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Two to ten years: Developmental trajectories of joint attention in children with ASD who received targeted social communication interventions

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Abstract

Lay Abstract—This study follows 40 children who were participants in a randomized controlled early intervention trial (Kasari et al., 2006, 2008, 2012) from early childhood (2–5 years of age) to elementary school age (8–10 years). The growth trajectories of social-communication and language outcomes in these children were estimated based on 5 time points during that period. The children were grouped by diagnosis at the last follow-up (Autism, ASD, No Diagnosis) and by their original treatment group assignment (Joint attention, Symbolic Play, Control), and differences between these groups evaluated. Results showed that joint attention skills of coordinated joint looking and showing increased over time and pointing to share interest increased over the first year measured and decreased thereafter. These trajectories were influenced by both original treatment assignment and diagnostic status at the follow-up. In addition, a cross-lagged panel analysis suggests a causal relationship between early pointing and later language development. This study highlights the longitudinal and developmental importance of measures of early core deficits in autism and suggests that both treatment and ASD symptomatology may influence growth in these skills over time.

Scientific Abstract—This study follows 40 children who were participants in a randomized controlled early intervention trial (Kasari et al., 2006, 2008, 2012) from early childhood (2–5 years of age) to elementary school age (8–10 years). To fully utilize the available longitudinal data, the general linear mixed model (GLMM) was the primary analytical approach. The growth trajectories of joint attention skills (pointing, coordinated joint looking and showing) and expressive language outcomes in these children were estimated based on 5 time points during the measurement period. The children were grouped by diagnosis at the last follow-up (Autism, ASD, No Diagnosis) and by their original treatment group assignment (Joint Attention, Symbolic Play, Control), and differences between these groups evaluated. Results showed that joint attention skills of coordinated joint looking and showing increased over time and pointing to share interest increased over the first year measured and decreased thereafter. These trajectories were influenced

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by both original treatment assignment and diagnostic status at the follow-up. In addition, a cross-lagged panel analysis revealed a causal relationship between early pointing and later language development. This study highlights the longitudinal and developmental importance of measures of early core deficits in autism and suggests that both treatment and ASD symptomatology may influence growth in these skills over time.

Keywords

early intervention; social-communication

Children with an autism spectrum disorder (ASD) have early delays and differences in prelinguistic skills that significantly differentiate them from children with other disabilities. For example, joint attention skills of sharing attention with others vis a vis objects or events, showing, and pointing are seriously impaired in children with ASD. The importance of these skills is underscored by their significant associations with spoken language (Charman, 2003; Kasari et al., 2012; Mundy, Sigman & Kasari, 1990). This link has resulted in the targeting of joint attention in early intervention programs. While joint attention has been studied in young children for many years, the trajectories of specific joint attention skills beyond preschool are unknown. Specifically, it is unclear if nonverbal gestures of joint attention should remain important targets of intervention, or whether they become less important as children develop spoken language skills.

Our current knowledge about the developmental trajectories of children with autism largely focuses on measures of intelligence or adaptive functioning. Intelligence improves across early childhood for children with autism and is influenced by factors such as the age the child began early intervention, intensity of services, and autism severity (Harris et al., 1991; Harris & Handleman, 2000). Studies of adaptive functioning show increased social-communication skills, but less change in repetitive behaviors over time (Munson et al., 2008). Stability in autism diagnosis is also well documented across early childhood and into adolescence (McGovern & Sigman, 2005; Robinson et al., 2011; Fecteau et al., 2003). There is little information about the developmental trajectory of early core deficits in autism, such as joint attention.

When joint attention is examined in a longitudinal framework, it is often in the context of how early joint attention influences later development. In a recent study, Kasari and colleagues (2012) found that, along with chronological age, play level, and treatment assignment, preschooler's initiations of joint attention predicted expressive language five years later. In addition, Gillespie-Lynch et al. (2012) found that responding to joint attention and language in childhood predicted social functioning in adulthood. These studies suggest that early joint attention skills are important to concurrent and subsequent development in related domains, but we know very little about the casual relationship, if any, that early joint attention has with later development.

