deckner**, and **Roger Bakeman**
Department of Psychology, Georgia State University, Atlanta, GA 30303, USA

Lauren B. Adamson: ladamson@gsu.edu

Abstract

This study examines how spontaneous interests in people and in objects relate to joint engagement in typically developing toddlers and young children with autism or Down syndrome. Ratings of interests were made repeatedly during intermissions in a laboratory-based protocol focused on caregiver-child interactions. Interests were moderated by diagnosis and relatively stable across intermissions. In autism, interest in people tended to be low and to decline rapidly, and the balance of interests favored familiar objects over people. Lower interest in people and in unfamiliar objects was associated with less coordinated joint engagement and with less steep developmental trajectories for symbol-infused joint engagement. These findings suggest that variations in interests may contribute to differences in the child's engagement during social interactions that facilitate the acquisition of language.

Keywords

Interests; Parent–child interaction; Autism; Down syndrome; Joint attention; Communication development

Introduction

A persistent impairment in joint attention is now widely recognized as a distinctive manifestation of autism (Mundy 1995). A burgeoning literature supports this claim with convincing demonstrations that toddlers with autism spectrum disorders display marked deficits in joint attention skills during standardized assessments (Lord and Corsello 2005), and rarely engage in periods of shared engagement that entail coordinating attention to both social partners and a shared topic during social interactions (Adamson et al. 2009). This disruption of coordinated joint engagement may reflect underlying core deficits such as a tendency not to look at faces or difficulty integrating gaze with gestures and vocalizations that constitute an early distinctive feature of autism (Dawson et al. 2005). Moreover, mounting evidence suggests that this deficit in joint attention is a pivotal problem (Charman 2003) that may lead to delays in the emergence of skills essential to symbolic development, including language acquisition (Adamson et al. 2009; Toth et al. 2006).

In the study reported here, we sought to examine the relation between joint attention and spontaneous interest in social partners and in objects both in typically developing toddlers and in young children with autism or with Down syndrome. Our focus on early interests is prompted

Correspondence to: Lauren B. Adamson, ladamson@gsu.edu.
Present Address: D. F. Deckner, Department of Psychology, Clayton State University, Morrow, GA, USA

by the longstanding emphasis on motivation in developmental theories that emphasize the importance of the child's active participation in contexts that facilitate learning. Decades ago, Vygotsky (1978, p. 92) issued the wise warning that "if we ignore the child's needs, and the incentives which are effective in getting him to act, we will never be able to understand his advance from one developmental stage to the next". Likewise, White (1959) and many others (see, e.g., Escalona 1968; Gibson 1988; Hunt 1961; for more contemporary discussions, see, Renninger et al. 1992; Silvia 2006) consider motivational factors and investigate how a young child's interest in different aspects of the environment actively shape individual patterns of development. Recently, Mundy (1995) and others (e.g., Adamson and Russell 1999; Hobson 2000) have suggested that variations in interests in the social and object realms may play a crucial role in the early developmental course of shared attention. For example, should a child persistently display a stronger interest in one realm over the other, as when a child focuses almost exclusively on objects and rarely on people, this skewing of interests may limit how often the child participates in periods of joint engagement during which the partner supports the child's exploration of objects. Early variations in social and object orientation may also influence children's early path toward language. Nelson (1979) (see also Adamson 1992; Bates et al. 1988; Gopnik 1988), for example, made the compelling suggestion that how toddlers resolve the inevitable challenge of coordinating social and object schemes affects the size and content of early vocabularies with children who have strong referential interests acquiring relatively large vocabularies of nouns that refer to objects and children who are very interested in people concentrating their smaller vocabularies on words that regulate interactions.

Our focus on variations in early interests aligns well with research on social and object orienting in young children with developmental disorders. This work includes a plethora of studies that document how children with autism fail to orient to social stimuli in experimental settings (Dawson et al. 1998, 2004), staged parent–child interactions (Swettenham et al. 1998), and naturally occurring events captured in home videotapes (e.g., Osterling et al. 2002). Although less plentiful, evidence is also mounting that very young children with autism may display restricted and limited interest in objects (e.g., Bruckner and Yoder 2007; Williams et al. 1999). In comparison, children with Down syndrome appear to exhibit initially delayed but subsequently heightened attention to people (Berger and Cunningham 1981; Slonims and McConachie 2006), especially during challenging situations (Fidler 2005; Moore et al. 2002), but display relatively little interest in objects (Legerstee and Weintraub 1997), a propensity which in turn appears related to cognitive functioning (Kasari et al. 1995).

This study adds to the current literature in two notable ways. First, it broadens the view of young children's spontaneous interest in people and in objects by systematically observing how they acted during a naturalistic routine that offered opportunities to engage with a friendly social partner and an array of enticing unfamiliar and familiar objects. Our observations were made using videorecords produced using a paradigm, the Communication Play Protocol (CPP, Adamson and Bakeman 1998), that was designed to observe caregiver-child interaction in a series of 5-min long *scenes*. During each scene, the care-giver was asked to enact a specific plot (e.g., going to an art gallery; taking turns) using specific props so that we could measure how the child (the play's "star") currently communicated, including the amount of joint engagement (Adamson et al. 2009). Between scenes, there was a brief period during which a friendly experimenter (the CPP's director) performed a three-phrase maneuver of entering the room and greeting the child and caregiver; providing new, unfamiliar props and when not disruptive, replacing old, familiar props, and saying goodbye and exiting the room. In the current study, we treated these periods (which, to continue our metaphor of a Play, we call here, *intermissions*), as a source of data on the child's spontaneous interests in people and in objects. To this end, videotapes of intermissions were systematically coded to derive reliable measures of interest in a friendly new social partner (the director) and in objects (the unfamiliar and the familiar props). This coding relied on raters' global assessment of interest in each target

so that the measure was not dependent on a child producing a specific expression of interest such as gaze to the director's face or purposeful manipulation of an object.

Second, this study provides both a cross-sectional design to make a detailed comparison across groups at relatively comparable levels of language development and a longitudinal view to trace developmental trajectories and to examine the relations between different aspects of development. Our overall expectations were that patterns of interests in people and in objects would be stable and would vary as a function of diagnosis and that different patterns of interests would relate in conceptually interesting ways to the emergence of symbol-infused joint engagement.

