

**Comparison of the Behavioural Development of Infants at Low and High-Risk for  
Autism Spectrum Disorders**

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### **Abstract**

By identifying early signs of Autism Spectrum Disorder, early intervention or parent training could be implemented and assist in increasing the developmental trajectory for these infants. This cross sectional study used the Parent Observation of Early Markers Scale (POEMS) to identify early signs of ASD in 69 high-risk (older sibling diagnosed with ASD) and 69 matched low-risk infants' families (no family history of ASD) between 6 and 36 months of age. The preliminary results showed the high-risk children had significantly more elevated POEMS items than the low-risk children at 12, 18, 24, 30 and 36 months of age. The results suggest that at-risk infants may show signs of ASD as early as 12 months of age, and that the POEMS could be used to guide early intervention or parent training for children 12 months or older.

## Introduction

### Autism Spectrum Disorders

In 1943 Leo Kanner coined the term “autism” to describe the triad of behaviours seen together in a number of his young patients. This triad, which includes social interaction challenges, communication challenges and stereotyped behaviours and/or repetitive interests has since that time, been used in the diagnosis of Autism Spectrum Disorders (Sue, Sue, & Sue, 2003). Autism Spectrum Disorder (ASD) is a continuum that encompasses five disorders including Autistic Disorder (Autism), Asperger’s Disorder, Pervasive Developmental Disorder Not Otherwise Specified, Rett’s Syndrome and Childhood Disintegrative Disorder (DSM-IV, American Psychiatric Association, 2000). Children with ASD tend to display impairments in social interaction by showing a lack of interest and engagement with others. They have also been reported to have poor social skills and lack the ability to take the perspectives of others (Perry, Dunlap, & Black, 2007). Unlike typically developing children, a child diagnosed with ASD may not seek the comfort of a parent when upset or distraught. Communication deficits are the second part of the triad of behavioural effects of this disorder. A child with ASD may not be able to use gestures or meaningful speech and instead may engage in echolalia (repeating words/phrases previously heard, but typically out of context) (Perry et al., 2007; Sue et al., 2003). Repetitive interests and stereotyped behaviours are the third part of the triad. Children with ASD tend to engage in repetitive behaviours of some form such as spinning objects, twirling around, hand flapping, rocking or staring out of the corner of their eye. They have also been reported to be difficult to engage and appear to be preoccupied with their own actions (Sue et al., 2003).

## **Genetic Risk**

Autistic Disorder (Autism) has been reported to affect as many as 22 per 10,000 and for Pervasive Developmental Disorder as many as 70 per 10,000 (Saracino, Noseworthy, Steinman, Reisinger, & Fombonne, 2010). Rutter, Silberg, O'Connor and Simonoff (1999) reviewed a number of quantitative and molecular genetic studies on ASD. These researchers determined that there is a strong clustering of ASD among families. Rutter et al. (1999) determined there is a 60-100 % higher chance of siblings of individuals with ASD to be diagnosed compared to the rest of the population. They also identified that there is a 90% liability of ASD among identical twins whereas only 5% for fraternal twins. As a result, siblings of children with ASD appear to have a strong genetic predisposition for this disorder. Hallmayer et al. (2011) reported that environmental factors during prenatal stages were found to hold a strong liability to the disorder. Hallmayer et al. (2011) continued to note that there is a strong genetic predisposition for ASD among fraternal twins (31-36% for 45 males and 13 female pairs) and identical twins (77% for 45 male pairs and 50% for 9 female pairs). Gould and Gottesman (2006) reviewed endophenotypes and stated that the relationship between genes and behaviour are not perfect and combinations of different genes can result in different behaviours (abnormal or normal). This finding suggests that siblings of children with ASD may still express or exhibit certain behaviours associated with the disorder as they are carriers of the gene. Schwichtenberg, Young, Sigman, Hutman and Ozonoff (2010) studied families who have different risk factors (i.e., number of affected siblings and degrees of quantitative autistic traits in all family members). They concluded that the infants were more at-risk based on their gender, family risk group, quantitative autistic traits and sibling quantitative autistic traits than the rest of the population. They found that having an older sibling diagnosed with ASD was the greatest risk to the infant whereas having social and communication

features in their relatives were not. They also noted that infants who came from families with many siblings with ASD were more at-risk than those who came from a family with one older sibling with ASD.

### **Gender**

Rivet and Matson (2011) reviewed the past research on ASD and gender differences. They stated very little research has been conducted to compare the symptoms of ASD between males and females. In their literature review, Rivet and Matson summarized the findings of three studies and reported no significant difference was found between males and females with ASD (Hus, Pickles, Cook, Risi, & Lord, 2007; Pilowsky, Yirmiya, Shulman, & Dover, 1998; Volkmar, Szatmari, & Sparrow, 1993). Other studies, however, claimed females with ASD were more delayed in their social and communication domains and in abnormal motor movements (Carter, Black, Tewani, Connolly, Kadlec, & Tager-Flusberg, 2007; Tsai & Beisler, 1983). In one toddler study they reviewed, females were reported to have greater impairments in social domains but not in communication (Alison et al., 2008). The researchers concluded that there is a lack of research done in this area and is in need of further pursuit.

### **Early Screening of Autism Spectrum Disorder**

Even though parents may identify concerns with their child's development at an early age, parents often have to wait for their child to be assessed by professionals before receiving services (Bryson, Rogers, & Fombonne, 2003). Due to the increase in numbers of children with an ASD disorder, a child may wait until the age of four or five before being diagnosed (Landa & Garrette-Mayer, 2006; Ventola et al., 2006). Once they are diagnosed, their name is often put on a waitlist for services (e.g. Intensive Behavioural Intervention) in their community; within Ontario, the

waitlist can be quite long until families receive services. This process is often frustrating and stressful for the family and can be seen as lost time for the best years of early intervention.

Parents have been reported to be accurate in identifying concerns with their child's development (Feldman et al., 2011; Palomo et al., 2008). Glascoe et al. (2007) found that parental reports could be used to accurately screen children for signs of ASD. Researchers have concluded parental concerns were accurate in predicting a diagnosis of ASD in infants at 12 months old (Feldman et al., 2011; Ozonoff et al., 2009)

Many screening tools are parent questionnaires in which parents identify areas of concern with their child's development (Early Screening of Autistic Traits Questionnaire: Deitz, Swinkels, van Daalen, van Engeland, & Buitelaar, 2006, Checklist for Autism in Toddlers: Baird et al., 2000, Modified-Checklist for Autism in Toddlers: Robins, Fein, Barton, & Green, 2001a). In 2001, Ward and Feldman created an early autism assessment tool completed by parents to identify specific behavioural excesses or deficits in their child which may be associated with early signs of ASD and which many be ameliorable by intervention. Their tool, the Parent Observation of Early Markers Scale (POEMS) allows parents to rate a range of behaviours they may observe in their child between the ages of 1 to 36 months. By completing the POEMS, parents are able to identify specific target behaviour deficits or excesses in their infant for which they may want to intervene to prevent or reduce early signs of ASD. Feldman et al. (2011) conducted a study to assess the validity of the tool in identifying children at-risk for ASD who would later go on to receive a diagnosis of ASD. The tool was reported to have good internal consistency, test retest reliability and construct and predictive validity. The POEMS successfully differentiated, as early as 9 months of age, at-risk infants who were diagnosed with ASD at 3-

years of age from at-risk infants who were not diagnosed. Thus, the POEMS has been found to be a reliable and valid early screening tool for children at-risk for ASD.

## **Literature Review**

### **Retrospective Studies on Early Signs of ASD**

Retrospective studies examine the early signs of ASD by analyzing home videos or by using parental reports. The downfall with retrospective parent report is that parents may have a difficult time accurately recalling their observations from the past. Zwaigenbaum et al. (2007) also noted a limitation to retrospective studies related to parents not being aware of “subtle social and communicative differences that characterize young children with autism”; this is in contrast to the heightened awareness level of trained professionals in prospective studies of ASD. Zwaigenbaum et al. (2007) went on to also indicate that parents may be biased in their reports as they may be more in tune with the behaviours associated with the diagnosis their child has been given. Home videos decrease these limitations as the researchers are able to objectively rate the child’s behaviour. However, Zwaigenbaum et al. (2007) also notes that family home videos are generally collected to save memories of the family and as a result the quality, activities and duration the child is present may be limited. Parents may also record over videos made when their child did not behave as they would like to remember (e.g. engaging in a tantrum at a birthday party or engaging in repetitive behaviour and not engaging the camera).

Oslerling and Dawson (1994) compared home videos of children who were later diagnosed with ASD to a control group of children to distinguish the early behavioural signs of autism. Twenty-two children (11 at-risk and 11 control) were recruited from the Autism Research Program or the infant subject pool at the University of Washington. The videotapes were coded by an interval coding system where the developmental pediatrician, blind to the group

membership of the infant, was to record social, affective, joint attention and communicative behaviours as well as specific autistic-like behaviours such as self stimulatory behaviours, not responding to name or blunt affect. The videotapes varied from 3 to 29 minutes although an average score was given for each of the behaviours in relation to the duration. Osterling and Dawson (1994) determined social and joint attention categories showed strong differences between the two groups and children with ASD engaged in more “autistic symptoms”.

Werner, Dawson, Osterling and Dinno (2000) aimed to identify early signs of autism in infants less than 1 year of age. The researchers expanded on the research conducted by Osterling and Dawson (1994) by examining the videotapes from this study while also adding 8 additional videotapes. The family videotapes of 15 children later diagnosed with ASD and 15 identified as typically developing, while the infants were between the ages of 8-10 months of age, were compared. The researchers viewed 8-23 minute sections of the videotapes and completed behavioural coding (based on social, communication and repetitive behaviours) for 1 second durations. Werner et al. (2000) determined that infants who were later diagnosed with ASD spectrum disorder were reliably detected by 8-10 months of age. The researchers also noted that responding to name and smiling while looking at others was significantly less in infants later diagnosed with ASD.

Wimpory, Hobson, Williams and Nash (2000) conducted a study of retrospective parental reports. Ten children with ASD and ten children without a diagnosis of ASD were matched and parental reports on a semi-structured interview, the Detection of Autism by Infant Sociability Interview (DAISI: Wimpory, Hobson, Williams, & Nash, 2000) were compared. The children at the time of the study were approximately 40 months in age and parents were asked to record their development at 24 months. Diagnoses (through the use of the Childhood Autism Rating Scale:

Schopler, Reichler, & Renner, 1986) were determined after the interviews were conducted.

Wimpory et al. (2000) concluded that the children who had a diagnosis of ASD and the children who did not have a diagnosis varied on 15 items on the DAISI. The differences were classified based on person to person communicative expressions (e.g. waving, raising arms to be picked up, eye contact, socially directed feelings, turn taking, using noises communicatively, sociability in play and lap games) and person to person to object relations (e.g. referential use of eye contact, offering and giving items to others, pointing and following others pointing).

Watson et al. (2007) evaluated the effectiveness of the First Year Inventory (FYI) scale which is a parent questionnaire to screen children 12 months of age for behaviour associated with autism. Three groups of children were screened (38 with a diagnosis of ASD, 15 with a developmental disorder not on the spectrum and 30 who were identified as typically developing). Parents were asked to complete the Ages and Stages Questionnaire (ASQ: Bricker and Squires, 1999) for the participants 5 yrs or younger, those with an ASD diagnosis were asked to show the paper work to provide confirmation of the diagnosis and rating 11 or greater on the Social Communication Questionnaire (SCQ: Rutter, Bailey, & Lord, 2003) and those with the DD diagnosis had to confirm the diagnosis through the necessary paper work, rating less than 11 on the SCQ and fail one section of the ASQ. Parents were asked to complete the FYI retrospectively which was later compared to normative sample of over 1300 participants. The retrospective results allowed the researchers to conclude the questionnaire was sensitive to group differences and was able to distinguish the participants who were diagnosed with ASD. Watson et al. (2007) indicated that high-risk ratings on social orienting, receptive communication and social affective engagement were not as common among the DD group as it was among the ASD group.

Palomo, Belinchon and Ozonoff (2006) conducted a meta-analysis review of eight retrospective articles identified by PubMed and PsychINFO (involving 289 children). Articles were excluded based on variables such as small sample size, lumping ASD and Pervasive Developmental Disorder Not Otherwise Specified (PDDNOS) groups together, limited comparison groups and weak behaviour coding system. The focus of this study was extract the early signs of ASD within the articles examined. The research concluded that there were noticeable differences between children with ASD and typically developing groups of children and children with intellectual disabilities. They also stated that most of the behaviour differences were apparent at the first year. The differences included response to name, reduced frequency of eye contact or looking at others faces, sharing experiences, interests or attention with others such as pointing and interacting, smiling at others, looking at what others are holding, alternating gaze or joint attention, using verbal communication and increased frequency of unusual postures. Palomo et al. (2006) stated that children with ASD were found to show early signs of ASD by 8-12 months of age.