A study examining the emergence of specific joint attention and requesting gestures during early childhood found that sequence and timing of skill emergence differed in children with ASD and typical children who were matched on expressive language ages (Paparella et al., 2011). Joint attention emerged in a different order in children with autism compared to typical children, while requesting developed in a similar order, but with delayed onset. Carpenter, Pennington and Rogers (2002) reported similar findings. Still, studies have not explored the developmental course of these behaviors in children with ASD.

Additional information can be gathered from the infant-sibling literature examining the early development of children who are at a higher risk for developing the disorder. Yoder and colleagues (2009) characterized the emergence of social-communication in children 15–34 months of age using a developmental trajectories framework and found that initial levels of responding to joint attention and the rate of growth in a weighed social-communication variable both predicted the degree of social impairment at the final time point. Later diagnosis of ASD was also related. This study utilized a longitudinal cross-sectional design in the youngest children at-risk for the disorder. Experimental research designs are needed to extend these findings and explicitly study the emergence of these skills in children with a known diagnosis past the early infancy and toddler period.

To expand our understanding of the development of joint attention beyond early childhood, this paper followed a sample of children across roughly six years of development, from preschool (2–5 years of age) to elementary school (8–10 years). These children were participants in a randomized controlled early intervention trial that found that children who received either a joint attention or a symbolic play intervention yielded higher scores in joint attention and play (Kasari et al., 2006) and had greater expressive language outcomes one year (Kasari et al., 2008) and four years later (Kasari et al., 2012).

The current study examines the growth trajectories of specific joint attention gestures (pointing, showing, coordinated joint looking), and expressive language over roughly a 6-year time period. We are expressly interested in the developmental course of prelinquistic gestures and the relationship between these early gestures and later language. We hypothesize that joint attention skills change over time, such that some skills are universal and increase throughout development, while others increase during distinct developmental periods and diminish later. We also hypothesize that specific joint attention skills, such as pointing and showing, are uniquely and casually related with later language outcomes due to the strong association between the two constructs in previous studies (e.g. Kasari et al., 2012). In addition, the relationship of these trajectories with treatment assignment in the original RCT (Joint Attention Group (JA), Symbolic Play Group (SP), and Control Group (CO)) is explored to better understand the relationship between targeted treatments and later developmental outcomes. We hypothesize that participation in a treatment focused on early prelinquistic gestures has long-term effects, changing trajectories of joint attention over the time period. Finally, diagnostic outcomes (Autism, ASD, No diagnosis) are utilized to retrospectively examine the typicality of joint attention gesturing and language by diagnostic group. We hypothesize that the pattern of change is different for children who continue to meet criteria for an ASD compared to those children who lose their diagnostic status over time. This study has important consequences for early intervention efforts and longitudinal measurement of outcomes in young children with ASD.

Methods

Participants

Forty children were evaluated as part of a longitudinal follow up of an early intervention treatment study for children with ASD. The original randomized controlled trial (RCT) consisted of 58 participants whose demographic and developmental characteristics are available in previous publications (Kasari et al., 2006, 2008, 2012). The present sample of 40 children consists of mostly males (82%) with an average age of 8.8 years (SD= .6 years). The sample was 69% Caucasian, 13% Asian, 3% Hispanic, 3% African American, and 15% mixed ethnicity. The mothers of these children were on average 42 years old (SD= 4.9 years) at follow-up and highly educated with a mean of 16.9 years (SD=2.5 years) of education. See Table 1.

All children were diagnosed with ASD at study-entry using the ADOS and ADI-R. The ADOS was re-administered by examiners blind to group status at the final measurement point in order to establish diagnostic classification at school age. Due to the different developmental and language abilities of the children, 8 children received Module 1 of the ADOS, 5 children received Module 2, and the remaining 27 received Module 3. At school age (between 8 years and 11 years) twenty-seven of the children met criteria for Autism, 5 for Autism Spectrum Disorder (ASD), and 8 children did not meet criteria for autism or ASD anymore. See Table 2.