Our analysis examined three sets of questions. As in Adamson et al. (2009), first we focused on a comparison of 30-month-old children with autism and with Down syndrome to typically developing toddlers at 18 months to describe patterns of interests during intermissions, their modulation during the intermission, and the relation between interests and concurrent joint engagement during parent–child interactions. We anticipated that during intermissions (a) typically developing children would modulate their interests to people and to objects resulting in an overall level of interest in the director and in the familiar and unfamiliar props that would appear moderate and balanced. In contrast, we hypothesized that (b) children with autism would consistently display lower levels of interest in a new social partner than typically developing children and children with Down syndrome (Dawson et al. 1998), and that (c) children with Down syndrome would show a relatively high level of social interest, a prediction that is consistent with reports that children with Down syndrome tend to maintain eye contact longer than their typically developing peers (Berger and Cunningham 1981; Crown et al. 1992). Additionally, we hypothesized that (d) both children with autism and with Down syndrome would exhibit comparatively low levels of interest in objects, both newly introduced and already available (Kasari et al. 1995; Williams et al. 1999), and that (e) children with autism would display less interest in unfamiliar props than in familiar ones, a finding that parallels Joseph and Tager-Flusberg's (1997) suggestion that familiarity may affect social attention and Bruckner and Yoder's (2007) report of their relatively intense interest in familiar objects.

Next, we examined how variations in the level and the balance of interests during the intermissions in the Communication Play were related to the amount and form of the child's joint engagement during social interactions with his or her caregiver during the scenes of the Play. Our previous work (Adamson et al. 2004, 2009) indicated that by 18 months of age, typically developing children have consolidated coordinated joint engagement (where they pay active attention to both the partner and the shared objects), and they maintain episodes of supported joint engagement (where they focus predominantly on the shared object). Autism, but not Down syndrome, selectively disrupts coordinated joint engagement such that young children with autism rarely enter and sustain this state even when interacting with responsive caregivers. In addition, at 18 months of age, typically developing children are usually just beginning to infuse symbols into periods of joint engagement. Both autism and Down syndrome often significantly delay the onset and dampen the slope of symbol-infusion into both supported and coordinated joint engagement. In the current study, we examined whether or not variations in interest in either the social or the object domain related to how often children sustained joint engagement during interactions with a caregiver. Our primary hypotheses were that (a) children who displayed relatively low interests in people and in objects would be more unengaged during interactions with their caregiver and (b) the amount of coordinated joint engagement, but not supported joint engagement, would be lower when a child displays low interest in people and especially when the child is more interested in familiar objects than in people.

Finally, taking a longitudinal view, we examined trajectories of early interests and the relation between interests and the emergence of symbol infused joint engagement. To begin, we

anticipated that our measures of interests would be stable over adjacent sessions, although stability does not preclude a shift in the level of interest when we look across a year of observations. Specifically, we expected that interest in new objects might increase in all three groups, and especially in the typically developing group as a reflection of increased displacement of interactions as language is acquired (Adamson and Bakeman 2006); and that children with Down syndrome would display increasing interest in the director, as suggested by reports of their heighted social interests during early and middle childhood (Fidler 2005; Fidler et al. 2005). Additionally, we anticipated that interests in people and in objects might also predict the pace of emergence of symbol-infusion into periods of joint engagement, thus, as our final prediction, we expected that young children who are interested both in people and in objects may be particularly well situated to start to infuse symbols into periods of joint engagement.

Method

Participants

108 children (23 children with autism, 29 children with Down syndrome, and 56 typically developing children), were observed several times over the course of a year with a parent (in all but two cases the mother). Demographic information at each child's initial visit is summarized in Table 1.

Children with autism (AU) were identified by three clinicians in our metropolitan area who described our study to parents if their child met our study criteria (i.e., was under 3 years of age and, according to the clinician, had a primary diagnosis of autism). If the parent expressed interest and agreed to be contacted, we provided additional information about the study. If the parent consented to participate, we administered the *Autism Diagnostic Interview-Revised* (*ADI-R*; Lord et al. 1994), a semi-structured clinical interview that assesses behavior in three core domains—social interaction, communication (verbal or nonverbal), and restricted or repetitive behaviors—and that determines whether developmental difficulties were evident before the child's third birthday. Clinician referrals were strongly supported by the ADI-R results: all of the children scored above cut-off for autism on the social interaction and restricted or repetitive behavior domains; all but one scored above the cut-off on the communication domain, and this child scored just one point below cut-off on the nonverbal version of the communication domain. The children with autism were observed two to five times over the course of the year with the majority of visits occurring at 3 month intervals; 19 were observed five times, 1 three times, and 3 two times.

For children with Down syndrome (DS), recruitment was predominantly done via clinicians and through information provided at local parent support events. All of the AU and all but one of the DS children received clinical services during at least some portion of the year-long study period. Moreover, 17 of the DS children were also participating in a study of the effects of augmented communication intervention (Romski et al. in press). The children with Down syndrome were observed two to five times over the course of the year with the majority of visits occurring at 3 month intervals; 15 were observed five times, 9 four times, 4 three times, and 1 two times.

The typically developing participants' parents had responded to a letter of invitation to participate in developmental research at a local university. All of the typically developing children (TD) were full-term with no history of serious illness. They were observed four to five times over the course of the year at 3 month intervals; 54 were observed five times and 2 four times.

Language and Cognitive Ability

Approximately a week before each visit, parents were mailed the *MacArthur Communication Development Inventory* (*CDI*; Fenson et al. 1993) and asked to bring the completed form with them to the upcoming visit. The CDI is a commonly used parental report that measures children's current expressive vocabulary. Additionally, the *Mullen Scales of Early Learning* (Mullen 1995) was administered at either the participant's first or second visit. The Mullen is a standardized assessment of cognitive development normed for children aged birth to 68 months that yields four subscale scores (visual reception, fine motor skills, receptive language, and expressive language) and a composite standard score. We compared the children on these four subscales and the CDI from the visit when the TD children were 18 months of age and from the visit when the AU and DS children were closest to 30 months of age. Results indicated effects of diagnostic group on the median number of words on the CDI, receptive and expressive language subscales, and composite total score. (See Table 2). In general, considering medians and their interquartile ranges, AU and DS children were relatively similar, and at 30 months scored lowered than TD children at 18 months. For these and subsequent analyses, AU and DS children at 30 months were compared with TD children at 18 months, and not 30, because, despite differences, the language level of TD children at 18 months more closely matched the language level of the other two groups at 30 months, and so provides a more appropriate comparison than older TD children (see also Adamson et al. 2009).