Saint- Georges et al. (2010) conducted a meta analysis of the past research involving review of home videos. Eighteen studies were reviewed in their analysis with a total of 317 videos. The authors examined the early signs of ASD by differentiating the signs at the first year or earlier and the signs in the second year of life. The researchers reported that by the first year of life, there were signs in all developmental domains of an ASD diagnosis (social, communication, showing shared attention and affect). Other behaviours identified as markers within the first year of life included rigid and repetitive object playing, unusual posturing, less gesturing, less looking at objects held by others, visual fixation and less affective expression. They also reported that responding to name, looking at others and quality of affect were less consistently reported. In the

second year of life, the researchers reported continued poor social interaction, decreased quality of eye contact, less imitation, gaze aversion and less communication gestures than the children with developmental disabilities. The researchers reported that there appeared to be more signs of ASD within the second year of life than for children with developmental delays.

Table 1 summarizes the above cited retrospective studies and the early signs of ASD at the associated age in months (Appendix B).

### **Prospective Studies on Early Signs of ASD**

Prospective studies eliminate many of the limitations discussed in the retrospective studies (e.g. based on parents recall from a number of years, parents may not be as aware of the subtle behaviour characteristics associated with an ASD disorder). Prospective studies have generally confirmed the findings of the retrospective studies. (Zwaigenbaum et al., 2007).

Prospective studies allow the researchers to compare the developmental behaviours of at-risk (or high-risk) groups of children to low-risk (or control) groups. Parents do not have to recall their child's behaviour; they instead record the behaviour of their child over time and at that point in time. Prospective studies allow researchers to narrow the screening tools and items for early identification.

Wetherby et al. (2004) compared three groups of children under 24 months of age: one group with a diagnosis of autism, one group with developmental disability, where a diagnosis of autism had been ruled out, and one group who were typically developing. They were screened from a larger pool of 3026 children. Children were screened by the use of the Communication and Symbolic Behaviour Scales Developmental Profile Infant Toddler Checklist (CSBS DP: Wetherby & Prizant, 2002). All participants were videotaped completing the CSBS DP behaviour sample. Two blind raters then reviewed the videotapes and rated the children by using the

Systematic Observation of Red Flags (SORF: Wetherby & Woods, 2002) for children with Autism Spectrum Disorders. The results showed significant differences between the groups in reciprocal social interaction, unconventional gestures, unconventional sounds and words, repetitive behaviours, restrictive interests and regulating their emotions.

Goldberg et al. (2005) conducted a study to examine the early signs of autism in the social and communication domains by comparing children with ASD ( $n = 8$ ), younger siblings of an older child with ASD ( $n = 8$ ) and typically developing children ( $n = 9$ ). The ages of each of the groups consisted of: 29.9 months for the ASD group, 17.1 for the younger siblings and 15.3 for the typically developing children. The Early Social Communication Scale (ESCS, Mundy, Hogan, & Doehring, 1996) was used to measure the child's social interaction, joint attention (responds to and initiates) and behavioural regulation (requesting behaviours such as eye contact, reach or point). The results showed typically developing children had higher levels of eye contact, gestures and turn taking than both the ASD group and the younger sibling group. Typically developing children also showed more frequent levels of shared eye contact, pointing and showing behaviours than the younger siblings of the children with ASD. The younger siblings, however, had higher levels of eye contact than the ASD group. Similar differences were found between the three groups for requesting behaviours. The researchers concluded that younger siblings of children diagnosed with ASD do differ from typically developing children (as found in all three domains investigated) and therefore should not be used as controls to compare with children with ASD but instead included for further investigation.

Zwaigenbaum et al. (2005) conducted a longitudinal study of infants at-risk for autism, with at-risk defined as having an older sibling with ASD. They followed 150 at-risk infants and 75 low-risk infants. Zwaigenbaum et al. (2005) found seven siblings at 24 months were given a

clinical diagnosis due to ratings on the Autism Diagnostic Observation Scale (ADOS: Lord et al., 2000) exceeding threshold. Twelve siblings were diagnosed at 24 months with atypical autism due to the exhibiting symptoms. It was also noted that although a number of the children included in the study were in the process of being assessed at 36 months of age, they would likely go on to receive a diagnosis (as 2 of 7 had already received a diagnosis by 36 months from another diagnostician). Zwaigenbaum et al. (2005) also noted that the children who do not receive a diagnosis may go on to experience atypical development in other areas such as language and anxiety. It was suggested that “behavioural observations as early as 6 to 12 months of age may be predictive of a later diagnosis of autism” (pg.149). This finding has since been validated by other research studies (e.g. Ozonoff et al., 2010). The research conducted by Zwaigenbaum et al. (2005) validates that infants at-risk can be screened earlier than 36 months as was hypothesized.

Zwaigenbaum et al. (2007) described the limitations of prospective studies and identified some suggestions to further research in the identification of early signs of ASD. The researchers highlighted the need to follow the development of the infants at-risk over time, the need to include a comparison or control group as well as ethical considerations about referral strategies if the infant does show early signs of ASD and how referrals will be initiated. Zwaigenbaum et al. (2007) continued to note that an adequate sample size (depending on the research questions being explored) and consistent measures are needed to make comparisons between the at-risk groups and the control samples.

Landa and Garrett-Mayer (2006) examined early behavioural indicators of ASD. They sought to determine the earliest age a diagnosis could be given. Eighty-seven participants (60 at-risk and 27 low-risk) were included in their study. They conducted assessments at 6, 14 and 24 months including the Mullen scales of Early Learning (Mullen, 1995), Autism Diagnostic

Observation Schedule (ADOS: Lord et al., 2000), Preschool Language Scale 3 & 4 (Zimmerman, Steiner, & Pond, 1991; Zimmerman, Steiner, & Pond, 2002) and Communication and Symbolic Behaviour Scales Developmental Profile (Wetherby & Prizant, 2002). The results indicated no substantive difference between infants later diagnosed and those not diagnosed at 6-months. Many researchers have concluded that since the ASD group show developmental deficits between 14 and 24 months and thus, they have cautioned that those participants who did not show delays in development by 6 months, should not be ruled out for future screening as they may show signs later on that may lead to a diagnosis of autism at a later time (Landa & Garrett-Mayer, 2006; Ozonoff et al., 2010). This study was important in early detection of ASD as it identifies early signs of ASD (e.g. differences in fine and gross motor, receptive and expressive language) and behaviours found in children who are later diagnosed with autism (e.g. visual reception, receptive and expressive communication, fine and gross motor).

Mitchell et al. (2006) conducted a study to examine the language and communication indicators of autism. Ninety-seven infant siblings of children with ASD and forty-nine low-risk control subjects were included in their study. Parents of the participants were asked to participate in the following assessments: the MacArthur Communicative Developmental Inventory Infant Form (Fenson et al., 1993) at 12 and 18 months and Preschool Language Scale 3<sup>rd</sup> edition (Zimmerman, Steiner, & Pond, 1991) and Mullen Scales of Early Learning (Mullen, 1995) at 12 and 24 months. Mitchell et al. (2006) concluded parents of children with ASD consistently identified early signs of atypical development prior to receiving a diagnosis. Children diagnosed with ASD by 24 months tended to understand fewer phrases and engaged in less gestures by 12 months. These children also showed less mature development in communication repertoires than typically developing children by the age of 12 months. The current findings are important in early

detection as the researchers concluded that communication differences could be detected as early as 12 months of age and specifically delays in gestures should be a red flag in child development.

Loh et al. (2007) conducted a study to compare videotapes of 8 infants at-risk for ASD (infants who have older siblings diagnosed with ASD) and 15 controls with typical development. The videotapes were reviewed when the infants were between the ages of 12-18 months of age. Thelen's taxonomy of repetitive behaviours (Thelen, 1979) was used to code the videotapes. Loh et al. (2007) concluded that infants at-risk for ASD were more likely to engage in an "arm wave" as a repetitive behaviour by 12 months than typically developing children. The researchers also found "hands to ears" was more common in the ASD sib groups than the typical group of children. One child who was later diagnosed with ASD was found to hold her posture for long periods of time (e.g. holding mouth open).

Landa, Holman and Garrett- Mayer (2007) studied 125 participants (107 at-risk for ASD and 18 low-risk for ASD) in order to examine the social and communication trajectory of both groups. Communication and Symbolic Behavior Scales Developmental Profile (CSBS DP: Wetherby & Prizant, 2002), Autism Diagnostic Observation Schedule (ADOS: Lord et al., 2000), Mullen Scales of Early Learning (Mullen, 1995) and Preschool Language Scale (Zimmerman, Steiner, & Pond, 1991) were used in order to determine delays in different developmental domains. Participants who were classified as having an early diagnosis (prior to 14 months) differed in having lower levels of shared positive affect, initiation of behaviour regulation, and initiation of joint attention and they engaged in fewer gestures and sounds. However by 24 months, both the later and the earlier diagnosed children, showed deficits in social, communication and play behaviours. The later diagnosed group differed from the typically developing participants by only one variable (fewer gaze shifts) at 14 months; however by 24

months there were remarkable differences between these two groups in social and communication domains. Landa et al. (2007) concluded that children who pass initial assessments for ASD at 12 months should be re-evaluated around 24 months of age.

Garon et al. (2008) compared children at-risk for autism ( $n = 138$ ) and a low-risk group ( $n = 73$ ) to determine their temperament profiles. All children were assessed by using the Toddler Behavior Assessment Questionnaire Revised (TBAQ-R: Goldsmith, 1996; Rothbart, Ellis, Rueda, & Posner, 2003) at 24 months, ADI-R (Lord, Rutter, & Le Couteur, 1994) and ADOS (Lord et al., 2000) at 36 months and the Mullen Scales of Early Learning (Mullen, 1995) at 24 and 36 months. The researchers concluded by 36 months there were notable differences in temperament between the two groups (lower affect, higher negative affect, difficulty controlling attention and behaviour). Garon et al. (2008) also noted that children with ASD may have less ability to regulate themselves when delaying gratification and experiencing irritability when denied a reward.

Ozonoff et al. (2009) conducted a prospective longitudinal study to determine early signs of ASD and determine the earliest age when parents have concerns with their child's development. 107 high-risk children (siblings with ASD who were meeting the criteria for a diagnosis of ASD) and those low-risk (siblings who were typically developing) were included in the study. The infants were screened at 6, 8, 12, 24 and 36 months. Measures used included Parent Concerns Questionnaire (Ozonoff et al., 2009), ADOS (Lord et al., 2000), Social Communication Questionnaire (Rutter, Bailey, & Lord, 2003), Mullen Scale of Early Learning (Mullen, 1995) and Modified Checklist for Autism in Toddlers (Robins et al., 2001a). Ozonoff et al. (2009) reported that parents who had older children with a diagnosis of autism had growing concerns for their child with ASD by the age of 12 months. The researchers concluded by 12

months the parental concerns were valid in regards to their child's development however at 6 months their concerns were not based on observed child developmental delays but instead based on having an older child with a diagnosis.

In a study conducted by Feldman et al. (2011), the researchers sought to validate the effectiveness of the POEMS as a prospective parent-report instrument for identifying early signs of ASD in at-risk infants. These researchers compared the results of nine at-risk children diagnosed with ASD at 3 years of age to 99 at-risk infants who were not diagnosed with ASD. The POEMS showed promising predictive validity as the at-risk children who received an ASD diagnosis at 3 years of age had higher POEMS scores and a higher number of elevated items than at-risk children who were not diagnosed. Differences were observed at 9, 12, 18 and 24 months old.

Table 2 summarizes the above mentioned prospective studies by the early signs of ASD at the associated ages in months (Appendix C).

### **Screening Tools**

There are also a number of screening tools to assess a child for early signs of ASD. The assessments that will be discussed are those that are completed with infants and toddlers. The following assessments are widely known and some of the earliest (under 3 years of age) assessments for children with ASD.

**The Early Screening of Autistic Traits Questionnaire (ESAT: Dietz et al., 2006).** The Early Screening of Autistic Traits Questionnaire (ESAT: Dietz et al., 2006) is completed by parents of children 14-15 months of age. The domains covered in the questionnaire are pretend play, joint attention, interest in others, eye contact, verbal and non verbal communication,

stereotypes, preoccupations, reaction to sensory stimuli, emotional reactions and social interaction.

Swinkels et al. (2006) aimed to examine the effectiveness of the ESAT for identifying children at-risk for autism. In study one, 478 parents/caregivers of children aged 8-20 months (mean age 13) were included in order to assess 19 of the items in the ESAT. Five items out of 19 were omitted from the pool in order to increase the specificity of the ESAT. In Study two, 34 children with ASD were included to assess the sensitivity of the tool. Swinkles et al. (2006) noted that caregivers were more likely to give negative answers than parents. Most of the caregivers were found to be grandparents. The researchers concluded that the screening tool had maximal sensitivity and specificity for identifying children with ASD (normal from abnormal child development).