Procedures

Families of children who participated in the original RCT were contacted via their preferred method (e.g. phone or mail) to participate in follow-up assessments at 6 months, 12 months, and 5 years after start of treatment. Therefore, we had a maximum of five possible data points on each subject (Entry to Treatment, Exit from Treatment, 6 month follow-up, 12 month follow-up and 5 year follow-up). All children in the original RCT attended the same clinic-based early intervention program (EIP) consisting of 30 hours of ABA treatment per week. At the time of their admission to EIP, children were randomized to one of three experimental treatment conditions: Joint Attention intervention (JA), Symbolic Play intervention (SP), or the control condition (CO; only content of the ABA program). At the follow-up time points, families were asked to visit the laboratory for a series of assessments delivered on two separate days. Each visit lasted roughly 2 hours. Parking was paid and a small gift was given to families participating in the follow-up assessments

Assessments

Testers who were blind to group status and who were not part of the original RCT study administered all assessments. Diagnostic assessments were conducted at the first (entry into the treatment study) and last (5 year follow-up) time point. Measures of language and joint attention were repeatedly administered at each time point. For all instruments, the coders were trained to a minimum reliability of .80.

Joint Attention Assessment—Several joint attention variables were derived from two developmentally appropriate measures: the ESCS (Seibert, Hogan, & Mundy, 1982) for preschoolers, and an adaption of the ESCS for older children (JAMES, Jahromi et al., 2009). All children received the ESCS in the first several measurement periods and then each received the JAMES at the last follow-up, when children were no longer preschoolers. The measures are semi-structured behavioral measures videotaped and later scored by raters blind to treatment status.

The coding of the joint attention behaviors was consistent with the variables reported in earlier papers (Kasari et al., 2006; Kasari et al., 2008), and included the frequency of initiated joint attention (JA) skills, including coordinated looking, distal and proximal pointing, and showing. A rate per minute was calculated for each skill in order to control for the potential influence of varying assessment lengths.

Expressive Language Assessment—The Expressive Vocabulary Test (EVT; Williams, 1997) is a standardized assessment of expressive vocabulary for children and adults aged 2 years, 6 months to 90 years. The measure was administered at the follow-up.

Statistical Approach and Results

To fully utilize the available longitudinal data we chose the general linear mixed model (GLMM) as our primary analytical approach. This framework allowed for modeling of each individual's change over time without requiring that every participant was measured at the same timepoints. This is especially important in this context as children started the program at different chronological ages and at a developmental stage where large changes in a short time span are common. To account for this, the estimated trajectories are modeled as functions of the real age in years of the participant with available data covering a wide range of ages – from two to ten years. To account for individual differences the model included a random intercept term modeling baseline differences between the participants. The GLMM estimates were generated running SPSS Version 22 on an IBM compatible computer. The GLMM approach requires the function that describes the overall trajectory to be specified beforehand, so graphs of the individual and aggregate empirical trajectories were used to guide the modeling process. Based on the graphs of the individual and aggregate empirical trajectories, quadratic change over time was considered to account for the overall curvature, but in all cases the likelihood ratio test of nested models showed that the linear model fit the data equally well; accordingly, results are presented with the linear model.

The growth trajectories of each variable of interest were estimated across the chronological ages covering between 2 years, 9 months and 10 years, 1 month. In addition, the children were grouped by diagnosis at the last follow-up (Autism, ASD, No Diagnosis (No-Dx) and by their original treatment group assignment (Joint Attention (JA), Symbolic Play (SP), Control (CO)). The main contrast of interest was the differences in the trajectories over age (age x group interaction). If the trajectories by diagnostic group were not significantly different, the group main effect was also reported, as the overall level of difference between the treatment groups is not meaningful in this randomized design.

The structural richness of the data allowed for, in addition to modeling the individual trajectories of the different observed variables, the use of causal modeling to establish the directionality of how variables influenced each other. A primary question was if early pointing (a variable where we saw early increases but that converged to very low use for all participants) was in a causal relationship with later expressive language (the variable that showed the largest spread at the follow-up time period). To establish that the relationship between early pointing and later expressive language is not just correlational, but causal, a cross-lagged panel model for the relationship between the observed scores at baseline and the final follow-up occasion was utilized (Kenny, 1979).

Joint Attention Skills—The overall trajectories of the joint attention skills of coordinated joint looking (CJL), showing, and pointing to share were modeled over the entire age range. Two of the three skills, CJLs and showing, each displayed a positive growth trajectory, (F(1,220)=46.6, p<.01; (F(1,234)=36.5, p<.01. In contrast, the joint attention skill of pointing to share *decreased* over time (F(1,221)=17.1, p<.01). See Figure 1.