Observational Sessions

All of the dyads in the current report participated in a longitudinal study of communication development (Adamson et al. 2009) in which they were observed two to five times over the course of a year engaging in the Communication Play Protocol (CPP; Adamson and Bakeman 1998). The CPP consists of distinct scenes designed to demonstrate the child's way of fulfilling the communicative functions of interacting, requesting, and commenting. During visits 2–5, dyads also participated in two scenes related to narrating the past and the future.

Ratings of children's interests were made during the intermissions between the scenes of the CPP. During the first session, there were 6 intermissions; during sessions 2–5, there were 8 intermissions. Intermissions lasted, on average, 81 s (SD = 17). For each intermission there was a relatively standardized format that consisted of three distinct phases: *greeting*, *prop exchange*, and *exit*, lasting on average 13, 55, and 13 s, respectively. During the greeting, the female researcher who was acting as the Play's director knocked on the door of the play room, entered the room with the new toys for the upcoming scene of the CPP, and greeted the child and parent. During the prop exchange the director distributed the toys for the next scene, explained the focus of the upcoming scene to the parent, and collected props from the prior scene that the child was not using or that he or she readily relinquished. During the exit, the director left the room, once again explicitly speaking to the child. For the first visit, there were six scene intermissions; for visits two through five there were eight.

Coding Schemes

Coding Interest in People and Objects—Separate ratings were made to characterize the child's interest in (a) the director, (b) the familiar toys that were currently in the playroom (old toys), and (c) unfamiliar toys that were being brought into the room by the director (new toys). Ratings were made on a scale of one to five. A score of one indicated essentially no attention to that target (i.e., people, old toys, new toys) and a five indicated relatively constant and intense interest in the target over the course of the specific intermission phase. Coders rated the child's interest based upon the child's visual attention to the target, efforts to approach and/or physically engage with the target, and verbalization or vocalizations either to or about the target. Ratings were made for each intermission phase, hence 18 for the first visit and 24 for each subsequent visit. Summary interest scores were formed by averaging these ratings.

Coding Engagement States—The child's engagement states were coded during the CPP's scenes. A total of 11 codes were used to describe the child's active attention to people, objects, and symbols (Adamson et al. 2004, 2009). For current purposes, we combined codes to derive three variables of primary interest: the proportion of time during the scenes when the child was observed in the state of *coordinated joint engagement, supported joint engagement*, and *symbol-infused joint engagement*. Supported joint engagement was coded when child and parent were actively involved with the same object or event, but the child was not actively acknowledging the mother's participation. Coordinated joint engagement was coded when child and parent were actively involved with the same referent, and the child was actively and repeatedly acknowledging the parent's participation, as when the child makes eye contact and smiles during a moment of affect sharing or when the child calls to the partner even if he or she is not looking at her. Finally, supported and coordinated joint engagement were also coded symbol-infused when there was evidence that the child was actively attending to symbols, as when the child spoke or responded to the parent's language. We also used state codes to assess the proportion of time spent attending exclusively to *objects* and *unengaged*.

Coding Procedures and Reliability

For both coding systems, two separate video recordings were made, synchronized with a common vertical interval time code (VITC; Long 1996). This procedure allowed coders to view either recording, whichever provided the better view, while preserving a common time code for data recording. For coding engagement states, teams, each comprised of two coders, viewed the recordings of each scene and identified seams or breakpoints in the stream of behavior between different engagement states, using the eleven code options described earlier. For rating of interest in people and interest in objects, coders, working individually, designated the boundaries, recording the time, of the three phases of the intermission (i.e., greeting, prop exchange, and exit) and then made the ratings for those time periods.

Reliability for engagement state coding was assessed with kappa, a summary index for nominal scales that corrects for chance agreement (Cohen 1960). To establish reliability, at least 15% of the corpus for each diagnostic group was coded independently by two teams who were unaware of which tapes were used for reliability. Kappas for the engagement state codes were .76, .69, and .71 for the AU, DS, and TD samples, respectively. Thus, all kappas were above the .60 cutoff typically regarded as acceptable (Bakeman and Gottman 1997; e.g., Fleiss 1981, characterizes kappa values of .60–.75 as good, and values over .75 as excellent).

Reliability for the interest ratings was assessed with weighted kappa (Bakeman and Gottman 1997; Cohen 1968). Weighted kappa, which permits degrees of disagreement to be weighted differently (here, a 1 point disagreement was weighted 1, a 2-point 2, etc.), is useful when scales are ordinal (Bakeman et al. 2005). To establish reliability, 15% of the coders' ratings were compared with ratings performed by a master coder; coders were unaware which tapes were used for reliability. Weighted kappas were .65, .73, and .74 for the three interest ratings (interest in director and old and new objects, respectively).

Data Analysis and Reduction

The three variables of primary concern were interest in the director and in old and new objects, derived by averaging ratings during the intermissions. Three additional variables assessed balance: differences between mean interests in old objects and the director, new objects and the director, and new and old objects. Also, as noted earlier, several of the engagement state codes were collapsed to allow for more focused attention on the forms of joint engagement of interest here. These values are based on the average percentage of time that a child was coded as being in one of those engagement states during the Communication Play Protocol scenes.

The cross-sectional sample used for group comparison consisted of 108 children (see Table 1). The longitudinal sample used for evaluating possible differences in level of interest as a function of time and in rate of change in joint engagement as a function of interest included those 104 children who had completed at least three visits.

Results

Group Comparisons of Interest in People and in Objects

As a preliminary, to determine whether interest in the director and in old and new objects were distinct and not simply measures of the child's general capacity to attend to or engage with the environment, we computed their intercorrelations, separately by diagnostic group, within the cross-sectional sample. Undifferentiated measures of general interest would have resulted in uniformly positive correlations. Instead, some were negative, some positive, and patterns varied by diagnostic group; in particular children with Down syndrome tended to show different patterns than children with autism or typically developing children (see Table 3).

Table 4 gives means, standard deviations, and ranges for the interest and balance variables for the full sample. Recall that ratings were 1–5 but that these variables are based on means over intermissions, thus the smaller ranges are not surprising. To answer our questions about differences due to diagnostic status (comparing AU_{30}, DS_{30}, and TD_{18}), the three interest scores and the three balance variables were subjected to one-way analyses of variance (standardized skews for these variables were all <1.5 absolute). Specifically, children with autism displayed less interest in the director and a greater difference between interest in old objects and the director and a different balance for interest in new and old objects than both children with Down syndrome and typically developing children (see Table 4). They also displayed greater interest in old objects than children with Down syndrome and less interest in new objects than typically developing children. In contrast, children with Down syndrome did not differ from typically developing children on any of these variables and children in all three groups showed a slightly greater interest in new objects then the director. The two strongest effects involved interest in the director and the difference between interest in old object and the director. For the AU group, interest in the director was about a standard deviation below, and interest in old objects compared to the director about a standard deviation above, means for both the DS and TD groups.