Dietz, Swinkels, Van Daalen, Van Engeland and Buitelaar (2006) conducted a study to examine the validity of the ESAT. 30,000 children were screened at paediatricians' offices and those that were screened as positive were evaluated during an at-home visit by a trained Child Psychologist. During the home visits, parents were asked questions from ESAT and additional questions from the Checklist for Autism In Toddlers (Baron-Cohen, Allen, & Gillberg, 1992), Infant/toddler Checklist for Communication and Language Development (Wetherby & Prizant, 1998) and some questions from the Autism Diagnostic Interview-Revised (Lord et al., 1994). The cognitive level of the children was assessed with either the Mullen Scales of Early Learning (Mullen, 1995) or the Bayley Scales of Infant Development (van der Meulen & Smirkosky, 1982). Children who were screened as positive were advised to undergo evaluations from diagnostic departments in the local area. The results showed that ESAT had good sensitivity, as the group not diagnosed with ASD contained children who were rated negative on the ESAT and

children who were diagnosed with other related disorders (false positives) and the group of children with ASD rated positively on ESAT. The false positive group contained children later diagnosed with Mental Retardation, ADHD and Language Disorders, suggesting that the tool is effective in identifying a broad range of developmental challenges not specific to autism. Dietz et al. (2006) did however identify three items that may differentiate the ASD group from children with other developmental concerns; they found that children with ASD were rated lower in the following items: “Interest in people”, “Smiles directly” and “Reacts when spoken to”. Overall, The Early Screening of Autistic Traits Questionnaire was found to reliably identify children showing early signs of ASD between 14-15 months of age (Dietz et al., 2006; Swinkels et al., 2006).

**The Checklist for Autism in Toddlers (CHAT: Baron-Cohen, Allen, & Gillberg, 1992).** The Checklist for Autism in Toddlers (CHAT: Baron-Cohen et al., 1992) is designed for infants 18 months old. The CHAT is administered by a health professional such as a doctor and consists of parental reports and an observation section which involves interactions with the infant to assess the child’s pointing, joint attention and play skills. Baron-Cohen et al. (1992) conducted a study to assess the usefulness of the CHAT on identifying children at-risk for autism who were 18 months of age. Two groups were included in the study (one which was at a higher risk for ASD due to having an older sibling diagnosed with the disorder and the other a control group with no family history of ASD). Four of the children who were at-risk and were identified as showing early signs of ASD on the CHAT by the age of 18 months, were later given a diagnosis of ASD. None of the control group children were later identified or received a diagnosis of ASD.

Baird et al. (2000) conducted a study to check the validity of the CHAT. Baird et al. (2000) included a sample of 16,235 infants who were 18 months old and were followed up at the

age of 7 years. Eleven of the twelve participants who were identified as at-risk for ASD at 18 months later received a diagnosis of ASD; however the researchers also concluded that only 1 of 3 children who were later diagnosed with ASD were identified by the CHAT. Baird et al. (2000) concluded that the CHAT had some sensitivity (i.e. identifying children at-risk for ASD) however was not accurately identifying all of the children who would later be diagnosed with ASD. The Checklist for Autism in Toddlers was found to reliably identify children who showed early signs of ASD by 18 months of age (Baird et al., 2000; Baron-Cohen et al., 1992), however it was likely to miss about two thirds of all children who would show ASD signs later on.

**The Modified Checklist for Autism in Toddlers (M-CHAT: Robins, Fein, & Barton, 2001).** The Modified Checklist for Autism in Toddlers Second Edition (M-CHAT Robins et al., 2001) is another assessment tool to assist in the screening for children with ASD. The M-CHAT includes a parent questionnaire that consists of 23 items and can be completed in the waiting area of a pediatrician's office. The M-CHAT is completed with infants 16-30 months old. There are a few changes which make the M-CHAT more user friendly than the CHAT in that it does not require the use of a physician's observation and the format is parent friendly, which leads to easy and fast administration. The first nine items were taken from the CHAT and therefore the M-CHAT is identified as an extension of the CHAT.

Robins, Fein, Barton and Green (2001a) sought to examine the effectiveness of the M-CHAT in identifying children at-risk for autism. 1,293 children who were 24 months of age were included in this study. The M-CHAT was completed by a paediatrician during a check-up appointment by the parents in the waiting area. Robins et al. (2001a) identified that paediatricians were more willing to screen children at the age of 24 months as they would be able to refer for early intervention at this age. Paediatricians also noted children who regress are more likely to do

so between 15-24 months of age, therefore by the time of the appointment the child's scores would be reliable. Robins et al. (2001a) concluded the M-CHAT was reliable in identifying children at-risk for ASD. Children who were later diagnosed with autism or PDD failed significantly more items than other children. The M-CHAT was able to identify 33 of 38 children later diagnosed with ASD and 1,188 of 1,196 children who did not have ASD. Therefore, the sensitivity and specificity of this assessment tool was found to be reliable in assessing children for ASD by 24 months. Robins, Fein, Barton and Green (2001b), in response to a critique by Charman et al. (2001), stated that screening at 18 month olds has the advantage of providing an ASD screen at the earliest reasonable age as well as providing the earliest opportunity for intervention.

The argument still remains that earlier detection would be in the best interest of children with early signs as earlier intervention before or by 24 months has the potential of preventing the full expression of ASD. The above studies validate that early signs of ASD can be reliably identified between 14-35 months of age. The Parent Observation Checklist (POEMS; Feldman et al., 2011) expands upon the previously reviewed screening tools as it allows families to identify areas of development that their child is having difficulty with and also allows the family to frequently track the progress of their child's development over time.

Based on the previous research reviewed, it is clear that more research is needed to analyze the early signs of ASD and determining the age at which they emerge. Studies have also not compared the difference in early signs between the females and males in either a high-risk and low-risk infant groups. More research is needed comparing infants at-risk to low-risk, including large sample sizes within each of the age groups, to determine if infants at-risk for ASD differ in substantive ways from children at lower risk.

### **Purpose of Current Study**

The purpose of the current study was to expand upon the Feldman et al. (2011) POEMS validation study by comparing at-risk infants (who have an older sibling with ASD) to low-risk infants (those with no family history of ASD). The current research will help to further validate the Parent Observation of Early Markers Scale (POEMS) as a screening tool for young children, under the age of 2 years, who are at-risk for ASD due to having an older sibling with ASD. The current study examined which of the items on the POEMS were found to differentiate the high-risk group of children versus the low-risk group at different ages, between 6 and 36 months of age. This analysis was completed to identify POEMS items that may be sensitive to screening for early signs of ASD at different ages, and provide additional information on the behavioural development of infants at-risk for ASD.

### **Research Hypotheses and Questions:**

1. The children in the ASD at-risk group will have higher mean total scores and a greater number of elevated items on the POEMS than the control group of children considered low-risk (no family history of ASD).
2. Specific items from the POEMS will be elevated at different ages for the at-risk group that differentiate the at-risk group from the control (low-risk) group (e.g. items specific to the triad of development associated with a ASD diagnosis such as social, communication and repetitive behaviours)
3. Are there gender differences in POEMS scores and number of elevated items in the at-risk and low-risk groups?

## Method

### Recruitment

The 108 children in the at-risk group were recruited through the Autism Spectrum Disorders-Canadian American Research Consortium (ADS- CARC) Prospective Study. Participants were considered at-risk if they had an older sibling who had been diagnosed with ASD. Data collection was complete on the at-risk group, so no further recruiting was needed. Details on the recruitment of this group can be found in Feldman et al. (2011). At-risk participants had been gathered through ASD regional service providers, Autism Ontario and other service providers across Canada and USA, as well as internet recruitment (autismresearch.ca). The low-risk/control group was recruited within Ontario through word of mouth to friends and colleagues of the principal student researchers and through distribution of advertisements via email. Criteria for inclusion in the low-risk group was no family history of ASD and having a second born or later, typically developing child under 36 months. Low-risk group participants completed three questionnaires, FIQ, POEMS and the Infant Behaviour Summary Evaluation (IBSE)<sup>1</sup>.

### Participants

Sixty-nine participants low-risk for ASD between the ages of 4 and 36 months were recruited in this study. They were gender and age matched to 69 at-risk children from the original prospective study of 108 at-risk participants (Feldman et al., 2011). There were 8 participants 6 months and younger, 17 participants 9 months and younger, 18 participants 12 months and younger, 34 participants 18 months and younger, 49 participants 24 months and younger, 61 participants 30 months and younger and finally 69 participants 36 months and younger. The researcher was blind to the POEMS scores and diagnoses of the at-risk children during the

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<sup>1</sup> IBSE results are not presented in this thesis

matching process. Table 3 presents key child, parent and family characteristics of each group. As seen in Table 3, mothers and fathers of high-risk infants were found to be significantly older than the low-risk mothers and fathers,  $t(136) = 5.30$ ,  $t(136) = 5.50$ , respectively,  $p$ 's  $< .01$ . High-risk families reported a lower income,  $t(136) = 5.47$ ,  $p < .01$ , and less maternal employment,  $\chi^2 = 14.85$ ,  $p < .01$ , than low-risk families. No other variables in Table 3 were significantly different.

**Table 3****Child, Parent and Family Characteristics**

Variable	At-risk	Low-risk
Mean ( <i>SD</i> ) child age (months)	18.60 (8.98)	19.01 (9.02)
Males/Females	34/35	34/35
Mean ( <i>SD</i> ) mother's age (years)	38.39	34.11
Percentage of mothers with college/university education	92%	96%
Percentage of mothers employed other than, or in addition to, homemaker	41%	83%
Mean ( <i>SD</i> ) father's age (years)	40.67	35.3
Percentage of fathers with college/university education	68%	83%
Percentage of fathers employed, other than or in addition to, homemaker	96%	98%
Range of annual family income	20,000-95,000	20,000-100,000 or more

Percentage of two parent families	96%	100%
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## Measures

**Family Information Questionnaire (Feldman, Hancock, Rielly, Minnes, & Cairns, 2000).** The Family Information Questionnaire was a locally developed form that has 71 questions in which parents are asked to report socio-economic information on the mother and father, information on their child's health and development. The FIQ was first used and described in the Feldman et al. (2000) study. Parents are asked to identify any developmental or mental health diagnoses which are present within the paternal and maternal sides of the family, such as developmental disabilities, ADHD, language delays, schizophrenia or Autism Spectrum Disorder. The family history information allows the researcher to determine if there is any family history of ASD or nontypical development in a potential low-risk infant that would exclude the child from the low-risk group (three children were excluded from the low-risk group because of health and developmental problems identified on the FIQ).

**Parent Observation of Early Markers Scale (POEMS) (Feldman et al., 2011).** The Parent Observation of Early Markers Scale has 61 questions in which where the parents are asked to rate their child's behaviours on a scale of 1 (i.e. indicates that the parents are not concerned with this behaviour) to 4 (i.e. indicates the behaviour is a severe problem for their child), with ½ ratings allowed. Some of the behaviours in question relate to sleeping, appetite, touch tolerance, mood, relating/interacting with others in their environment and sensitivity to stimuli in their immediate environment. In the study conducted by Feldman et al. (2011), the researchers sought to validate the effectiveness of the POEMS in identifying early signs of autism in at-risk infants (who had older siblings with ASD). Internal consistency was found for each age measured (e.g.

3, 6, 9, 12, 18 and 24 months). One month test-retest reliability was found to be stable across the age range that the POEMS were conducted (e.g.  $r=.93$  for 2-3 months and  $r=.98$  for 22-23 months). Both convergent validity and divergent validity were conducted to compare the POEMS with the Ages and Stages Questionnaire (ASQ: Bricker and Squires, 1999). Feldman et al. (2011) reported that the POEMS and ASQ were more strongly correlated for the core symptoms of ASD (social,  $t = 2.75$ ,  $df = 42$ ,  $p < .01$  and communication development,  $t = 2.77$ ,  $df = 42$ ,  $p < .01$ ) than for gross motor development. Feldman et al. (2011) concluded the POEMS had acceptable reliability and validity. The researchers also reported the POEMS had promising predictive validity as children at-risk for ASD were differentiated from those not at-risk at all stages of development tested (9, 12, 18 and 24 months old) (e.g. .25, .10, .29, .16, .20, .24).

### **Procedure**

Parents reviewed the consent form and provided written informed consent for their participation in the study. Control participants were kept blind to the purpose of the current study and that the POEMS measured early signs of ASD to eliminate the possibility of skewing the results, as well as to eliminate any negative reactions as a result of their scoring on the measures. Parents were informed that the purpose of the current study was to study the development of second born or later children. Parents of the at-risk children could not be kept blind to the purpose of the study as they would have been aware their second child was being screened. Parents were then asked if they would prefer to complete the questionnaires via email, telephone or mail (Canada Post). The measures were mostly completed by mothers of infants however there were a few fathers who participated in completing the measures. Parents chose to complete the measures mostly electronically through email, some were completed over the telephone and a less common measure was through the mail. The POEMS protocol that was given to both the

control families and the at-risk families was called the nondescript Parent Observation Checklist (POC); the name was changed so that parents would be blind to the early markers the researchers were searching.

