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On Becoming Socially Competent Communicators: The Challenge for Children with Fetal Alcohol Exposure

Truman E. Coggins

Center on Human Development and Disability

University of Washington

Lesley B. Olswang

Speech and Hearing Sciences

University of Washington

Heather Carmichael Olson

Psychiatry and Behavioral Sciences

University of Washington

Geralyn R. Timler

Department of Communicative Disorders

University of Rhode Island

Please address correspondence to:

Truman E. Coggins
Center on Human Development and Disability
University of Washington
Seattle, Washington 98195
Email: tec@u.washington.edu
Phone: (206) 685-2530
Fax: (206) 543-5771

More than a generation has passed since fetal alcohol syndrome (FAS) was formally identified as a birth defect (Jones & Smith, 1973). Much of the information that has accumulated over the past 30 years has focused on describing characteristic features of the syndrome and demonstrating the teratogenic effects that prenatal alcohol exposure can have on fetal development (see Carmichael Olson, Morse & Huffine, 1998; Mattson & Riley, 1998; Thomas, Kelly, Mattson & Riley, 1998; Streissguth, 1997). Clinical and epidemiological data in humans (see Driscoll, Streissguth & Riley, 1990), paralleling a large body of experimental animal research (see Astley, Magnuson, Omnell & Clarren, 1999), reveal that alcohol exposure has a broad range of deleterious effects on growth and development. High levels of prenatal alcohol exposure can interfere with the developing brain at multiple levels and cause lifelong disabilities (Streissguth, Barr, Kogen & Bookstein, 1997).

Clinical researchers have explored developmental outcomes of fetal alcohol exposed children. The results reveal a population of children who seem less adept than their age peers at benefiting from experience, who struggle to keep track of important pieces of information, who have difficulty understanding logical consequences and, not surprisingly, experience remarkable difficulty during social interactions (Kleinfeld & Wescott, 1993; Spohr, Willms & Steinhausen, 1993; Thomas, Kelly, Mattson & Riley, 1998). The social and behavioral problems appear to become more pronounced during the school years and coincide with problems in adaptive behavior and secondary disabilities such as mental health problems and educational failures (Streissguth, 1997)

Investigators, clinicians and parents have identified a variety of language problems in fetal alcohol exposed children (see Carmichael Olson, Morse & Huffine,

1998). The findings from several recent studies at the University of Washington suggest that children with significant prenatal alcohol exposure have compromises in their interpersonal uses of language, particularly when confronted with the demands associated with more sophisticated social interactions (Coggins, Friet & Morgan, 1998; Olswang, Coggins, & Timler, 2001; Timler, 2000; Timler & Olswang, 2001). These findings add further support to the notion that children with social problems often present with co-occurring conditions that include language problems (Guralnick, 1999; Redmond & Rice, 1998; 2002). The findings also suggest that the social communicative abilities of children with high levels of prenatal alcohol exposure may vary as a function of environmental demands.

The ability to use language appropriately in different contexts is critical for social success. To date, research with children who have been exposed to high levels of prenatal alcohol has largely ignored this basic tenet of language acquisition. The purpose of this paper is to present a social communicative framework for understanding and examining why these children have such difficulty using language interpersonally. To create this framework, we first present demographic and descriptive data. We also briefly consider the challenges that clinicians and researchers have routinely encountered diagnosing children who have been exposed to alcohol in utero. We then summarize the findings from a variety of investigators who have explored the cognitive, social and language abilities of this clinical population. Building on this information, we then argue that deficits in these areas create special problems in the way children communicate during social interactions. Based on this argument, we present the reader with a conceptual framework for considering social communication competence. The

framework provides the basis for researching and clinically examining the social communicative competence of children with prenatal alcohol exposure.

Incidence, Identification and Inclusion

Incidence

Alcohol is the most frequently ingested teratogen in the world (Streissguth, 1997). In the United States, data from the National Co-morbidity Study indicates that one in four people between the ages of 15 and 54 have a substance abuse disorder at some point in life. Of all individuals with a substance abuse disorder, a striking 88 per cent have an alcohol disorder with or without other drug involvement. Moreover, men and women in their peak childbearing years (i.e., ages 18 to 34) are two to four times more likely to have a DSM-IV alcohol dependence diagnosis than are individuals in other age ranges (Zucker, Fitzgerald, Refior, Puttler, Pallas & Ellis, 2000). Because so many women drink alcohol during pregnancy, disabilities associated with alcohol have been estimated to occur in as many as six per thousand live births (Institute of Medicine [IOM], 1996). Using this estimate, 2000-12,000 of the projected four million children born each year in the United States are likely to have an alcohol spectrum disorder. The incidence of disorders linked to alcohol is greater than that of children born with chromosomal disorders, metabolic or exocrine disorders, or specific neurological disorders (Plumridge, Bennett, Dinno & Branson, 1993; Streissguth, 1997).