Figure 1 shows graphically how diagnostic groups differed in their interest in the director and in old and new objects. With respect to old objects and the director, children with autism tended to cluster in the upper-left quadrant (low interest in the director, high interest in old objects). As a result, their difference between interest in old objects and the director was higher than for the other groups (see Table 4). With respect to new objects and the director, children with autism tended to cluster in the lower-left quadrant. This reflects their lower interest both in new objects and the director. However, their difference between interest to new objects and the director (perfect balance is reflected by the lower-left to upper-right diagonal) did not differ much from other groups (again, see Table 4). Finally, with respect to old and new objects, children with autism and typically developing children tended to cluster on the upper-left to lower-right diagonal, indicating their inverse association between interest to old and new objects. In contrast, children with Down syndrome tended to cluster on the lower-left to upper-right diagonal, indicating little differentiation between old and new objects (see Table 3).

Next, we evaluated whether there were any group differences in how interest in the director changed across the intermission phases. We categorized each child's pattern as: (a) *rapid decline*—the child exhibited strong interest in the director during the greeting phase followed by a decline in the prop exchange, exit phase, or both (i.e., more than half a standard deviation), (b) *sustained* interest—the child displayed strong interest in the director during the greeting

phase with negligible change during the prop exchange phase (i.e., less than half a standard deviation), (c) *strengthening* interest—the child displayed interest in the director during the prop exchange or exit phase that was substantially stronger than during the greeting phase (i.e., more than half a standard deviation), or (d) consistently *low* interest in the director across all intermission phases (i.e., more than a standard deviation below the overall mean).

Results partially supported our hypotheses. An overall chi-square indicated that the pattern of interests differed across the groups ($\chi^2[6, N = 108] = 24.9$, $p < .001$; see Table 5). In particular, children with autism were less likely than expected to exhibit the sustained and more likely than expected to exhibit the low interest pattern, whereas typically developing children were the opposite. In fact, the low interest pattern was evidenced only by 5 children with autism, and no DS or TD children. These five are marked in Fig. 1. As might be expected given their location in the scattergram, the director-old, director-new, and old-new correlations given in Table 3 for the AU group (−.46, .15, and −.26) change to −.16, −.23, and .02, respectively, without these five cases.

Interests and Concurrent Engagement States

To test our hypothesis that children who displayed lower interests in people and in objects would be more unengaged with their caregiver, we evaluated models that included main effects for interest in the director and in old and new objects. To check whether any effects were moderated by diagnostic group, we also included a main effect for diagnostic group and an interaction term. For all groups in the cross-sectional sample, lower interest in the director was associated with more time unengaged ($r = −.33$, $p = .001$; interaction $p = .38$). Lower interest in new objects was also associated with more time unengaged, but just for children with autism and Down syndrome, not typically developing children ($r = −.64$, −.36, and .02, $p = .001$, .057, and .86, respectively; interaction $p < .001$), but interest in old objects was not associated with time unengaged in any group ($r = .00$, $p = .99$; interaction $p = .79$).

To test our hypothesis that children who displayed less interest in people would be less often engaged in coordinated (but not supported) joint engagement, especially for children more interested in old objects than people, we evaluated a model that included a main effect for interest in the director, a main effect for old object-director balance, and their interaction—but first we checked for diagnostic group moderation. For all groups, lower interest in the director was associated with less time in coordinated and supported joint engagement, but the latter was not statistically significant ($r = −.32$ and .11, $p = .001$ and .11; group interaction $p = .99$ and .94, respectively). Finally, for both coordinated and supported joint engagement, the difference between interest in people and old objects, and people and new objects, did not moderate these effects (interaction $p = .17$ and .53 for coordinated, and .45 and .71 for supported, respectively).

Trajectories of Interests and Engagement States

To determine whether interests were relatively stable over sessions, we examined correlations of the three interest variables between visits. Between-visit stability was strong for interest in the director (r's = .52–.59, p's < .001), weak to moderate for interest in old objects (r's = .28–.43, p's < .001), and strong for interest in new objects (r's = .53–.68, p's < .001; Cohen 1988). To assess how interests changed over time, we compared the linear trajectories of the three interest variables. Specifically, for the 104 participants who had at least three visits, we calculated slopes for interest in the director and familiar and unfamiliar objects and analyzed whether these slopes differed as a function of diagnostic status. We used sign tests to determine whether slopes were predominately positive or negative for each group and one-way analyses of variance to determine whether the magnitude of the slopes differed by group.

As indicated by their slopes, interest in the director increased for AU and DS children but decreased for TD children (see Table 6). Mean slopes for interest in old objects did not differ among the groups, but interest in new objects increased for all groups, more strongly for the TD than the DS groups (the mean AU slope was nearer the TD but not significantly different from the DS one). At the individual level, interest in the director increased for a majority of AU and DS children, and decreased for a majority of TD children, although the percentages were not significantly different from chance (i.e., 50%). Interest in old objects decreased for a majority of AU and TD children (only TD significant), and increased for a bare majority of DS children. Finally, as expected given the slope difference, interest in new objects increased for a significant majority of children in all three groups. For details, see Table 6.

To test our hypothesis that young children who are interested both in people and in objects may be particularly well situated to start to infuse symbols into periods of joint engagement, we evaluated models that included main effects for interest in the director and in old and new objects on the slope of symbol-infused joint engagement over sessions. For all groups, higher interest in the director and in new objects, but not old objects, was associated with steeper upward trajectories for symbol-infused joint engagement (r = .21, 21, and −.08, p = .034, .034, and .41; interaction p = .16, .82, and .29).

Discussion

This study's findings provide ample support for the contention that young children's level of interest in people and in objects may contribute to crucial variations in their experiences during interactions with their caregivers. As we anticipated, early differences in children's interests in people and in objects are relatively stable, and they are moderated in conceptually reasonable and informative ways by autism and by Down syndrome. Moreover, interests predict not only how often a child will sustain periods of coordinated joint engagement during caregiver-child play but also how rapidly symbols will infuse joint engagement.