### Results

*Analyses.* A 2x2 ANOVA (gender and group) was conducted on total POEMS scores and the mean number of elevated items. Then, using independent *t*-tests (one-tailed), total scores and number of elevated items up to 9, 12, 18, 24, 30 and 36 months were compared. As this is a preliminary study and the sample size is relatively small, to reduce the risk of Type II error, we did not use a Bonferroni correction of significance levels. We then provided descriptive analyses of the most common POEMS elevated items at the different ages studied.

*2x2 ANOVA on total score.* Table 4 summarizes the descriptive statistics for the ANOVA on POEMS total score. The ANOVA revealed no significant differences in group,  $F(1, 134) = 1.68$ , gender,  $F(1, 134) = .52$  or group x gender interaction,  $F(1, 134) = 1.65$ , all  $p$ 's > .05.

**Table 4**

#### **Descriptive statistics on 2x2 ANOVA on POEMS total score**

	<i>N</i>	Mean POEMS total score	<i>SD</i>
Low-risk males	35	68.94	8.85
Low-risk females	34	67.49	6.26
Total low-risk	69	68.22	7.66
High-risk males	35	68.97	12.17
High-risk females	34	74.16	25.74

Total high-risk	69	71.53	20.06
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*2x2 ANOVA on number of elevated items.* Table 5 summarizes the descriptive statistics for the ANOVA on number of elevated items. An elevated item was a rating of 3, 3.5 or 4 (maximum score = 4). The ANOVA revealed significant differences in group,  $F(1, 134) = 16.03, p < .02$ , but not gender,  $F(1, 134) = 1.76$  or the group x gender interaction,  $F(1, 134) = 1.71$ . As can be seen in Table 5, the high-risk group had more elevated items than the low-risk group.

**Table 5**

**Descriptive statistics on 2x2 ANOVA on POEMS elevated items**

	<i>N</i>	Mean POEMS elevated items	<i>SD</i>
Low-risk males	35	.54	.89
Low-risk females	34	.56	1.28
Total low-risk	69	.55	1.09
High-risk males	35	1.49	3.88
High-risk females	34	3.65	8.74
Total high-risk	69	2.55	2.77

*Between group comparisons between 6 and 36 months.* Because there was no gender difference found in the ANOVAs, we conducted independent *t* tests combining males and females within each group and age. Figure 1 shows the mean, cumulative, cross-sectional

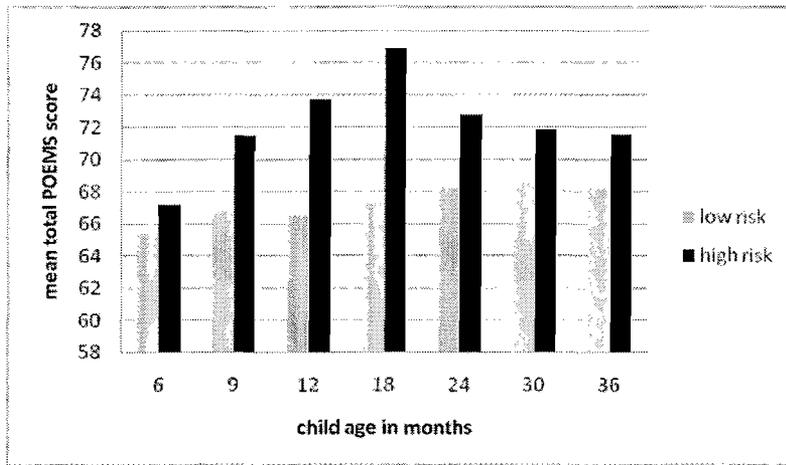
POEMS total scores between 6 and 36 months. Although Figure 1 shows that the high-risk group mean total POEMS scores were higher than the low-risk groups' at each age comparison, the only age showing a significant group difference was up to 18 months, when the high-risk group was rated lower than the low-risk group,  $t(65) = 2.14, p < .02$ . The 2x2 ANOVA already showed that there was no significant group differences on POEMS total scores up to 36 months.

As mentioned previously, there were 8 participants 6 months and younger, 17 participants 9 months and younger, 18 participants 12 months and younger, 34 participants 18 months and younger, 49 participants 24 months and younger, 61 participants 30 months and younger and finally 69 participants 36 months and younger.

Figure 2 shows the mean number of elevated POEMS scores cross-sectionally between 6 and 36 months. The high-risk group had significantly more elevated scores at every comparison age except up to 6 and 9 months (all tests are one-tailed). The  $t$  scores and level of significance are: up to 12 months,  $t(34) = 1.94, p < .05$ ; up to 18 months,  $t(65) = 2.43, p < .01$ ; up to 24 months,  $t(94) = 2.20, p < .02$ ; and, up to 30 months,  $t(120) = 2.28, p < .02$ . The 2x2 ANOVA already showed that the high-risk group had significantly more elevated items than the low-risk group up to 36 months.

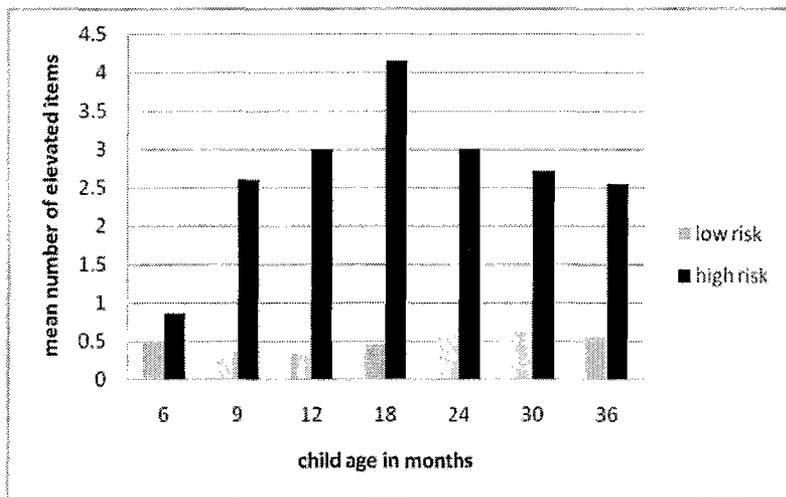
### **Figure 1**

#### **Mean Total POEMS Score Across Age Groups**



**Figure 2**

**Mean number of POEMS Elevated Items Across Age Groups**



*Comparison of at-risk diagnosed and undiagnosed infants.* As reported in Feldman et al.

(2011), the sample pool of 108 from which the 69 high-risk children were chosen for this study

included nine children who were independently diagnosed with ASD at 3 years of age. Six of those nine children were (blindly) chosen as matches for low-risk children in the current study.

An independent *t*-test revealed that the subsequently diagnosed high-risk children had

significantly higher POEMS total scores (mean = 110.17, *SD* = 40.98) than the high-risk children

who were not diagnosed by 3 years of age (mean = 67.85, *SD* = 12.16),  $t(67) = 6.12, p < .001,$

The diagnosed high-risk children also had a greater number of elevated POEMS items (mean = 15.83,  $SD = 15.64$ ) than the high-risk children who were not diagnosed by 3 years of age (mean = 1.29,  $SD = 3.43$ ),  $t(67) = 6.31$ ,  $p < .001$  (cf., Feldman et al., 2011). As it is possible that the group differences on the mean number of elevated items between high-risk and low-risk children reported above may be due primarily to the six to-be-diagnosed children, a  $t$ -test on the mean number of elevated items was conducted removing these six children. Although the mean number of elevated items of the at-risk sample decreased from 2.55 to 1.29, the high-risk group still had significantly more elevated items than the low-risk group,  $t(130) = 1.69$ ,  $p < .05$ , even when the six to be diagnosed children were not included in the analysis.

*POEMS age by item comparisons.* Table 6 shows the most common elevated POEMS items from 9 to 36 months in the high-risk group with corresponding number of elevated scores for those items in the low-risk group. As can be seen in Table 6, the most common elevated items in the high-risk group were not elevated in a similar number of low-risk children. Overall, sleep duration at night, milk and formula intolerance, interest in faces, imitates sounds and words, waiting, and coordinates gestures with communication were items that appeared to show a higher difference between the low-risk and the at-risk groups. These findings are not surprising as many of these items are consistent with ASD features (e.g., social and communication).

**Table 6**

**POEMS items elevated for the at-risk group by age in months**

Up to age in months	$n$	Elevated item on POEMS	Number of at-risk participants with elevated	Number of low-risk participants with elevated

			item	item
9	17	Sleep duration at night	4	1
		Milk/formula intolerance	4	0
12	18	Sleep duration at night	5	1
		Milk/formula intolerance	4	0
		Acceptance of new foods	3	0
		Mood	3	0
		Interest in faces	3	0
		Attention span	3	0
18	34	Sleep duration at night	9	1
		Milk/formula intolerance	6	0
		Appetite	6	1
		Interest in faces	5	0
		Imitates sounds or words	7	2
		Waiting	5	0
		Coordinates gestures with communication	5	0
24	49	Sleep duration at night	9	1
		Milk/formula intolerance	6	0
		Interest in faces	5	0
		Imitates sounds or words	7	2
		Coordinates gestures with	5	0

communication				
30	61	Sleep duration at night	9	2
		Interest in faces	6	0
		Shifts attention to person	5	0
		Imitates sounds or words	7	2
		Waiting	6	1
		Coordinates gestures with	6	0
communication				
36	69	Sleep duration at night	9	1
		Interest in faces	7	0
		Waiting	8	1
		Coordinates gestures with	5	0
communication				

A correlational analysis was done to examine if there was a relationship between the number of times the participant had completed the measure ( $M=8.19$ ,  $SD= 5.19$ ) and the POEMS number that was used for the study ( $M= 3.96$ ,  $SD=3.97$ ). For example, if the high risk child was matched to the low risk child at 12 months and the high risk child's 12 month POEMS was the third POEMS the child had, then that child's POEMS number would be 3. There was no significant relationship between the POEMS used (depending upon the age matched) and the POEMS total score,  $r(67) = -0.18$ ,  $p>0.05$ , or the number of elevated items,  $r(67) = -0.16$ ,  $p>0.05$ .

A correlational analysis was also completed on the demographic variables that were significantly different between the two groups, mothers age ( $M=36.2$ ,  $SD= 4.87$ ) and fathers age ( $M= 38.09$ ,  $SD= 5.34$ ) and median family income ( $M=75344.83$ ,  $SD=25217.58$ ). There was no significant relationship between the mothers age and the total POEMS score,  $r(136) = 0.084$ ,  $p>0.05$  and the number of elevated items  $r(136) = .118$ ,  $p>0.05$ . There was no significant relationship found between the fathers age and the total POEMS score,  $r(136) = 0.145$ ,  $p>0.05$  and the number of elevated items,  $r(136) = .163$ ,  $p>0.05$ . There was also no relationship found between the median family income and the total POEMS score,  $r(136) = -.088$ ,  $p>0.05$  and the number of elevated items,  $r(136) = -.059$ ,  $p>0.05$ .

### Discussion

Hypothesis 1 was partially supported. In this cross-sectional study, the children at high-risk for ASD had significantly more elevated POEMS items from 12 to 36 months; total POEMS scores were not significantly different except up to 18 months. No significant differences on POEMS total score or elevated items were found between males and females, in either group. More research is needed to determine if the severity of the ASD symptoms is higher for one gender than the other in both diagnosed and high-risk samples (Rivet & Matson, 2011).

The elevated items may be more sensitive in identifying the high-risk group of children than the total POEMS scores because the high-risk children had several areas of concern not seen in the low-risk children (see Table 6). The total POEMS scores, however, would not be as sensitive because of the large number of items rated below 3 in the high-risk group would reduce the overall score and overshadow areas of concern. Also, some children within the low-risk group may have some items that were rated as 2 or 2.5, but these were not considered elevated (i.e. 3 or

greater). The high-risk sample may include children with varying developmental trajectories. Some high-risk children would not be distinguishable from the low-risk as they do not develop ASD or show any related symptoms; other children from the high-risk sample have mostly low ratings early on, but may regress later; and other high-risk children will have consistently elevated items and a higher resulting rating that signifies eventual diagnosis of ASD.

This study has some results which compare to other researchers findings in early signs of ASD. This study is the first to identify sleep duration and formula intolerance as an area of concern in high-risk infants 9 months or younger. These two areas continued to be a concern throughout the age groups analyzed in this study. Inability of children at-risk for ASD to wait showed up in this study as a possible “red flag” across most ages examined (e.g. 18, 30 & 36 months), as it did in the enlarged sample including the children in this study in Feldman et al. (2011). Similar to other prospective studies (Zwaigenbaum et al., 2005), our results reported mood to be an item that was reported as a concern in the infant siblings. Attention span and responding to name has consistently been identified as an early sign of ASD prior to 12 months in age in prior literature (Ozonoff et al., 2010; Palomo et al., 2006; Saint- Georges et al., 2010; Werner et al., 2000; Zwaigenbaum et al., 2005). Other items that appeared as early signs were consistent with the literature on early communication and socialization skills (e.g. imitates sounds and words, coordinates gestures with communication) (Bryson et al., 2009; Landa et al., 2007; Landa & Garrett-Mayer, 2006; Mitchell et al., 2006; Ozonoff et al., 2010; Palomo et al., 2006; Saint- Georges et al., 2010; Wetherby et al., 2004; Wimpory et al., 2000; Zwaigenbaum et al., 2005).