Identification

Alcohol is a neurobehavioral teratogen that can cause permanent defects in the structure and/or function of the central nervous system (CNS). The timing, quantity

and/or pattern of maternal drinking can impact CNS development (Astley, Magnuson, Omnell & Clarren, 1999). Sampson and colleagues (1997) demonstrated that maternal drinking patterns associated with the highest risk to the developing fetus are those in which drinking occurs early in pregnancy and in which "binge" drinking occurs. Prenatal alcohol exposure can interfere with the developing brain at multiple levels and alter the coordinated developmental schedule of the entire central nervous system (Carmichael-Olson, Morse & Huffine, 1998).

Teratogenic alcohol exposure has a broad range of individually variable effects. For example, while virtually all children exposed to teratogenic doses of alcohol have alterations in brain functioning (Astley & Clarren, 2000), a sizable majority have IQ scores within the normal range (Carmichael Olson, Morse & Huffine, 1998). Further, the interpersonal interactions displayed by children with FAS and associated clinical conditions range from mildly impaired (e.g., difficulty interacting with peers) to severely abnormal (e.g., physical aggression against others) (Roebuck, Matson, & Riley, 1999; Streissguth et al, 1997; Timler, 2000; Thomas et al, 1998). Finally, notable variability occurs in the linguistic performance of these children and their use of language for communicative purposes (Coggins, Friet and Morgan, 1998). This means that children with high levels of prenatal alcohol-exposure are a heterogeneous group, not unlike other clinical populations, with varying levels of compromise that create a series of outcomes.

The effects of prenatal alcohol exposure fall on a continuum with fetal alcohol syndrome (FAS) at one end and relative normal growth and development towards the other. Interestingly, most children exposed to alcohol during gestation do not present with the complete fetal alcohol syndrome. The National Institute on Alcohol and

Alcoholism (1997) has estimated that even among children with significant prenatal exposure histories, there are approximately three times as many children who manifest a partial expression of the FAS condition, as there are children with the complete syndrome. Over the years, a variety of diagnostic terms have been introduced to characterize children with prenatal alcohol exposure do not meet the complete FAS criteria. These terms have included "fetal alcohol effects" (FAE) (Clarren & Smith (1978), "alcohol-related neurodevelopmental disorders" (ARND) (IOM, 1996), "alcohol-related birth defects" (ARBD) (Sampson, Streissguth, Bookstein, et al, 1997) and, most recently, "fetal alcohol spectrum disorders" (O'Malley & Hagerman, 1998).

Numerous behavioral characteristics and associated physical features occur between the ends of this alcohol continuum. Mattson & Riley (1998) aptly note that the impressive range of clinical conditions is "representative of the continuous nature of alcohol's behavioral teratogenicity" (p. 279). Because FAS represents only one discrete point on this continuum, it is imperative for researchers and clinicians to evaluate the impact of prenatal alcohol on all exposed children.

Inclusion

FAS is widely regarded as the most recognizable teratogenic effect of prenatal alcohol exposure. This birth defect syndrome is characterized by abnormalities in three areas (Rosett & Weiner, 1984):

1. Prenatal and/or postnatal growth retardation -- Below the 10th percentile for weight and/or length when corrected for gestational age.

2. A set of minor facial anomalies -- Specifically, short palpebral fissures, a long and flattened philtrum and thin upper lip.

3. Brain dysfunction – Alterations include neurological abnormality, developmental delay, structural abnormalities or brain malformation (found through brain imaging)

Trained clinicians, dysmorphologists or clinical geneticists have little difficulty in making the diagnosis of FAS when "anomalies in growth, face and brain are extreme and the alcohol exposure is conclusive and substantial" (Astley & Clarren, 2000, p. 400). However, as noted earlier, the clinical features associated with prenatal alcohol exposure are rarely "fully" present or "altogether" absent. Nominal scales have traditionally been used to capture differences in the growth, facial morphology and brain functioning. In fact, virtually all of the investigations reviewed in the following section have used nominal scales. Unfortunately, the terms that investigators and clinicians have used to identify children with prenatal alcohol histories, particularly FAE, ARND and ARBD, lack precision and equivalence.

In an attempt to reliably diagnose this clinical population, an interdisciplinary research team at the University of Washington has introduced a new methodology for examining the spectrum of disabilities present among children with fetal alcohol exposure (Clarren, Carmichael Olson, Clarren & Astley, 2000). The "4-Digit Diagnostic Code" is a descriptive, case-defined approach that uses quantitative scales to measure and report outcomes (Astley and Clarren, 2000; Astley and Clarren, 2001; Clarren, Carmichael Olson, Clarren & Astley, 2000). The 4-Digit Diagnostic Code is presented in Figure 1.