A critical first step in investigating the specific role of interests in the development of joint engagement was the formulation of an assessment of a child's spontaneous propensities to engage with social and object domains. The rating scales that we used in this study produced reliable information about how our trained observers perceived each child's shifting engagement with people and objects during a complex, dynamic event that occurred in a relatively controlled naturalistic condition. One strength of this rating procedure is that it provides a reading of the quality and duration of interest that is not limited to specific constituent behaviors such as visual regard of faces or touches of objects. The differences we observed across diagnostic groups likely reflect underlying differences in how children attend to and process the meaning of various aspects of this situation. Thus, complementary interpretations of the findings can fruitfully be probed by specifying variations in specific attention related actions, such as responding to greetings and to joint attention bids, gaze to faces, attention shifting, and specific affective displays.

Our strategy of using intervals between formal observational conditions lent a relaxed air to the proceedings and provided a good setting for the observation of variations in social interest across ages and between diagnostic groups. We were particularly impressed by how many children rapidly established a routine way of acting as the friendly adult entered the room, exchanged props, and then gracefully exited at 5 min intervals, and by how varied these routines were. For example, some especially socially attuned children oriented to the door and said "Come in" each time the adult knocked before entering; others remained steadfastly focused on their current activity, despite being greeted cheerfully by name. This consistency was captured in the strong across-session correlations of ratings of interest in the adult and in the unfamiliar objects she brought on the scene.

This standardized observational protocol documented clearly that autism had a strong effect on how children negotiate the common social situation of greeting and casual interaction with a friendly adult. It is noteworthy that the mean rating for the autism group on the variables that measured interest in the Play's director and that compared interest in familiar objects and the director were almost a full standard deviation less than those for either the typically developing and Down syndrome groups. In addition, our findings indicate that it may be fruitful in future studies to probe further variations in the modulation of social interests during a dynamic social situation. All of the typically developing toddlers we observed displayed considerable interest in the director when she entered the room for the intermission between scenes. Then, in half of the observations, they rapidly turned their attention elsewhere and in half they either sustained or strengthened interest in her. In contrast, the children with autism paid significantly less heed to the adult, and in a sizable minority of observations, they did not display interest in her at any point throughout the interval, despite her attempts to greet. These findings are consistent with reports that many children with autism are less likely than others to orient socially (Dawson et al. 1998) and more likely to ignore or resist the social aspects of a communicative context (Adamson et al. 2001), and they support the view that the social difficulties associated with autism are in part due to lowered levels of motivation to engage with people (Carr 2007; Dawson et al. 2004). However, it is also important to note that there is considerable heterogeneity within the autism group with some children increasing interest in the director over the course of an intermission and others, unique to the autism group, showing low interest over all three phases of greeting, prop exchange, and saying goodbye.

The effects of Down syndrome on interest in people were not as marked. Counter to our hypothesis, they did not display an overall elevation of interest in the adult when compared to typically developing toddlers. However, we did find that their interest was significantly more likely to strengthen over time during an intermission so that even when the adult turned most of her attention towards exchanging props, the child maintained interest in her. Moreover, over the year-long study, the children with Down syndrome tended to display increasing interest in the director while typically developing children's interest in her declined. This observation suggests that the heightened social attention documented for infants with Down syndrome (Berger and Cunningham 1981; Legerstee and Bowman 1989; Slonims and McConachie 2006) continues into the preschool years.

Our results also indicate that interest in objects may be influenced markedly by the child's on-going activities. Rather than derive a single variable for interest in objects that would parallel the variable for interest in people, preliminary analyses led us to keep interest in newly presented props distinct from interest in already available ones. First, the correlation between interest in unfamiliar (new) and familiar (old) objects was negative for our typically developing sample, suggesting that these children tended to either sustain interest in the objects they were playing with before the trial began or they were enticed by the new props. Indeed, as with interest in the new person, the children tended to follow a routine relative to the props, with some children rapidly coming to anticipate each new bundle of toys and others holding fast to one or more of the previous props. Moreover, although the negative correlation between familiar and unfamiliar object interest in the autism sample and the positive correlation in the Down syndrome sample were only marginally significant, their magnitude raises the intriguing possibility that familiarity may moderate object interest differently in different diagnostic groups. In line with the recent suggestion that autism may produce early unusual interest in and use of objects (Bruckner and Yoder 2007; Williams et al. 2000), we found that autism may selectively dampen interest in unfamiliar, as compared to familiar, objects. These contentions are supported by the findings that the level of interest in unfamiliar objects was significantly lower in the autism group than in typically developing toddlers, and that children in this group displayed less interest in unfamiliar than familiar objects while children in both the typically developing and Down syndrome samples displayed more interest in unfamiliar objects than in

familiar ones. Furthermore, when interest in objects and interest in people were contrasted, children with autism showed a marked preference for familiar objects that was not evident in the other two groups. These findings may reflect the difficulty young children with autism have in disengaging and shifting attention (Landry and Bryson 2004).

Evidence that early interest in people and interest in objects are both stable across sessions and that their trajectory may be influenced by developmental disorders provides impetus for probing how variations in these interests affect early experience. In the current study, we investigated this effect by exploring the link between the interest variables and the amount and forms of engagement with people and objects during child-caregiver interaction. As predicted, higher amounts of coordinated joint engagement when playing with the caregiver were linked to higher interest in people, suggesting that paying explicit attention to the caregiver during joint engagement reflects in part a more general propensity to focus on social aspects of communication. Moreover, this finding underscores why it may be very difficult, although not impossible, to increase the amount of coordinated joint engagement in young children with autism (see, e.g., Kasari et al. 2006). The amount of supported joint engagement was related to heightened interest in unfamiliar objects, a result that is consistent with the notion that this state is often one in which the adult scaffolds the child's exploration of shared events. The relation between a child's tendency to sustain supported joint engagement to his or her interest in unfamiliar objects highlights how curiosity likely plays an important role in fostering communication, even when the child does not pay explicit attention to the social partner. It is also noteworthy that interest in unfamiliar objects tended to increase for most children in all three diagnostic groups.