Items that were not identified as early signs of ASD by the POEMS included motor movements (holding positions for long periods of time or engaging in repetitive behaviours) that

have been reported as early signs in previous literature (Bryson et al., 2009; Landa & Garrett-Mayer, 2006; Loh et al., 2007; Palomo et al., 2006; Saint- Georges et al., 2010; Wetherby et al., 2004).

High-risk families had older parents, fewer mothers who worked and lower family income. It could be speculated that parents with one diagnosed child may delay having a second child. Families may have to change their priorities when their first child is diagnosed with ASD. One parent (usually the mother) stays at home to take responsibility for finding services and providing child care because of the inability to afford or find specialized child care. Hence, family income drops as one parent devotes her/himself to caring for the child with ASD.

These demographic differences are a relatively new finding as many prospective studies have not even compared the low-risk to the high-risk on demographic variables other than gender and age (Garon et al., 2009; Landa et al., 2007; Loh et al., 2007; Mitchell et al., 2006). One prospective study reviewed reported demographic variables between high-risk and low-risk infant groups (e.g. age, gender, mothers age at birth of the child, parents education in years); however, no further analysis was discussed (Wetherby et al., 2004). The demographic findings in this study suggest that further analysis of differences between low-risk and high-risk groups is warranted.

There are some limitations to discuss based on the current study. The sample size for each of the age groups was small, specifically the younger age groups (e.g. 6 months, 9 months). As a result the findings reported can only be discussed as preliminary results. With a small sample size the Bonferroni correction for multiple testing is very conservative and increases the risk of Type II error. Therefore, the results were presented without the correction (Nakagawa & Foster, 2004). With the analyses reported above, there were significant differences between the high-risk and

low-risk groups in the number of elevated POEMS items at each of five age groups. This pattern suggests that there may be a strong effect in the number of elevated items between the high-risk and low-risk groups. The finding of only one significant difference in total POEMS scores (at 18 months) suggests that result may have been a chance finding. Another limitation is that interrater reliability was not conducted. Different raters who knew the child well were not asked to independently complete the POEMS to compare scoring of children. By having another family member complete the POEMS, we could have compared the results to see if the ratings were reliable. There is also the risk that some of the items could have been misinterpreted by the reader (i.e. milk or formula intolerance meaning the infant has difficulty sucking or resists and parents could have interpreted it as also including allergies and lactose intolerance). It could also be a limitation that the high-risk families completed the POEMS on average more frequently than the low-risk families. As a result, it could be speculated that the high-risk families may have learned from this prior experience with the screening tool. Due to this speculation, a correlational analysis was conducted however there was no relationship found between the number of POEMS completed and the total POEMS score or the number of elevated items.

Further research should include increasing the sample size to add to the statistical power particularly at the younger ages. It would also be interesting to analyze the number of family history variables to see if they correlate with higher total POEMS scores and elevated items. Some family vulnerability to mental health diagnoses may lead to the possibility of having an increase in the number of elevated items or total POEMS scores in high-risk infants.

In conclusion the POEMS is an innovative screening tool that can be used by parents to follow the behavioural development of their child with respect to possible early signs of ASD. The tool can be completed on a regular basis to track the progress of their child's development.

Items where the child may show a problem (skill deficit or behavioural excess) and result in a repeated elevated POEMS score, could be used to guide parent training or assist in guiding behavioural and language programming. Retrospective studies have been reported to have limitations due to parents' lack of memory recall. Therefore, by providing the parents with a screening tool where they can have ongoing documentation of their child's development, this may allow parents to identify areas of concern early on in their child's life and provide a focus for early intervention programming or parent training.

## References

- Allison, C., Baron-Cohen, S., Wheelwright, S., Charman, T., Richler, J., Pasco, G., ... Brayne, C. (2008). The Q-CHAT (Quantitative Checklist for Autism in Toddlers): A normally distributed quantitative measure of autistic traits at 18–24-months of age: Preliminary report. *Journal of Autism and Developmental Disorders*, 38(8), 1414–1425.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual* (4<sup>th</sup> ed.). Text revision. Washington, DC: Authors.
- Baird, G., Charman, T., Baron-Cohen, S., Cox, A., Swettenham, J., Wheelwright, S., & Drew, A. (2000). A screening instrument for autism at 18 months of age: A 6-year follow-up study. *Journal of the American Academy of Child & Adolescent Psychiatry*, 39(6), 694-702.
- Baron-Cohen, S., Allen, J., & Gillberg, C. (1992). Can autism be detected at 18 months? The needle, the haystack, and the CHAT. *British Journal of Psychiatry*, 161, 839-843.
- Bricker, D., & Squires, J. (1995). *Ages and Stages Questionnaire: A parent-completed child monitoring system* (2nd ed.). Baltimore, MD: Brookes.
- Bryson, S. E., Rogers, S. J., & Fombonne, E. (2003). Autism Spectrum Disorders: Early detection, intervention, education, and pharmacological management. *The Canadian Journal of Psychiatry*, 48(8), 506-516.
- Carter, A. S., Black, D. O., Tewani, S., Connolly, C. E., Kadlec, M. B., & Tager-Flusberg, H. (2007). Sex differences in toddlers with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 37(1), 86–97.

Charman, T., Baron-Cohen, S., Baird, G., Cox, A., Wheelwright, S., Swettenham, J., & Drew, A.

(2001). Commentary: The modified checklist for autism in toddlers. *Journal of Autism and Developmental Disorders*, 31, 145–148.

Dietz, C., Swinkels, S., van Daalen, E., van Engeland, H., & Buitelaar, J. K. (2006). Screening

for autistic spectrum disorder in children aged 14-15 months. II.: population screening with the Early Screening of Autistic Traits Questionnaire (ESAT). Design and general findings.

*Journal of Autism and Developmental Disorders*, 36(6), 713-722.

Feldman, M. A., Hancock, C. L., Rielly, N., Minnes, P., & Cairns, C. (2000). Behavior problems

in young children with or at risk for developmental delay. *Journal of Child and Family Studies*, 9(2), 247-261.

Feldman, M. A., Ward, R. A., Savona, D., Regehr, K., Parker, K., Hudson, M., ... Holden, J. J. A.

(2011). Development and initial validation of a parent report measure of the behavioral development of infants at risk for autism spectrum disorders. *Journal of Autism and*

*Developmental Disorders*, DOI 10.1007/s10803-011-1208-y

Fenson, L., Dale, P. S., Reznick, J. S., Thal, D. J., Bates, E., ... Reilly, J. S. (1993). *MacArthur*

*Communicative Development Inventories: User's guide and manual*. San Diego, CA: Singular Publishing Group.

Garon, N., Bryson, S., Zwaigenbaum, L., Smith, I., Brian, J., Roberts, W., & Szatmari, P. (2009).

Temperament and its relationship to autistic symptoms in a high-risk infant sib cohort.

*Journal of Abnormal Child Psychology*, 37(1), 59-78.

Glascocoe, F. P., Macias, M. M., Wegner, L. M., & Robertshaw, N. S. (2007) Can a broadband developmental-behavioral screening test identify children likely to have autism spectrum disorder? *Clinical Pediatrics*, 46(9), 801-805.

Goldberg, W., Jarvis, K., Osann, K., Lauthere, T., Straub, C., ... Spence, M. (2005). Brief report: early social communication behaviors in the younger siblings of children with autism. *Journal of Autism and Developmental Disorders*, 35(5), 657-664.

Goldsmith, H. H. (1996). *Toddler behavior assessment questionnaire*. Eugene, OR: University of Oregon, Department of Psychiatry.

Gould, T., & Gottesman, I. Psychiatric endophenotypes and the development of valid animal models. *Genes, Brain & Behavior*, 5(2), 113-119.

Hallmayer, J., Cleveland, S., Torres, A., Phillips, J., Cohen, B., ... Risch, N. (2011). Genetic Heritability and Shared Environmental Factors Among Twin Pairs with Autism. *Archives of General Psychiatry*. Retrieved from <http://archpsyc.ama-assn.org/>

Hus, V., Pickles, A., Cook, E. H., Risi, S., & Lord, C. (2007). Using the Autism Diagnostic Interview – Revised to increase phenotypic homogeneity in genetic studies of autism. *Biological Psychiatry*, 61(4), 438-448.

Landa, R. J., Holman, K. C., & Garrett-Mayer, E. (2007). Social and communication development in toddlers with early and later diagnosis of autism spectrum disorders. *Archives of General Psychiatry*, 64(7), 853-864.

Landa, R. & Garrette-Mayer, E. (2006). Development in infants with autism spectrum disorders: a prospective study. *Journal of child psychology and psychiatry*, 47, 629-638.

- Loh, A., Soman, T., Brian, J., Bryson, S. E., Roberts, W., ... Zwaigenbaum, L. (2007). Stereotyped motor behaviors associated with autism in high-risk infants: A pilot videotape analysis of a sibling sample. *Journal of Autism and Developmental Disorders*, 37(1), 25-36.
- Lord, C., Risi, S., Lambrecht, L., Cook, E. H., Leventhal, B. L., ... Rutter, M. (2000). The Autism Diagnostic Observation Schedule-Generic: a standard measure of social and communication deficits associated with the spectrum of autism. *Journal of Autism and Developmental Disorders*, 30, 205–223.
- Lord, C., Rutter, M., & Le Couteur, A. J. (1994). 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*, 24, 659–685.
- Mitchell, S., Brian, J., Zwaigenbaum, L., Roberts, W., Szatmari, P., Smith, I., & Bryson, S. (2006). Early language and communication development of infants later diagnosed with autism spectrum disorder. *Journal of Developmental and Behavioral Pediatrics*, 27(2), 69-78.
- Mullen, E. M. (1995). *Mullen: Scales of early learning (AGS Edition)*. Circle Pines, MN: American Guidance Service.
- Mundy, P., Hogan, A., & Doehring, P. (1996). *A preliminary manual for the abridged Early Social Communication Scales (ESCS)*. Unpublished manual, University of Miami.
- Nakagawa, S., & Foster, T. M. (2004). The case against retrospective statistical power analyses with an introduction to power analysis. *Acta Ethologica*, 7, 103-108.
- Osterling, J., & Dawson, G. (1994). Early recognition of children with autism: A study of first birthday home videotapes. *Journal of Autism and Developmental Disorders*, 24(3), 247-257.

- Ozonoff, S., Iosif, A., Baguio, F., Cook, I., Hill, M., ... Young, G. (2010). A prospective study of the emergence of early behavioral signs of autism. *Journal of American Academy of Child & Adolescent Psychiatry*, 49(3), 256-266.
- Ozonoff, S., Young, G. S., Steinfield, M. B., Hill, M. M., Cook, I., ... Sigman, M. (2009). How early do parent concerns predict later autism diagnosis? *Journal of Developmental and Behavioral Pediatrics*, 30(5), 367-375.
- Palomo, R., Belinchón, M., & Ozonoff, S. (2006). Autism and family home movies: A comprehensive review. *Journal of Developmental and Behavioral Pediatrics*, 27(2), 59-68.
- Palomo, R., Thompson, M., Colombi, C., Cook, I., Goldring, S., Young, G., & Ozonoff, S. (2008). A case study of childhood disintegrative disorder using systematic analysis of family home videos. *Journal of Autism and Developmental Disorders*, 38(10), 1853-1858.
- Perry, A., Dunlap, G., & Black, A. (2007). *Autism and Related Disabilities: A comprehensive guide to intellectual and developmental disabilities*. Baltimore, MD: Paul H Brookes Publishing.
- Pilowsky, T., Yirmiya, N., Shulman, C., & Dover, R. (1998). The Autism Diagnostic Interview – Revised and the Childhood Autism Rating Scale: Differences between diagnostic systems and comparison between genders. *Journal of Autism and Developmental Disorders*, 28(2), 143–151.
- Rivet, T., & Matson, J. (2011). Review of gender differences in core symptomatology in autism spectrum disorders. *Research in Autism Spectrum Disorders*, 5(3), 957-976.

- Robins, D. L., Fein, D., Barton, M. L., & Green, J. A. (2001a). The Modified Checklist for Autism in Toddlers: An Initial Study Investigating the Early Detection of Autism and Pervasive Developmental Disorders. *Journal of Autism and Developmental Disorders*, 31(2), 131-144.
- Robins, D. L., Fein, D., Barton, M. L., & Green, J. A. (2001b). Reply to Charman et al.'s Commentary on the Modified Checklist for Autism in Toddlers. *Journal of Autism and Developmental Disorders*, 31(2), 149-151.
- Rothbart, M., Ellis, L., Rueda, M., & Posner, M. (2003). Developing mechanisms of temperamental effortful control. *Journal of Personality*, 71, 1113-1143.
- Rutter, M., Bailey, A., & Lord, C. (2003). *Social Communication Questionnaire*. Los Angeles, CA: Western Psychological Services.
- Rutter, M., Silberg, J., O'Connor, T., & Simonoff, E. (1999). Genetics and Child Psychiatry: II Empirical Research Findings. *Journal of Child Psychology and Psychiatry*, 40 (1), 19-55.
- Saint-Georges, C., Cassel, R., Cohen, D., Chetouani, M., Laznik, M., Maestro, S., & Muratori, F. (2010). What studies of family home movies can teach us about autistic infants: A literature review. *Research in Autism Spectrum Disorders*, 4(3), 355-366.
- Saracino, J., Noseworthy, J., Steiman, M., Reisinger, L., & Fombonne, E. (2010). Diagnostic and assessment issues in autism surveillance and prevalence. *Journal of Developmental and Physical Disabilities*, 22(4), 317-330.
- Schopler, E., Reichler, R., & Renner, B. R. (1986). *The Childhood Autism Rating Scale (CARS) for diagnostic screening and classification of autism*. New York, NY: Irvington.