Next each joint attention skill was modeled according to the participant's assignment in the original RCT (JA, SP, CO conditions). Both the skills of CJL and showing displayed differential trajectories by treatment, (F(2,218)=5.8, p<.01); (F(2,231)=10.6, p<.01) driven, in both cases, by the JA group having a significantly faster growth rate than the CO group (t(218)=3.1, p<.01; (t(232)=4.5, p<.01) and the SP group (t(219)=2.66, p<.01; (t(233)=2.74, p<.01), respectively. The CO group and the SP group were not significantly different from each other for either of the two skills, CJL or showing, respectively (t(217)=0.22, p=.83); (t(128)=1.44, p=.15). The growth rate of pointing to share was not influenced by treatment group (F(2,233)=0.1, p=.90). See Figure 2.

Next each participant's use of joint attention was modeled according to their diagnostic status at the follow-up (Autism, ASD, No-DX). The same two skills showed differentiated trajectories by diagnosis; CJL, (F(2,157)=20.6, p<.01), and showing, (F(2,163)=28.14, p<.01). For CJL, the difference by diagnostic group was based on the No-Dx group having a significantly steeper growth in CJLs than the autism group (t(161)=6.24, p<.01). The No-Dx group also had a significantly steeper slope than the ASD group (t(158)=2.2, p=.03), and the ASD group had a higher slope than the autism group (t(157)=2.50, p=.01). For showing, this difference was driven by the No-Dx group having a significantly faster growth in showing than either the autism group (t(163)=8.5, p<.01) or the ASD group (t(163)=4.329, p<.01). There was no statistically significant difference between the ASD and autism groups (t(163)=1.81, p=.07). For pointing there was no significant effect of diagnosis on the trajectory over age (F(2,160)=2.45, p=.09).

Expressive Language—Adjusted expressive language standard scores showed significant overall change during the study period, (F(1,163)=520.11, p<.01) and there were significant changes in the developmental trajectories of expressive language growth when grouped by both treatment (F(2,162)=3.58, p=.03) and diagnostic (F(2,125)=19.15, p<.01) groupings. When examined by treatment group, this difference was driven by the CO group having a slower rate of growth than the JA group (t(163)=2.67, p<.01), while there were no significant differences between the CO group and the SP group (t(163)=1.4, p=.14) or between the JA and the SP group (t(160)=1.3, p=.19). Regarding diagnostics, this difference was driven by the No-Dx group and the ASD group both showing faster expressive language growth than the autism group (t(120)=5.1, p<.01 and t(118)=4.3, p<.01, respectively), while

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the ASD group and the No-Dx group were not significantly different from each other ($t(127)=0.2$, $p=.83$).

Causal Analysis—A cross- lagged panel analysis was used to test the association between early joint attention skills and later expressive language. Using the Steiger (1980) tests for comparing elements of a correlation matrix formula, there was a significant difference between the cross lagged path from pointing to share to expressive language, compared to the cross lagged path from expressive language to pointing ($z=2.5$, $p<.01$), establishing both association and precedence and thus strongly supporting a causal interpretation of the relationship between early pointing and later expressive language.

A casual relationship was not supported for either of the early skills of showing or CJLs and later expressive language ($z=0.7$, $p=.22$; $z=0.5$, $p=.59$). CJLs appeared to be moderately associated with expressive language, both early and later in development ($r=.226$ and $r=.295$, respectively) and showing and expressive language were strongly correlated at the follow-up ($r=.501$).

Discussion

This study examined the growth of several joint attention skills across early childhood in a group of children with ASD who participated in an early intervention RCT and a series of longitudinal follow-up visits. Using a growth trajectory framework, children's skills were measured across a six-year period and potential influences of developmental change (diagnostic status and treatment assignment) were explored. Several key findings are noted.

First, by exploring the developmental trajectories of specific joint attention skills, one can begin to better understand the natural course of these behaviors in children with ASD. Specifically, showing (holding an object of interest up for someone else to view) and coordinated joint looking (alternating gaze from an object of interest to another person and back to the object) both steadily increased in their use over time, while pointing to share interest with others increased over the preschool years (3 to 5 years of age) and declined in its use thereafter. These findings on the developmental progression of joint attention are particularly informative given the rigorous methodology and longitudinal nature of the dataset and encourage one to consider timing and development as important aspects when intervening on joint attention.