Our findings also support the notion that variations in patterns of interests in people and in objects may have important developmental implications. Our longitudinal observations spanned the time period when the rates of coordinated and supported joint engagement remain relatively stable and the rate of symbol-infusion increases in both typically developing toddlers (Adamson et al. 2004) and young children with autism and Down syndrome (Adamson et al. 2009). Thus, it is not surprising that there were no significant relationships between variations in interests and variations in the rate of change of either coordinated or supported joint engagement. In contrast, there was sufficient change in symbol-infused joint engagement to probe if the amount of change might be related to interests, and indeed, as we predicted, it was, with higher interests in people and in unfamiliar objects linked to more rapid change in the amount of symbol-infused joint engagement. Moreover, it is interesting that the balance of interest seemed to make a difference, with children who showed more interest in familiar objects than in a new social partner making smaller gains in symbol infusion. These findings provide empirical support for the seminal view of symbol formation that initial introduction of symbols into communication entails a dynamic orchestration of the child's activities within both the social and object realms (Bruner 1983; Nelson 1996; Werner and Kaplan 1963). Furthermore, they suggest that it would be instructive to consider how interests may affect what a child learns during language facilitating contexts such as shared reading (Deckner et al. 2006).

In summary, the current study sought to highlight young children's interests in people and objects and to relate these interests to important early experiences within caregiver-child interactions. Its findings illustrate well the differences in enthusiasms that young children bring to everyday activities such as play with a parent. Moreover, these findings provide good reason to continue to explore how interests influence experiences that foster the emergence of language and literacy, and how interventions might be focused to alter atypical propensities, such as intense interest in familiar objects or low interest in people, that appear to interfere with the incorporation of symbols in joint engagement.

Acknowledgments

This research was supported by grants from the National Institute of Child Health and Human Development (HD35612). Portions of the study were presented at the International Conference on Infant Studies, Kyoto, 2006. The authors thank Barbara Dunbar, Pamela K. Rutherford, Janis Sayre, Kimberly M. McMillian, and Alicia Brady for their many contributions to this project. In addition we gratefully acknowledge the coders of this corpus, R. Michael Barker, Nicolle Angeli, Jana Pruett, Kelli Eastman, and Tonya Evans.

References

Adamson, LB. Variations in the early use of language. In: Winegar, LT.; Valsiner, J., editors. Children's development within social context, vol. 1: Metatheory and theory. Hillsdale, NJ: Lawrence Erlbaum Associates; 1992. p. 123-141.

Adamson, LB.; Bakeman, R. Tech Rep No 8. Atlanta: Georgia State University, Department of Psychology; 1998. The communication play protocol.

Adamson LB, Bakeman R. The development of displaced speech in early mother-child conversations. Child Development 2006;77:186–200. [PubMed: 16460533]

Adamson LB, Bakeman R, Deckner DF. The development of symbol-infused joint engagement. Child Development 2004;75:1171–1187. [PubMed: 15260871]

Adamson LB, Bakeman R, Deckner DF, Romski MA. Joint engagement and the emergence of language in young children with autism and Down syndrome. Journal of Autism and Developmental Disorders 2009;39:84–96. [PubMed: 18581223]

Adamson LB, McArthur D, Markov Y, Dunbar B, Bakeman R. Autism and joint attention: Young children's responses to maternal bids. Journal of Applied Developmental Psychology 2001;22:439–453.

Adamson, LB.; Russell, CL. Emotion regulation and the emergence of joint attention. In: Rochat, P., editor. Early social cognition: Understanding others in the first months of life. Hillsdale, NJ: Erlbaum; 1999. p. 281-297.

Bakeman, R.; Deckner, DF.; Quera, V. Analysis of behavioral streams. In: Teti, DM., editor. Handbook of research methods in developmental science. Oxford, UK: Blackwell Publishers; 2005. p. 394-420.

Bakeman, R.; Gottman, JM. Observing interaction: An introduction to sequential analysis. 2. New York: Cambridge University Press; 1997.

Bates, E.; Bretherton, I.; Snyder, L. From first words to grammar: Individual differences and dissociable mechanisms. Cambridge, England: Cambridge University Press; 1988.

Berger J, Cunningham CC. The development of eye contact between mothers and normal versus Down's syndrome infants. Developmental Psychology 1981;17:678–689.

Bruckner CT, Yoder P. Restricted object use in young children with autism: Definition and construct validity. Autism 2007;11:161–171. [PubMed: 17353216]

Bruner, J. Child's talk: Learning to use language. Oxford: Oxford University Press; 1983.

Carr EG. Social skills that are not always social and problems that are not always problems. Research and Practice for Persons with Severe Disabilities 2007;32:110–111.

Charman T. Why is joint attention a pivotal skill in autism? Philosophical Transcripts of the Royal Society of London B 2003;358:315–324.

Cohen J. A coefficient of agreement for nominal scales. Educational and Psychological Measurement 1960;20:37–46.

Cohen J. Weighted kappa: Nominal scale agreement provision for scaled disagreement or partial credit. Psychological Bulletin 1968;70:213–220. [PubMed: 19673146]

Cohen, J. Statistical power analysis for the behavioral sciences. 2. Hillsdale, NJ: Erlbaum; 1988.

Crown CL, Feldstein S, Jasnow MD, Beebe B. Down's syndrome and infant gaze: Gaze behavior of Down's syndrome and nondelayed infants in interactions with their mothers. European Journal of Child and Adolescent Psychiatry 1992;55:51–55.

Dawson G, Meltzoff A, Osterling J, Rinaldi J, Brown E. Children with autism fail to orient to naturally occurring social stimuli. Journal of Autism and Developmental Disorders 1998;28:479–485. [PubMed: 9932234]

Dawson G, Toth K, Abbott R, Osterling J, Munson J, Estes A, et al. Early social attention impairments in autism: Social orienting, joint attention, and attention to distress. Developmental Psychology 2004;40:271–283. [PubMed: 14979766]

Dawson G, Webb SJ, McPartland J. Understanding the nature of face processing impairment in autism: Insights from behavioral and electrophysiological studies. Developmental Neuropsychology 2005;27:403–424. [PubMed: 15843104]

Deckner DF, Adamson LB, Bakeman R. Child and maternal contributions to shared reading: Effects on language and literacy development. Applied Developmental Psychology 2006;27:31–41.

Escalona, SK. The roots of individuality. Chicago: Aldine; 1968.

Fenson, L.; Dale, PS.; Reznick, JS.; Thal, D.; Bates, E.; Hartung, JP., et al. MacArthur communicative development inventories. San Diego: Singular; 1993.

Fidler DJ. The emerging Down syndrome behavioral phenotype in early childhood. Infants & Young Children 2005;18:86–103.