- Schwichtenberg, A. J., Young, G. S., Sigman, M., Hutman, T., & Ozonoff, S. (2010). Can family affectedness inform infant sibling outcomes of autism spectrum disorders? *Journal of Child Psychology and Psychiatry*, *51* (9), 1021-1030.
- Sue, D., Sue, D. W. & Sue, S. (2003). *Understanding Abnormal Behaviour* (7th ed.). Boston, MA: Houghton Mifflin Company.
- Swinkels, S. H. N., Dietz, C., van Daalen, E., Kerkhof, I. H. G. M., van Engeland, H., & Buitelaar, J. K. (2006). Screening for Autistic Spectrum in Children Aged 14 to 15 Months. I: The Development of the Early Screening of Autistic Traits Questionnaire (ESAT). *Journal of Autism and Developmental Disorders*, *36*(6), 723-732.
- Thelen, E. (1979). Rhythmical stereotypies in normal human infants. *Animal Behavior*, *27*, 699–715.
- Tsai, L., & Beisler, J. (1983). The development of sex differences in infantile autism. *British Journal of Psychiatry*, *142*(4), 373.
- van der Meulen, B. F., & Smirkosky, M. (1982). *BOS 2-30 Bayley Ontwikkelingsschalen*. Swets en Zeitlinger.
- Ventola, P. E., Klienman, J., Pandey, J., Barton, M., Allen, S., ... Fein, D. (2006). Agreement among four diagnostic instruments for autism spectrum disorders in toddlers. *Journal of Autism & Developmental Disorders*, *36*, 839-847.
- Volkmar, F. R., Szatmari, P., & Sparrow, S. S. (1993). Sex differences in pervasive developmental disorders. *Journal of Autism and Developmental Disorders*, *23*(4), 579–591.

- Watson, L., Baranek, G., Crais, E., Reznick, J. S., Dykstra, J., & Perryman, T. (2007). The First Year Inventory: Retrospective parent responses to a questionnaire designed to identify one-year-olds at risk for autism. *Journal of Autism and Developmental Disorders*, 37(1), 49-61.
- Wetherby, A., & Prizant, B. (2002). *Communication and symbolic behavior scales developmental profile – first normed edition*. Baltimore, MD: Paul H. Brookes.
- Wetherby, A., & Woods, J. (2002). *Systematic observation of red flags for autism spectrum disorders in young children*. Unpublished manual, Florida State University, Tallahassee, FL.
- Wetherby, A. M., Woods, J., Allen, L., Cleary, J., Dickinson, H., & Lord, C. (2004). Early indicators of Autism Spectrum Disorders in the Second Year of Life. *Journal of Autism and Developmental Disorders*, 34(5), 473-493.
- Werner, E., Dawson, G., Osterling, J., & Dinno, N. (2000). Brief report: Recognition of autism spectrum disorder before one year of age: A retrospective study based on home videotapes. *Journal of Autism and Developmental Disorders*, 30(2), 157-162.
- Wimpory, D. C., Hobson, R. P., Williams, J. M. G., & Nash, S. (2000). Are infants with autism socially engaged? A study of recent retrospective parental reports. *Journal of Autism and Developmental Disorders*, 30(6), 525-536.
- Zimmerman, I. L., Steiner, V. G., & Pond, R. E. (1991). *Preschool Language Scale, Third Edition (PLS-3)*. San Antonio, TX: Psychological Corp.
- Zimmerman, I. L., Steiner, V. G., & Pond, R. E. (2002). *Preschool Language Scale, Fourth Edition (PLS-4)*. San Antonio, TX: Psychological Corp.

Zwaigenbaum, L., Bryson, S., Rogers, T., Roberts, W., Brian, J., & Szatmari, P. (2005).

Behavioral manifestations of autism in the first year of life. *International Journal of Developmental Neuroscience*, 23(2-3), 143-152.

Zwaigenbaum, L., Thurm, A., Stone, W., Baranek, G., Bryson, S., ... Sigman, M. (2007).

Studying the emergence of autism spectrum disorders in high-risk infants: methodological and practical issues. *Journal of Autism and Developmental Disorders*, 37(3), 466-480.



## Appendix B

Table 1: Summary of retrospective studies identifying early markers of ASD

<b>Table 1</b>				
<b>Summary of retrospective studies identifying early markers of ASD (2000-2011)</b>				
<b>Retrospective Studies</b>	<b>Under 12 months</b>	<b>12-18 months</b>	<b>18-24 months</b>	<b>24-36 months</b>
Wimpory et al. (2000)			waving, raising arms to be picked up, eye contact, socially directed feelings, turn taking, using noises	communicatively, sociability in play and lap games, referential use of eye contact, offering and giving items to others, pointing and following others pointing
Werner et al. (2000)	Less pointing, showing, looking at others, responding to name, smiling			
Palomo, Belinchon, & Ozonoff, (2006)	response to name and reduced frequency of eye contact or looking at others faces, sharing experiences, interests or attention with others such as pointing and interacting, smiling at others, looking at what others are holding, alternating gaze or joint attention, using verbal			

	communication and increased frequency of unusual postures	
Watson et al. (2007)	Social orientating, receptive communication, social affective engagement	
Saint- Georges et al. (2010)	social, communication, showing shared attention and affect, rigid and repetitive object playing, unusual posturing, less gesturing, less looking at objects held by others, visual fixation and less affective expression, responding to name, looking at others and quality of affect was less consistently reported	poor social interaction, decrease quality of eye contact, less imitation, gaze aversion and less communication gestures

## Appendix C

Table 2: Summary of prospective studies identifying early markers of ASD

<b>Table 2</b>				
<b>Summary of prospective studies identifying early markers of ASD (2000-2011)</b>				
<b>Prospective Studies</b>	<b>Under 12 months</b>	<b>12-18 months</b>	<b>18-24 months</b>	<b>24-36 months</b>
Wetherby et al. (2004)			reciprocal social interaction, unconventional gestures, unconventional sounds and words, repetitive behaviours, restrictive interests and emotional dysregulation	
Zwaigenbaum et al. (2005)	atypicalities in eye contact, visual tracking, disengagement of visual attention, orienting to name, imitation, social smiling, reactivity, social interest and affect, and sensory-oriented behaviours, prolonged latency to disengage visual attention, a characteristic pattern of early temperament, with marked passivity and decreased activity level at 6 months, followed by			

	<p>extreme distress reactions, a tendency to fixate on particular objects in the environment, and decreased expression of positive affect by 12 months, delayed expressive and receptive language, not orienting to name and atypical sensory-oriented behaviors</p>		
Goldberg et al. (2005)			<p>Less frequent levels of shared eye contact, pointing and showing behaviours</p>
Landa and Garrett-Mayer, (2006)	<p>Differences across fine and gross motor, receptive and expressive communication</p>	<p>Visual reception, receptive and expressive communication, fine and gross motor</p>	
Mitchell et al. (2006)	<p>Fewer phrases and gestures, poor communication repertoires</p>		
Loh et al. (2007)		<p>Finger extension, hand to ears, arm shake object,</p>	<p>Finger extension, hand extension, hands to ears, arch head to trunk, arm wave, arm shake noisy</p>

	arm wave, arm wave noisy object, arm bang surface, arm bang object together, trunk movements	object, arm bang surface, arm bang surface with object, trunk movements
Landa, Holman, & Garrett-Mayer (2007)	lower levels of shared positive affect, initiation of behaviour regulation, and initiation of joint attention and they engaged in fewer gestures and sounds, fewer gaze shifts	deficits in social, communication and play behaviours
Garon et al. 2008		lower positive anticipation, higher activity level, low attention shifting, low positive affect, poor regulation of negative emotions, difficulty controlling attention and behaviour (effortful emotion regulation)
Bryson et al. (2009)		“Social-communication, notably a lack of/atypicalities in Eye gaze and shared/joint attention Affect and its regulation (eg, less positive and more negative affect) Social/reciprocal smiling Social interest and shared enjoyment (in absence of physical contact such as tickling) Orienting to name called Development of gestures

(eg, pointing)  
Coordination of different  
modes of communication  
(eg, eye gaze, facial  
expression, gesture,  
vocalization)  
Play, notably  
Reduced imitation of  
actions with objects  
Excessive  
manipulation/visual  
exploration of toys and  
other objects  
Repetitive actions with  
toys and other objects  
Language and cognition,  
notably a lack of/delays or  
atypicalities in  
Cognitive development  
Babbling, particularly  
back-and-forth social  
babbling  
Language comprehension  
and production (eg, odd  
first words or  
unusually repetitive)  
Unusual prosody/tone of  
voice  
Regression/loss of early  
words and/or social-  
emotional  
engagement/connectedness  
Visual/other sensory and  
motor, notably  
Atypical visual tracking,  
visual fixation (eg, on  
lights) and unusual  
inspection of objects  
Underreactive and/or  
overreactive to sounds or  
other forms of sensory  
stimulation  
Decreased activity levels  
and delayed fine and gross  
motor skills

			Repetitive motor behaviors and atypical posturing/motor mannerisms Atypicalities in regulatory functions related to sleep, eating, and attention” (p. 1385)	
Ozonoff et al. (2010)	Decline in eye contact, social smiling, social responsiveness, in particular loss of social communication behaviours	Gaze to faces, social smiling		
Feldman et al. (2011)	Interest in faces, shifts attention to person, mood, response to name, waiting	Interest in faces, shifts attention to person, mood, response to name, waiting, imitates sounds and words	Waiting, imitates sounds and words, coordinates point and gaze	Imitates sounds and words, waiting, imitates actions, coordinates point and gaze, points in response to questions and communicates with words

## Appendix D

## Informed Consent Letter

# Informed Consent Letter

**Project Title:** Development of Young Children with Different Family Histories

**Principal Investigator:**

Dr. Maurice Feldman, Ph.D Professor

Centre for Applied Disability Studies, Brock University

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**Co-Investigator:**

Rebecca Ward, Ph.D Assistant Professor

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**INVITATION**

You are invited to participate in a study that involves research. The purpose of this study is to collect data from parents of second born (or later) infants with different family histories. We are interested in studying children with a variety of family histories that may or may not put them at risk for mental health problems, developmental or seizure disorders.

**WHAT'S INVOLVED**

As a participant, you will be asked to complete a Family Information Questionnaire, the Parent Observation Checklist and the Infant Behavior Summary Evaluation. The questionnaires will ask questions pertaining to your second or later born child in terms of their behaviour and social interaction. The questionnaires can be administered in a variety of ways for your convenience. You can choose to participate in person, online, by email, telephone or mail. We ask that you answer the Parent Observation Checklist and the Infant Behavior Summary Evaluation once per month for three months but you are under no obligation to do so and may withdraw at any time. We expect the first questionnaire session to take no longer than an hour and subsequent sessions to be much quicker. Participation time will vary depending on the mode of administration you choose as well. This research is a small part of a large longitudinal study with Queen's University, in which Dr. Feldman (Principal Investigator) is a co-principal investigator. After the first 3 months, you will be asked to continue in the study to follow your child's development until the age of 3 years. We would appreciate your input if you choose to continue with the research, but you have no obligation to continue and we greatly appreciate the time you have agreed to contribute.

**POTENTIAL BENEFITS AND RISKS**

We hope that parents feel good that their participation in this study will provide data about the early development in children. If parents participate monthly, they will be better able to track their infant's development. Even if the parent does not benefit directly from this study, results from the study will be published and will improve our understanding of the effects of different family histories on the early development of children. It will also allow for the validation of our screening tool and may lead to the development of an early screening protocol for use by physicians and other clinicians for all infants. Thus, participants may feel good about contributing to research that may help other families who may be at risk for mental health problems, developmental or seizure disorders.

There could be a small risk to parents who may become distressed or anxious about the presence or absence of some behaviours in their infants. The Principal Investigator, Prof. Feldman is a clinical child psychologist and any participants who have concerns can feel free to contact him.

### **CONFIDENTIALITY**

All information you provide is considered confidential; your name and contact information will be stored separately from questionnaire respondents. Furthermore, because our interest is in the average responses of the entire group of participants, you will not be identified individually in any way in written reports of this research.