A particularly compelling case for this comes from the finding regarding pointing to share attention, which displayed a dramatic decrease in use after the preschool years. Support for this progression is taken from the study of language acquisition in children with typical development, which demonstrates that as young children begin to acquire increasingly sophisticated ways to communicate (i.e., spoken language) their need for explicit gesturing decreases (e.g. Werner and Kaplan, 1963). The same developmental re-prioritization in typical development also appears true in this sample of children with ASD and may explain the decreased use of the gesture over time.

Another striking finding related to early pointing was its association with later expressive language. Despite the documented decrease in its use over time, study results reveal its critical importance in the preschool years to the development of later expressive language; in fact the data suggests that the children with ASD who pointed the most frequently in preschool years had higher levels of expressive language at the follow-up. The cross -lagged panel analysis allowed us to test this association and to consider the potential of early pointing as a causal mechanism for future language development in children with ASD. This finding illustrates the critical importance of intervention targeting specific joint attention skills early in a child's development.

These findings are particularly relevant when considering developmentally appropriate outcomes and treatment targets for children with autism. Understanding the natural course of the gesture over time may lend itself to a discussion of *when* to intervene on a particular joint attention skill. The data in the current study suggests that focusing on pointing to share in early childhood (when children are preverbal) is of particular importance but once children begin to use spoken language, focusing on pointing may be less important. It remains unclear if focusing on pointing gestures (or gestures in general) remains important to the developmental course of language development for children who remain minimally verbal past the preschool years.

Another finding that supports the critical need for an emphasis on joint attention in early intervention was exemplified when the trajectory of each skill was explored by the child's original treatment assignment. While, on average, all children increased in the use of showing and CJLs, those children randomized to the JA treatment condition showed the fastest growth compared to children in either the SP or CO conditions. This finding replicates the finding previously reported that children in the JA group had more joint attention at the exit to treatment and the 1 year follow-up (Kasari et al., 2008), but extends this finding to five years after treatment. It also suggests that participation in the JA treatment set these children on a "different" developmental trajectory comprised of accelerated growth in these core deficit areas. While the exact mechanism of change is unknown, one could hypothesize that a treatment focused on early forms of gestural social-communication has the potential to enhance the development of social motivation and, in turn, later social cognition (Mundy & Newell, 2007). This brings to light the very important reality that *what* you target and *when* you intervene are both critically important for the long term outcomes of children with ASD.

This "different" trajectory may also have important implications regarding overall symptomatology. In the current study, similarly to children who received the JA treatment, children who no longer met criteria for an ASD at the follow-up displayed a faster growth trajectory in both showing and CJLs compared to children who continued to meet criteria for the disorder. While not surprising that joint attention, a core feature in the diagnosis, would be more prevalent in children who no longer meet criteria for the disorder, this finding adds support for the typicality of the increase in the use of these specific joint attention skills across preschool and elementary years. Future studies are warranted to examine the relationship between early joint attention interventions and overall changes in diagnostic status. The current sample size was too small to formally test this, although there was a tendency for children in the JA group (36%) to lose their diagnosis.

Several limitations are also noted, including the small sample (N=5) of children who received a diagnosis of ASD at the follow-up and the use of the ADOS classifications only to determine diagnostic outcomes at the follow-up. Future work should examine diagnostic outcome using multiple measures including ADOS scores, parent interview, and clinician's best estimate. In addition, calibrated severity scores may also lend new information about symptomatology and its relation to joint attention and language over time. Future studies may also want to include a comparative sample of children with typical development to better understand the longitudinal nature of these constructs.

This study highlights the patterns of growth in the core deficit domain of joint attention in autism. With increasing emphasis on early intervention, it is exceedingly important to understand how these treatment targets may change and be reprioritized with development. This study suggests that a decrease in some joint attention skills, such as pointing to share interest, and an increase in other joint attention skills may simultaneously be indicative of positive, and increasingly "normative" developmental outcomes in children with ASD.