Fidler DJ, Barrett KC, Most DE. Age-related differences in smiling and personality in Down syndrome. Journal of Developmental and Physical Disabilities 2005;17:263–280.

Fleiss, JL. Statistical methods for rates and proportions. New York: Wiley; 1981.

Gibson EJ. Exploratory behavior in the development of perceiving, acting, and the acquiring of knowledge. Annual Review of Psychology 1988;39:1–41.

Gopnik A. Three types of early word. First Language 1988;8:49–70.

Hobson, RP. The grounding of symbols: A social-developmental account. In: Mitchell, P.; Riggs, KJ., editors. Children's reasoning and the mind. East Sussex, UK: Hove; 2000. p. 11-35.

Hunt, JMcV. Intelligence and experience. New York: Ronald Press; 1961.

Joseph RM, Tager-Flusberg H. An investigation of attention and affect in children with autism and Down syndrome. Journal of Autism and Developmental Disorders 1997;27:385–396. [PubMed: 9261665]

Kasari C, Freeman SF, Mundy P, Sigman MD. Attention regulation by children with Down syndrome: Coordinated joint attention and social referencing looks. American Journal of Mental Retardation 1995;100:128–136. [PubMed: 8527109]

Kasari C, Freeman S, Paparella T. Joint attention and symbolic play in young children with autism: A randomized controlled intervention study. Journal of Child Psychology and Psychiatry 2006;47:611–620. [PubMed: 16712638]

Landry R, Bryson SE. Impaired disengagement of attention in young children with autism. Journal of Child Psychology and Psychiatry 2004;45:1115–1122. [PubMed: 15257668]

Legerstee M, Bowman TG. The development of responses to people and a toy in infants with Down syndrome. Infant Behavior and Development 1989;12:465–477.

Legerstee M, Weintraub J. The integration of person and object attention in infants with and without Down syndrome. Infant Behavior and Development 1997;20:71–82.

Long, J. Video coding system reference guide. Caroga Lake, NY: James Long Company; 1996.

Lord, C.; Corsello, C. Diagnostic instruments in autistic spectrum disorders. In: Volkmar, F.; Klin, A.; Paul, R., editors. Handbook of autism and pervasive developmental disorders. 3. Vol. 2. New York: Wiley; 2005. p. 730-771.

Lord C, Rutter M, Le Couteur A. Autism diagnostic interview-revised: A revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. Journal of Autism and Developmental Disorders 1994;24:659–685. [PubMed: 7814313]

Moore DG, Oates JM, Hobson RP, Goodwin J. Cognitive and social factors in the development of infants with Down syndrome. Down Syndrome Research and Practice 2002;8:43–52.

Mullen, EM. Mullen scales of early learning: AGS edition. Circle Pines, MN: American Guidance Service; 1995.

Mundy P. Joint attention and social-emotional approach behavior in children with autism. Development and Psychopathology 1995;7:63–82.

Nelson, K. The role of language in infant development. In: Bornstein, MH.; Kessen, W., editors. Psychological development from infancy: Image to intention. Hillsdale, NJ: Erlbaum; 1979. p. 307-337.

Nelson, K. Language in cognitive development: Emergence of the mediated mind. Cambridge: Cambridge University Press; 1996.

Osterling J, Dawson G, Munson J. Early recognition of one year old infants with autism spectrum disorder versus mental retardation: A study of first birthday party home videotapes. Development and Psychopathology 2002;14:239–252. [PubMed: 12030690]

Renninger, KA.; Hidi, S.; Krapp, A., editors. The role of interest in learning and development. Hillsdale, NJ: Erlbaum; 1992.

Romski M, Sevcik R, Adamson LB, Cheslock M, Smith A, Barker RM, Bakeman R. Randomized comparison of augmented and non-augmented language interventions for toddlers with developmental delays and their parents. Journal of Speech, Language, and Hearing Research. (in press).

Silvia, PJ. Exploring the psychology of interest. Oxford: Oxford University Press; 2006.

Slonims V, McConachie H. Analysis of mother-infant interaction in infants with Down syndrome and typically developing infants. American Journal on Mental Retardation 2006;111:273–289. [PubMed: 16792429]

Swettemham J, Baron-Cohen S, Charman T, Cox A, Baird G, Drew A, et al. The frequency and distribution of spontaneous attention shifts between social and nonsocial stimuli in autistic, typically developing, and nonautistic developmentally delayed infants. Journal of Child Psychology and Psychiatry 1998;39:747–753. [PubMed: 9690937]

Toth K, Munson J, Meltzoff AN, Dawson G. Early predictors of communication development in young children with autism spectrum disorder: Joint attention, imitation, and toy play. Journal of Autism and Developmental Disorders 2006;36:993–1005. [PubMed: 16845578]

Vygotsky, LS. Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press; 1978.

Werner, H.; Kaplan, B. Symbol formation. New York: Wiley; 1963.

White RW. Motivation reconsidered: The concept of competence. Psychological Review 1959;66:299–333.

Williams E, Costall A, Reddy V. Children with autism experience problems with both objects and people. Journal of Autism and Developmental Disorders 1999;29:367–378. [PubMed: 10587883]

Williams E, Reddy V, Costall A. Taking a closer look at functional play in children with autism. Journal of Autism and Developmental Disorders 2000;31:67–77. [PubMed: 11439756]

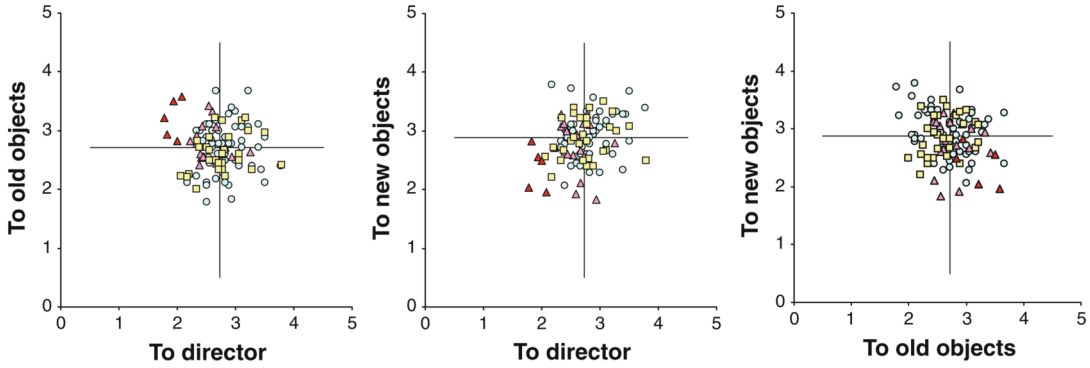

Fig. 1.