Data collected (questionnaires) will be stored in a locked filing cabinet in a locked office. Access to your name and contact information will be restricted to Dr. Feldman and co-investigators. The data will be secured until July 2012 (when it is anticipated that the larger study with Queen's University will be completed and all data collected and analysed). The data will be disposed by Dr. Feldman by machine shredding all written records, and permanently deleting electronic information from computer hard drives, remote drives and disks.

### **VOLUNTARY PARTICIPATION**

Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time and may do so without any penalty or loss of benefits to which you are entitled. We also ask you if you agree to allow us to or to use your data in a new way (secondary analyses). We also ask you if you would allow us to contact you in the future to ask you if you would be willing to participate in further related studies. Agreeing now to allow us to contact you about future studies does not obligate you to participate in those studies. In regards to the prospective study that participants are welcomed to join, they will be contacted by email or phone and asked if they would like to continue to monitor their child's development, using the same measures and procedures. If they say yes, then they will be told that they will shortly receive a new Brock ethics consent form for continuing in the study.

### **PUBLICATION OF RESULTS**

Results of this study may be published in professional journals and presented at conferences. We will never use any identifying information in any presentations or publications. A follow-up letter will be sent to your mailing or email address when the preliminary study is completed and the data are analyzed. However, if you agree to continue in the longitudinal study, we will wait until your participation is completed (when your child turns 3-years old) before sharing our results with you. We request your patience in this regard because we do not want knowledge of the results to influence responses on the questionnaire. If you would like any feedback at an earlier time, feel free to contact the Principal Investigator.

### **CONTACT INFORMATION AND ETHICS CLEARANCE**

If you have any questions about this study or require further information, please contact the Principal Investigator or the Faculty Supervisor using the contact information provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University (file # 06-109). If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

Thank you for your assistance in this project. Please keep a copy of this form for your records.

**CONSENT FORM**

I agree to participate in this study described above. I have made this decision based on the information I have read in the Information-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I also understand that I may withdraw this consent at any time without penalty.

Name: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Appendix E

Family Information Questionnaire

**Cover Page Information**

Name of Interviewer:

Date of Interview (m/d/y):

Respondent's name:

Respondent's relationship to child:

Family address:

Family's phone number and area code:

Family's email:

Alternate contact name:

Relationship to respondent:

Phone number:

Email:

Child's first name: \_\_\_\_\_ Child's last name \_\_\_\_\_

Child's birth date (m/d/y):

CHILD CODE (child's initials and birth date - mmddyy)

**SCREENING QUESTIONNAIRE**

1. How many biological children do you have? \_\_\_\_\_
2. How old is your youngest child? \_\_\_\_\_
3. Any other children under age 3 that are 2<sup>nd</sup> or later born?
  - a. If YES: ASK if they are interested in completing the questionnaires on both children

(Inclusion Criteria: At least 2<sup>nd</sup> born natural born child to the same mother. 2<sup>nd</sup> or later born must be under 3 years of age.)

**FAMILY INFORMATION QUESTIONNAIRE**

1. Date (month-day-year) \_\_\_\_\_
2. Relationship to the child in the study \_\_\_\_\_
3. Participant child's name \_\_\_\_\_
4. Participant child's date of birth (month-day-year) \_\_\_\_\_

**PARENT/FAMILY INFORMATION**

5. Number of all children and adolescents (up to age 18 years) living in the home: \_\_\_\_\_  
 Age: \_\_\_\_\_ Relationship to participant child \_\_\_\_\_
6. Number of all adults (19 years and over) living in the home: \_\_\_\_\_
7. Present marital status of parents (Check ONE):  
*Married Living together Separated Divorced Widowed*

## 8. Total family income (Check ONE):

<i>Less than \$10,000</i>	<i>\$10,000-\$20,000</i>	<i>\$20,000-\$30,000</i>	<i>\$30,000-\$40,000</i>
<i>\$40,000-\$50,000</i>	<i>\$50,000-\$60,000</i>	<i>\$60,000-\$70,000</i>	<i>\$70,000-\$80,000</i>
<i>\$80,000-\$90,000</i>	<i>\$90,000-\$100,000</i>	<i>more than \$100,000</i>	

**INFORMATION ABOUT MOTHER**

9. Mother's date of birth (month-day-year): \_\_\_\_\_

10. Highest education obtained by mother (Check ONE):

*None High School Trade diploma College University Graduate/Professional*

11. Mother had special education experience when in school (Check ONE):

*No Yes (specify): \_\_\_\_\_*

12. Current occupation of mother: \_\_\_\_\_

13. Mother works (Check ONE):

*No Full-time Part-time Homemaker*

14. In general, how is mother's health? (Check ONE)

*Excellent Very good Good Fair Poor Don't know*15. Are any of the following prevalent within birth Mother's family [Includes mother's parents, siblings, 1<sup>st</sup> cousins and children] (Check all that apply):

- Developmental disabilities

- Learning disorders
- Depression
- Schizophrenia
- Autism
- Attention deficit hyperactive disorder
- Epilepsy
- Pervasive developmental disorder
- Bipolar depression (manic depression)
- Anxiety
- Phobias
- Language disorders
- Chronic medical conditions (such as, allergies or asthma)
- Other \_\_\_\_\_

16. If any of the listed conditions have been present in the mother's family, please indicate who the relation is for each.

#### **INFORMATION ABOUT FATHERS**

17. Father's date of birth (month-day-year): \_\_\_\_\_

18. Highest education obtained by father (Check ONE):

*None High School Trade diploma College University Graduate/Professional*

19. Father had special education experience when in school (Check ONE):

*No Yes (specify): \_\_\_\_\_*

20. Current occupation of father: \_\_\_\_\_

21. Father works (Check ONE):

*No Full-time Part-time Homemaker*

22. In general, how is father's health? (Check ONE)

*Excellent Very good Good Fair Poor Don't know*

23. Are any of the following prevalent within birth father's family [Includes father's parents, siblings, 1<sup>st</sup> cousins and children] (Check all that apply):

- Developmental disabilities
- Learning disorders
- Depression
- Schizophrenia
- Autism
- Attention deficit hyperactive disorder
- Epilepsy
- Pervasive developmental disorder
- Bipolar depression (manic depression)
- Anxiety
- Phobias
- Language disorders
- Chronic medical conditions (such as, allergies or asthma)
- Other \_\_\_\_\_

24. If any of the listed conditions have been present in the father's family, please indicate who the relation is for each.

**PARTICIPANT CHILD INFORMATION (replicate if more than 1 child under age 3)**

25. Child's initials \_\_\_\_\_

26. Child's sex (Check ONE):

- Male
- Female

27. Child's birth order (Specify number): \_\_\_\_\_

28. Child's siblings (Specify numbers for each category)

- a. Younger Brothers \_\_\_\_\_
- b. Younger Sisters \_\_\_\_\_
- c. Older Brothers \_\_\_\_\_
- d. Older Sisters \_\_\_\_\_

29. In general, how is your child's health? (Check ONE):

*Excellent Very good Good Fair Poor Don't know*

If poor, please explain \_\_\_\_\_

30. In general, how is your child's development? (Check ONE):

*Excellent Very good Good Fair Poor Don't know*

If poor, please explain \_\_\_\_\_

31. In general, how is your child's behaviour? (Check ONE):

*Excellent Very good Good Fair Poor Don't know*

If poor, please explain \_\_\_\_\_

32. Does the participant child have any chronic medical conditions such as epilepsy, diabetes, cancer, hearing impairment, allergies or asthma?

Yes No

If Yes, please list \_\_\_\_\_

33. Does the child have any syndrome, developmental or behavioural diagnosis (e.g., Down syndrome, cerebral palsy, Global Developmental Delay, autism, ADHD)?

Yes No

If Yes, please list \_\_\_\_\_

34. Is the participant child taking any medications currently?

Yes No

If Yes, please list \_\_\_\_\_

**PRENATAL AND BIRTH HISTORY OF PARTICIPANT CHILD**

35. Length of pregnancy: full-term \_\_\_\_\_ Premature? (how many weeks): \_\_\_\_\_

36. Any medical complications during **pregnancy**? (Check ONE)

*No Yes (Please specify):* \_\_\_\_\_

37. Any medical complications during **birth**? (Check ONE)

*No Yes (Please specify):* \_\_\_\_\_

38. Birth weight: \_\_\_\_\_

Appendix F

Parent Observation of Early Markers Scale

Parent Observation Checklist

**PARENT INSTRUCTIONS:**

- *This checklist is to be completed on your infant every month, if possible (minimum every 3 months)*
- *The following infant/toddler behaviors are grouped together by topic and are NOT developmentally sequenced.*
- *Over the past week, please indicate with a score from 1-4 whether the child has no difficulty (score 1) to severe problem (score 4) for each item. If you are unsure about how to score an item, you can test it out with your infant/toddler or ask your spouse or other caregivers, where possible.*
- *Depending upon the age of your child not all items will apply; mark N/A (not applicable) if the item is too advanced for your child's age.*

**SCORING**

- *A score of 1 indicates that you have no concern about the behavior and you feel that the infant is developing typically*
- *A score of 2 indicates a mild problem, i.e., child's behaviour is not completely typical of what you expect of his/her age*
- *A score of 3 indicates a moderate problem i.e., child behaviour is concerning, but not as severe as described in (4)*
- *A score of 4 indicates a severe problem that matches one or more of the descriptions provided*

	No evidence of difficulty 1	Mild problem 2	Moderate problem 3	Severe problem 4
1.	<b>NAP TIME</b> Sleeps well at nap time; wakes easily on his/her own	1-----1.5-----2-----2.5-----3-----3.5-----4		Difficult to wake especially for feedings; or excessively light sleeper, need to tip-toe around during infant's nap time
	Comments:			
2.	<b>SLEEP DURATION AT NIGHT</b>	1-----1.5-----2-----2.5-----3-----3.5-----4		Wakes frequently during the night; stays awake for long

	Sleeps at least four hours consecutively during the night; easy to get back to sleep	--4	periods during the night
Comments:			
3.	<b>SLEEP DURATION TOTAL PER DAY</b>  Sleeps at least 10 hours per day (night-time and naps combined)	1-----1.5-----2-----2.5-----3-----3.5----- --4	Sleeps less than 10 hours per day (night-time and naps combined)
Comments:			
4.	<b>ACCEPTS BOTTLE/BREAST FEEDING</b>  Accepts breast or bottle-feeding readily	1-----1.5-----2-----2.5-----3-----3.5----- --4	Has difficulty sucking, or resists or appears to lose interest in feeding
Comments:			
5.	<b>MILK/FORMULA TOLERANCE</b>  Tolerated breast milk or formula well; rarely spit up mild or formula	1-----1.5-----2-----2.5-----3-----3.5----- --4	Could not tolerate breast milk or formula; spit up frequently; needed milk substitute (e.g. soy)
Comments:			
6.	<b>ACCEPTANCE OF NEW FOODS</b>  Accepts transition to <i>new</i>	1-----1.5-----2-----2.5-----3-----3.5----- --4	Strongly resists switch to bottle feeding or introduction of pablum/baby food; strongly resists/refuses

	food readily, e.g., breast to bottle, pablum to puree, new tastes, new textures		new tastes and/or textures
	Comments:		
7.	<b>APPETITE</b> Enjoys a variety of foods and eats an appropriate amount for child's age	1-----1.5-----2-----2.5-----3-----3.5----- --4	Eats and/or drinks small quantity and/ or variety; or has a huge appetite, eats a lot more than expected for his/her age, always wanting food
	Comments:		
8.	<b>CUDDLING</b> Accepts and enjoys cuddling and physical affection	1-----1.5-----2-----2.5-----3-----3.5----- --4	Actively resists being cuddled; dislikes being touched or picked up; or passive, indifferent to being picked up
	Comments:		
9.	<b>DEMANDS PARENT ATTENTION</b> Cries or vocalizes and looks for parent when parent leaves room or parent is occupied	1-----1.5-----2-----2.5-----3-----3.5----- --4	Appears indifferent to parent attention; prefers to be left alone most of the time
	Comments:		
10.	<b>MOOD</b> Easy to please; generally good mood; appears to be a happy child	1-----1.5-----2-----2.5-----3-----3.5----- --4	Difficult to please; frequent colic symptoms; appears to be unhappy and/or irritable child
	Comments:		

11.	<b>SMILING</b> Readily smiles at people during social interactions	1-----1.5-----2-----2.5-----3-----3.5----- --4	No social smile; might smile during play but not directed at people
Comments:			
12.	<b>LAUGHING</b> Laughs readily in social situations; responds to other's laughter	1-----1.5-----2-----2.5-----3-----3.5----- --4	Never laughs in social situations; may appear unaware of or indifferent to other's laughter; may laugh only when alone; other's can't figure out why
Comments:			
13.	<b>ATTACHMENT TO PARENTS</b> Differentiates parents from other adults; may be shy with strangers; cries when left with less familiar adult	1-----1.5-----2-----2.5-----3-----3.5----- --4	Does not differentiate parents from other adults; would happily go to or stay with an adult; does not acknowledge parent's leaving the room
Comments:			
14.	<b>RECOGNITION OF PARENT'S VOICE</b> Turns head toward mother or father's voice when held by another adult	1-----1.5-----2-----2.5-----3-----3.5----- --4	Does not appear to differentiate parent's voice from that of a stranger; no turning to look for parent when child hears parent's voice
Comments:			
15.	<b>PAIN REACTION</b> Reacts to painful event (e.g., fall, cut) by crying or screaming; recovers quickly from mild bumps or discomfort	1-----1.5-----2-----2.5-----3-----3.5----- --4	Does not appear to feel pain in situations when others would find painful; or overreacts to what should be mild bumps or discomfort
Comments:			