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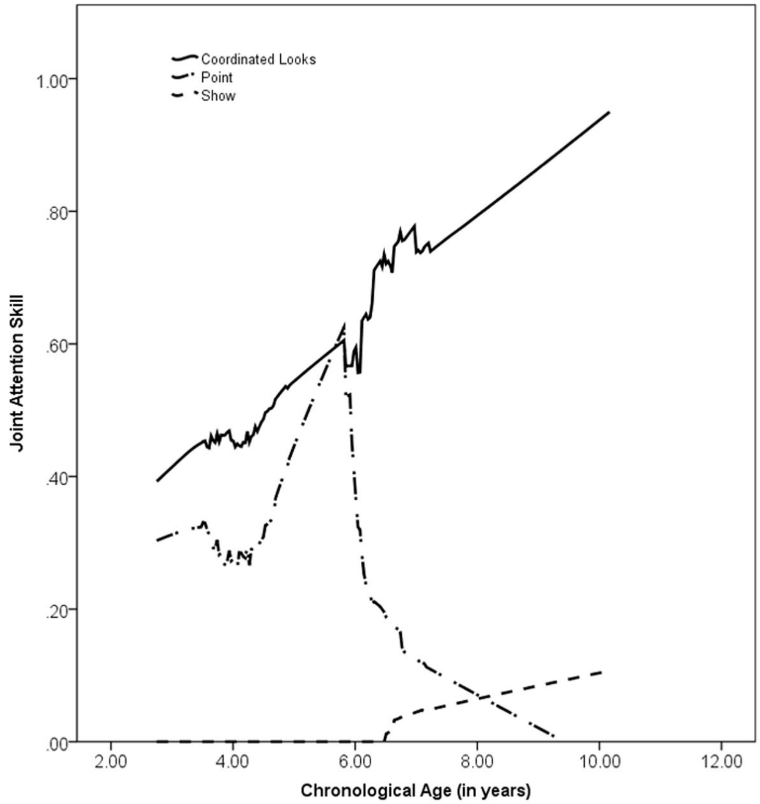

Figure 1.
Overall trajectories of coordinated joint look, point, and show

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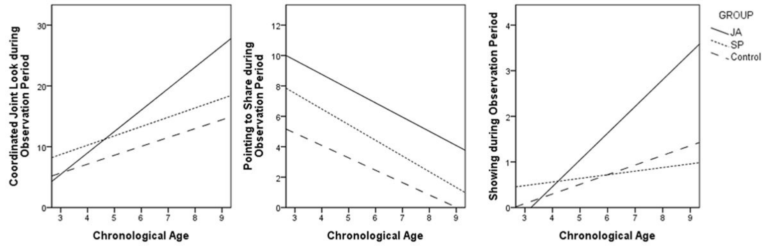

Figure 2.