Scatterplots for interest to old (familiar) objects by director, interest to new (unfamiliar) objects by director, and interest to new objects by old objects. *Vertical* and *horizontal lines* represent means. *Triangles* represent children with autism (*n* = 23), *squares* represent children with Down syndrome (*n* = 29), and *circles* represent typically developing children (*n* = 56). The *five darker triangles* represent the 5 children with autism who remained low in interest to the director over intermissions; see text

Table 1

Sample demographics at initial visit

Variable	AU	DS	TD
Sample size (*n*)	23	29	56
Number male	21	19	28
Age (months) (SD)	30.8 (4.6)	30.3 (4.9)	18.1 (0.3)
Ethnicity (%)			
European American	83	79	79
African American	0	21	4
Hispanic	13	0	13
Mixed, other	4	0	4
Parent college graduate (%)	65	79	75

AU autism, *DS* Down syndrome, and *TD* typical development group

Table 2

Vocabulary and cognitive level

Variable	AU_{30}	DS_{30}	TD_{18}	χ^2	*p*
CDI	23 (5–165)	22 (9–59)	53 (34–82)	7.0	.030
Visual reception	23 (18–25)	20 (18–25)	21 (20–23)	3.3	.194
Fine motor	22 (19–26)	20 (18–22)	20 (19–21)	5.8	.055
Receptive language	15 (13–27)	14 (13–20)	20 (18–23)	11.2	.004
Expressive language	16 (13–24)	15 (14–17)	18 (17–19)	20.1	< .001
Mullen composite	52 (49–62)	55 (49–63)	107 (98–118)	70.2	< .001

AU autism, *DS* Down syndrome, and *TD* typical development group; subscripts refer to average age (in months) at observation. Scores are medians (with 25th to 75th percentiles in parentheses). Scores in the first row are the median number of words reported by parents on the CDI; in rows 2–5, children's median raw scores on the respective subtests of the Mullen Scales of Early Learning; and in the last row, children's median total composite standard score on the Mullen Scales of Early Learning. Medians and not means are reported because the standardized skew exceeded 3 for the CDI, fine motor, and expressive language scores. For the CDI, $n = 23$, 29, and 56 for AU, DS, and TD groups, respectively; *n*s are the same for the other variables except $n = 21$ for AU. χ^2 is per a Kruskal–Wallis test of group differences, $df = 2$

Table 3

Correlations between ratings of interests

Variable pair	AU_{30}	DS_{30}	TD_{18}
Director-old objects	−.46*	.33	.06
Director-new objects	.15	.19	.20
Old objects-new objects	−.26	.31	−.34**

AU autism, *DS* Down syndrome, and *TD* typical development group; subscripts refer to average age (in months) at observation. n = 23, 29, and 56 for the AU, DS, and TD groups, respectively

* $p < .05$;

** $p < .01$

Table 4

Interests and difference in interests by diagnostic group

Variable	Full sample statistics			*M*s for diagnostic groups			η^2	*p*
	M	*SD*	Range	AU_{30}	DS_{30}	TD_{18}		
Director	2.7	0.39	1.8–3.8	2.4_a	2.8_b	2.8_b	.14	< .001
Old objects	2.7	0.40	1.8–3.7	2.9_a	2.6_b	2.7_{ab}	.05	.080
New objects	2.9	0.40	1.8–3.8	2.7_a	2.9_{ab}	2.9_b	.06	.035
Old objects-director	−0.01	0.57	−1.4–1.6	0.42_a	-0.15_b	-0.12_b	.16	< .001
New objects-director	0.15	0.48	−1.3–1.6	0.24	0.11	0.13	.01	.55
New–old objects	0.16	0.62	−1.6–1.9	-0.18_a	0.25_b	0.24_b	.08	.013

AU Autism, *DS* Down syndrome, and *TD* typical development group; subscripts refer to average age (in months) at observation. For the first two balance variables (rows four and five), positive values indicate stronger interest in the objects than the director. For the last balance variable (row six), positive values indicate stronger interest in the new, unfamiliar objects than the old, familiar ones. n = 23, 29, and 56 for AU, DS, and TD groups, respectively. Means that do not differ significantly per Tukey post hoc test, $p < .05$, share a common subscript. Effect size (η^2) and exact p-value are from a one-way analysis of variance

Table 5

Patterns of interest in the director across intermissions by diagnostic group

Pattern	AU_{30}	DS_{30}	TD_{18}
Rapid decline	11 (48%)	12 (41%)	27 (48%)
Sustained	1 (4%)$_{*}$	5 (17%)	15 (27%)*
Strengthening	6 (26%)	12 (41%)	14 (25%)
Low	5 (22%)**	0 (0%)	0 (0%)$_{**}$

AU autism, *DS* Down syndrome, and *TD* typical development group; subscripts refer to average age (in months) at observation. Scores are number of children exhibiting a pattern (with percentage of group in parentheses). Group percentages may not sum exactly to 100% due to rounding. One and two asterisks indicate cell frequencies significantly below (subscripts) and above (superscripts) their expected values, $p < .05$ and $< .01$, respectively

Table 6

Patterns of increasing interests across visits by diagnostic group

Interest	No. and % increasing			Mean slope			η^2	*p*
	AU	DS	TD	AU	DS	TD		
Director	13 (65%)	19 (68%)	22 (39%)	$.034_a$	$.030_a$	$-.052_b$	.142	< .001
Old objects	7 (35%)	15 (54%)	17 (30%)$_*$	−.028	.019	−.047	.042	.11
New objects	16 (80%)*	18 (64%)*	47 (84%)**	$.11_{ab}$	$.043_a$	$.13_b$	.079	.016

AU autism, *DS* Down syndrome, and *TD* typical development group. n = 20, 28, and 56 for AU, DS, and TD groups, respectively. Scores in the first three columns are number of children whose interest increased across visits (with percentage of group in parentheses); one and two asterisks indicate a number significantly below (subscripts) or above (superscripts) a chance-expected 50%, $p < .05$ and < .01, respectively, per two-tailed sign test. Scores in the next three columns are mean slopes. Means that do not differ significantly per Tukey post hoc test, $p < .05$, share a common subscript. Effect size (η^2) and exact *p*-values are from a one-way analysis of variance