16.	<p><b>SEEKS COMFORT WHEN HURT</b></p> <p>Seeks adult comfort when hurt; able to calm down when comforted</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Does not seek out adults when hurt; actively resists comforting when adult initiates; or difficult to calm when upset</p>
<p>Comments:</p>			
17.	<p><b>APPROPRIATENESS OF EMOTIONS</b></p> <p>Crying or laughter is appropriate to the situation</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Displays apparently unmotivated fits of crying or laughter; frequently can't figure out what he/she's crying or laughing about</p>
<p>Comments:</p>			
18.	<p><b>ANTICIPATION TO BEING PICKED UP</b></p> <p>Shows excitement or anticipation when being picked up; raises arms to adult</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Shows no awareness or anticipation of being picked up; does not raise arms to be picked up</p>
<p>Comments:</p>			
19.	<p><b>CONSISTENCY OF RESPONSE</b></p> <p>Shows consistent response to familiar people, situations or places; easy to predict what will please or upset</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Highly inconsistent response to familiar people, situations, or places; difficult to predict reaction; small changes can set off and upset</p>
<p>Comments:</p>			
20.	<p><b>TOLERANCE OF TRANSITIONS</b></p> <p>Accepts transitions from one activity to another easily (e.g., play to meal or bath time)</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Usually becomes very upset during transitions; may tantrum or cry for prolonged period</p>

	Comments:		
21.	<p><b>ATTENTION TO LOUD NOISE</b></p> <p>Turns head toward loud noise right away</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Does not respond to loud noises appears not to hear; or is overly reactive to loud noises and startles easily</p>
	Comments:		
22.	<p><b>RESPONSE TO NAME</b></p> <p>Responds to name by turning eyes and head toward person calling name; prefers human voice over object noise</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Does not respond to name when called; does not look at the caller; may appear deaf to the human voice</p>
	Comments:		
23.	<p><b>EYE CONTACT</b></p> <p>Makes eye contact easily during feeding, bathing etc.</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Never makes eye contact; avoids eye contact all the time</p>
	Comments:		
24.	<p><b>INTEREST IN OBJECTS</b></p> <p>Shows interest in objects that move or make noises</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Is excessively fearful of and tries to avoid certain object that move or make noises (e.g., fans, vacuums)</p>
	Comments:		

25.	<p><b>VISUAL TRACKING-SIDE TO SIDE</b></p> <p>Good visual tracking of an interesting object moved slowly side to side</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- -4</p>	<p>Does not track objects at all when object is slowly moved from side to side</p>
Comments:			
26.	<p><b>VISUAL TRACKING-UP AND DOWN</b></p> <p>Good visual tracking of an interesting object moved slowly up and down</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- -4</p>	<p>Does not track objects at all when object is moved slowly up and down</p>
Comments:			
27.	<p><b>INTEREST IN FACES</b></p> <p>Shows more interest in a person's face than in objects/toys</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- -4</p>	<p>Prefers looking at objects/toys' indifferent to faces or avoids faces</p>
Comments:			
28.	<p><b>SHIFTS ATTENTION TO PERSON</b></p> <p>Shifts attention from object/toy to person's face easily</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- -4</p>	<p>Has great difficulty shifting attention from an object/toy to a face</p>
Comments:			
29.	<p><b>SHIFTING ATTENTION BETWEEN EVENTS</b></p> <p>Shifts attention readily from one toy or event to another</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- -4</p>	<p>Gets "stuck" on one toy or activity and may not even notice when another toy or activity is introduced</p>
Comments:			
30.	<p><b>OBJECT PERMENANCE</b></p>	<p>1-----1.5-----2-----2.5-----3-----3.5-----</p>	<p>Immediately loses interest when object/toy is out of</p>

	Searches for object/toy when hidden by adult or lost from view	--4	view, does not search for lost object/toy
Comments:			
31.	MUSCLE TONE  Shows good muscle tone when sitting, rolling, crawling, or grasping objects	1-----1.5-----2-----2.5-----3-----3.5----- --4	Shows very poor muscle tone when sitting or moving; floppy baby; rarely initiates movement
Comments:			
32.	AGILITY IN MOVEMENT  Developmentally appropriate movement: crawls, walks, runs, climbs smoothly	1-----1.5-----2-----2.5-----3-----3.5----- --4	Awkward in moving; may adopt unusual postures or gait (e.g., toe-walking); appears to move like a younger child
Comments:			

33.	<p><b>EXPLORING NEW ENVIRONMENTS</b></p> <p>Enjoys exploring new environments and new toys</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Shows no interest in new places or new toys; or actively tries to leave new place or discard new toy</p>
<p>Comments:</p>			
34.	<p><b>APPROPRIATE TOY PLAY</b></p> <p>Plays appropriately with toys; explores, uses toy as intended</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Plays inappropriately with toys; throws, destroys, plays with just one part not as intended; highly repetitive and stereotyped play</p>
<p>Comments:</p>			
35.	<p><b>ATTENTION SPAN</b></p> <p>Plays with toys for amount of time appropriate to age (several minutes in infancy; gradually expanding with age to 15-30 min by age 2)</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Attention is much briefer than expected given child's age; only able to focus for longer periods on TV, video, or limited set of objects of special interest</p>
<p>Comments:</p>			
36.	<p><b>RANGE OF INTEREST IN TOYS</b></p> <p>Shows interest in variety of toys appropriate of child's age</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Very limited range of interest in only one or two objects or toys not always appropriate to age</p>
<p>Comments:</p>			
37.	<p><b>TOY VS. BODY PLAY</b></p> <p>Prefers to play appropriately with toys on own or with other</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Prefers to lay with his/her own body, using whole body movements (e.g., spinning, rocking) or small body movement (e.g., hand gazing, flapping)</p>
<p>Comments:</p>			
38.	<p><b>BUILDING TOWERS</b></p>	<p>1-----1.5-----2-----2.5-----3-----3.5-----</p>	<p>Can not build tower even with adult assistance; shows</p>

	Builds towers with at least 3 blocks without adult assistance	--4	no interest and may resist tower building
Comments:			
39.	IMITATES ACTIONS  Readily imitates actions of others with toys or imitates body actions when asked "to this".	1-----1.5-----2-----2.5-----3-----3.5-----4 --4	Never imitates action of others with toys or body actions of others when asked "to this".
Comments:			
40.	IMITATES SOUNDS OR WORDS  Readily imitates sounds or words of others, spontaneously or when asked "say ___"	1-----1.5-----2-----2.5-----3-----3.5-----4 --4	Never imitates sounds or words of others, spontaneously or when asked "say ___"
Comments:			

41.	PRETEND PLAY  Able to pretend play, as in making tea in toy cup, feeding doll with spoon, pushing toy car with appropriate sounds	1-----1.5-----2-----2.5-----3-----3.5-----4 --4	No evidence of pretend play; may use toy cups or spoons as if real; may push car without sounds or pretend actions; no evidence that child is pretending
Comments:			
42.	ACTIVITY LEVEL  Shows appropriate activity level during unstructured play	1-----1.5-----2-----2.5-----3-----3.5-----4 --4	Appears lethargic or overly passive during unstructured play; or is overly excited and hyperactive during unstructured play
Comments:			
43.	CRIES/VOCALIZES TO	1-----1.5-----2-----2.5-----3-----3.5-----4	Does not appear to be aware of own needs; does not cry

	<p><b>EXPRESS NEEDS</b></p> <p>Easily expresses needs with cries and vocalizations (hungry, wet, soiled or sleepy)</p>	<p>--4</p>	<p>when hungry or in discomfort</p>
<p>Comments:</p>			
44.	<p><b>SOCIAL GAMES</b></p> <p>Enjoys playing social games (e.g., peek a boo, being swung, bounce on adult knee, songs, chase, ring-around- the-rosey)</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Indifferent to or avoids social games; resists by looking away, pushing away, or moving away when game initiated by others</p>
<p>Comments:</p>			
45.	<p><b>POINTING TO REQUEST</b></p> <p>Uses index finger to point to ask for something; may use words along with point</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Does not point to make request; may use whole hand to reach toward the object of interest</p>
<p>Comments:</p>			
46.	<p><b>POINTING TO SHARE INTEREST</b></p> <p>Uses index finger to point to indicate interest in something out of reach</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Does not point to interesting object to direct your attention; may look toward or reach toward</p>
<p>Comments:</p>			
47.	<p><b>COORDINATES POINT AND GAZE</b></p> <p>When pointing to something child wants, checks that adult is looking in same direction</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Point toward object he/she wants, but does not check to make sure adult is looking</p>
<p>Comments:</p>			
48.	<p><b>POINTS IN RESPONSE</b></p>	<p>1-----1.5-----2-----2.5-----3-----3.5-----</p>	<p>When asked a where</p>

	<p><b>TO QUESTIONS</b></p> <p>When asked “Where’s the light (or other object out of reach)?” points with full hand reach or, later with index finger</p>	<p>--4</p>	<p>question, does not look toward object; never attempts to point to or each toward the object requested</p>
<p>Comments:</p>			

49.	<p><b>FOLLOWS ADULT POINT WITH GAZE</b></p> <p>Looks toward an object when the adult points and says “look, there’s ____!”</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Does not turn head in direction of adult point when adult points and says “Look there’s a ____!”</p>
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Comments:

50.	<p><b>FOLLOWS SIMPLE DIRECTION</b></p> <p>When asked to do something simple, can respond appropriately when adult does not point (get your shoes, give me the dolly)</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Not able to understand or follow any adult direction unless adult uses gestures or physically prompts the child to follow through</p>
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Comments:

51.	<p><b>INTEREST IN BIRTHDAYS/PRESENTS</b></p> <p>Shows interest or excitement when he/she or sibling given birthday cake or present</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Appears indifferent when given a birthday cake or presented with a present</p>
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Comments:

52.	<p><b>BRINGING TOY TO REQUEST</b></p> <p>Brings toys/objects over to adult to request assistance or permission</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Never brings toys or objects to an adult to request assistance or permission</p>
<p>Comments:</p>			
53.	<p><b>BRINGING TOY TO SHARE ATTENTION</b></p> <p>Bring toys/objects over to adult to show or share joint attention</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Never brings toys to show adult or to share going attention</p>
<p>Comments:</p>			
54.	<p><b>WAITING</b></p> <p>Tolerates brief wait before needs can be met; remains calm but expectant while waiting</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Cannot tolerate any wait to have needs met; easily frustrated; quick to cry or tantrum if needs are not met immediately</p>
<p>Comments:</p>			
55.	<p><b>WAVES BYE-BYE</b></p> <p>Waves bye-bye when someone is leaving the home, without prompts to wave</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Indifferent to visitors leaving; may resist prompts to wave bye-bye</p>
<p>Comments:</p>			
56.	<p><b>GREETINGS</b></p> <p>Acknowledges parents after brief period of absence with unprompted approach to smile, give or receive a hug, and/or says "hi"</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Indifferent to parents when returning after period of absence; does not acknowledge with greeting, smile or hug; may resist parent's greeting.</p>
<p>Comments:</p>			

57.	<p><b>INTEREST IN PEERS</b></p> <p>Shows interest in the play of other children or siblings; watches other children playing</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Shows no interest in the activity of other children; ignores them as if they were not present</p>
<p>Comments:</p>			
58.	<p><b>PLAY WITH PEERS</b></p> <p>Appropriate level of engagement with play side by side with same set of toys)</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>No interest in playing with or near siblings or peers; may do some chase or tickles with sibs, but won't share toys or materials; moves away from peers/sibs</p>
<p>Comments:</p>			
59.	<p><b>COORDINATE GESTURES WITH COMMUNICATION</b></p> <p>Expresses needs easily by combining gestures and vocalizations or speech</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Frequently frustrated in communicating needs; resorts to screaming, crying, tantrums, etc.; or does not persist, walks away when not understood the first time</p>
<p>Comments:</p>			
60.	<p><b>COMMUNICATES WITH WORDS</b></p> <p>Consistently uses understandable words to communicate needs and interests</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Does not have any words to express needs or interests; uses gestures and vocalizations only</p>
<p>Comments:</p>			
61.	<p><b>CONVENTIONAL USE OF WORDS</b></p> <p>Uses conventional. common words or phrases</p>	<p>1-----1.5-----2-----2.5-----3-----3.5----- --4</p>	<p>Uses a lot of idiosyncratic, echolalic or made-up words and phrases to express needs and interests</p>

	to express needs and interest		
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