Trajectories of joint attention skills by treatment grouping

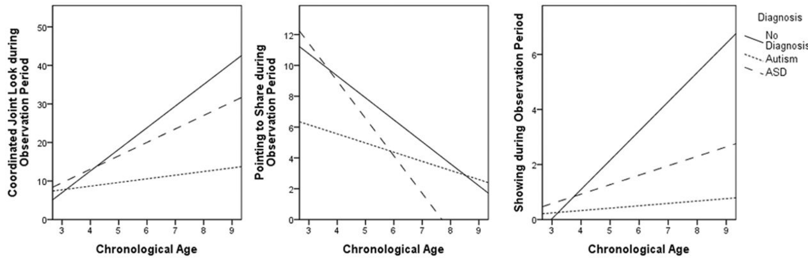

Figure 3.
Trajectories of joint attention skills by diagnostic grouping

Table 1

Participant Demographics

	Overall	Treatment Groups					Diagnostic Groups				
		JA	SP	CO			No DX	Autism	ASD		
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*	*F*	*p*	*M (SD)*	*M (SD)*	*M (SD)*	*F*	*p*
CA (baseline)	3.55 (.53)	3.6 (.59)	3.55 (.58)	3.49 (.41)	0.18	0.84	3.48 (.34)	3.68 (.64)	3.22 (.29)	1.58	0.22
CA (5-year follow-up)	8.84 (.63)	8.92 (.66)	8.8 (.73)	8.79 (.63)	0.18	0.84	8.72 (.39)	8.94 (.71)	8.53 (.24)	1.08	0.351
DQ (baseline)	56.08 (18.56)	56.65 (15.93)	58.9 (18.2)	51.98 (21.83)	0.66	0.52	59.57 (7.43)	50.02 (14.6)	75.3 (16.04)	7.5	<.01
DQ (5-year follow-up)	90.44 (18.51)	93.46 (22.31)	87.73 (17.96)	89.25 (13.13)	0.29	0.75	101.5 (15.74)	80.79 (12.79)	109.4 (18.11)	10.8	<.01
Maternal age (5-year follow-up)	42 (4.9)	41.8 (44)	43.1 (5.6)	40.5 (5.2)	0.85	44	38.6 (3.7)	42.3 (4.9)	45.3 (5.8)	3.17	0.05
Maternal Education	16.9 (2.5)	17.5 (2.2)	16.7 (2.8)	16 (2.3)	1.09	0.35	17 (2.6)	17 (2.3)	16.4 (3.6)	0.1	0.89
Ethnicity					6.2	0.62				5.7	0.68
Hispanic	1	0	0	1			0	1	0		
Caucasian	27	12	9	6			6	16	5		
AA	1	0	1	0			0	1	0		
Asian	5	1	2	2			1	4	0		
Mixed	6	2	2	2			1	5	0		

Table 2

Diagnostic Group by Treatment

	Treatment Group			
Diagnostic Group	**JA**	**SP**	**CO**	**Overall**
Non-Spectrum	5 (36%)	1 (7%)	2 (18%)	8 (20%)
Autism	8 (57%)	11 (79%)	7 (64%)	27 (67%)
ASD	1 (7%)	2 (14%)	2 (18%)	5 (13%)

Table 3

Within-subject parameters for joint attention skills (per minute) over time (age in years)

	Coordinated Looks		Pointing		Showing	
	Intercept	Slope	Intercept	Slope	Intercept	Slope
β	0	0.13	0.68	−0.06	−0.05	0.02
SE	0.11	0.02	0.08	0.01	0.01	0

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Table 4

Joint attention skills over time (age in years) by treatment group

	JA		SP		CO	
	Intercept	Slope	Intercept	Slope	Intercept	Slope
Joint Attention Skills	**β (SE)**	**β (SE)**	**β (SE)**	**β (SE)**	**β (SE)**	**β (SE)**
Coordinated Looks	−0.42 (0.27)	0.22 (0.05)	0.40 (0.27)	0.08 (0.05)	0.03 (0.20)	0.09 (0.20)
Pointing	0.83 (0.21)	−0.07 (0.04)	0.72 (0.21)	−0.07 (0.04)	0.47 (0.15)	−0.05 (0.15)
Showing	−0.13 (0.04)	0.04 (0.01)	0.02 (0.04)	0.00 (0.01)	−0.05 (0.03)	0.01 (0.03)

Table 5

Joint attention skills (per minute) over time (age in years) by diagnostic group

	No Dx		Autism		ASD	
	Intercept	**Slope**	**Intercept**	**Slope**	**Intercept**	**Slope**
Joint Attention Skills	**β (SE)**	**β (SE)**	**β (SE)**	**β (SE)**	**β (SE)**	**β (SE)**
Coordinated Looks	−0.89 (0.44)	0.39 (0.08)	0.34 (0.37)	0.06 (0.06)	−0.08 (0.34)	0.22 (0.34)
Pointing	0.98 (0.33)	−0.10 (0.06)	0.56 (0.28)	−0.04 (0.05)	1.14 (0.26)	−0.14 (0.26)
Showing	−0.26 (0.06)	0.07 (0.01)	0.00 (0.05)	0.01 (0.01)	−0.05 (0.05)	0.02 (0.05)

Table 6

Expressive language over time (age in years) by diagnostic and treatment groups

	Overall	Treatment Group			Diagnostic Group		
		JA	SP	CO	No Dx	Autism	ASD
	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)
Intercept	−14.97 (2.80)	−19.77 (6.95)	−13.14 (6.94)	−10.44 (5.22)	−21.75 (10.82)	14.02 (1.63)	−20.38 (8.67)
Slope	10.16 (.44)	11.42 (1.10)	10.07 (1.11)	8.49 (5.22)	14.02 (1.63)	−10.62 (9.38)	14.38 (8.67)