Figure 1 about here

The four digits of the diagnostic code reflect the magnitude of expression of key FAS features. These features include: 1) growth deficiency; 2) facial phenotype; 3) brain dysfunction or damage; and 4) teratogenic exposure to alcohol. A "1" on any scale characteristic signals a finding within the normal range. In contrast, a "4" reveals a finding consistent with confirmed cases of FAS. Scores of "2" or "3" represent intermediate steps between average and atypical. Each four-point scale thus reflects the degree of confidence "that the sought FAS characteristic is present " (Clarren et al., 2000).

The alcohol exposure scale is based on dose exposure patterns that cause fetal damage in animal models. An example of a "4" on this scale would be a woman who consumed enough alcohol to cause drunkenness on a weekly basis throughout the first trimester of pregnancy. The system also includes rating for prenatal (e.g., nutrition, prescription and non-prescription medications) and post-natal (e.g., physical or sexual abuse) co-morbidities in order to account for other developmental influences.

While FAS is a recognizable syndrome, the diagnosis cannot be reliably established by one professional on the basis of a single distinctive feature or laboratory test (Carmichael et al, 1998). The spectrum of individuals with fetal alcohol exposure has made differential diagnosis a challenging proposition and one that is most likely accomplished in the context of an interdisciplinary team assessment (Clarren et al. 2000). To increase the accuracy of characterizing the full spectrum of disabilities associated with prenatal alcohol exposure, several research teams at the University of Washington have used the quantitative measurement scales and specific case definitions of the 4-Digit

Diagnostic Code (Astley, Clarren & Stachowiak, 2001; Carmichael Olson, Gendler, Kraegel, Rosengren, Clarren & Astley, under review; Timler, Olswang & Coggins, in preparation). However, most investigators have yet to consider this approach for studying children who show some, but not all, of the features of the full FAS syndrome. Future investigations will establish the clinical utility of using quantitative scales in measuring and reporting different behavioral outcomes as well as designing differential interventions.

Behavioral Phenotype

Abnormal brain development is regarded as the most debilitating outcome associated with high prenatal alcohol exposure (Carmichael Olson, Morse & Huffine, 1998; Carmichael Olson, Feldman, Streissguth, Sampson & Bookstein, 1998). Children with conditions associated with fetal alcohol exposure exhibit diminished cognitive capacity, atypical neuropsychological functioning, and remarkable social problems (Coles et al., 1997; Mattson and Riley, 1998; Streissguth, Barr, Kogan, & Bookstein, 1996). The difficulty in reasoning and problem-solving has led some to characterize these children as "living in a new world each day" (Kleinfeld & Westcott, 1993).

Cognitive

Intellectual Functioning. Interestingly, mental retardation is not a defining feature of an alcohol spectrum disability. While overall intelligence can be compromised, the majority of individuals with full or partial expression of FAS have intellectual functioning broadly within the normal range. Streissguth and her colleagues (1996) examined the cognitive abilities of 473 individuals with FAS and clinical conditions associated with prenatal alcohol exposure. Primary disabilities were documented with an

age appropriate *Wechsler* intelligence scale. The investigators found that 73% of individual with the full expression of FAS, and 91% of individuals with high levels of prenatal alcohol exposure, performed broadly within the average range. Mean IQ for the former group was 79 (range 29-120) whereas the latter group attained a mean IQ of 90 (range 42-142).

Neuropsychological Functioning. A growing number of neuropsychological investigations have provided more specific descriptions of FAS and clinical conditions associated with heavy prenatal alcohol exposure (Coles, Platzman, Raskind-Hood, Brown, Falek & Smith, 1997; Conry, 1990; Janzen, Nanson & Block, 1995; Nanson, 1990). Virtually all individuals exposed to teratogenic levels of alcohol show specific cognitive deficits, even those with IQs in the normal range (Kerns, Mateer & Streissguth, 1997). Findings from executive function testing have revealed some commonalties in neuropsychological profiles. Compromises in concept formation and planning, response inhibition and self-regulation have been documented (Jacobson & Jacobson, 1977; Kodituwakku, Handmaker, Cutler, Weathersby & Handmaker, 1995; Kopera-Frye, Dehaene & Streissguth, 1996; Mattson, Goodman, Caine, Delis & Riley, 1999). Researchers have also identified deficits in attention, memory and learning (Coles, et al, 1997; Mattson & Riley, 1998; Uecker & Nadel, 1996). Mattson & Riley (1998) have argued that not only are attention deficits frequently observed, they do not appear to resolve over time. Hyperactivity, frequently reported in younger alcohol exposed children, appears to manifest itself in adolescence as problematic social behavior (National Institute on Alcohol and Alcoholism, 1997).

Several investigators have reported processing limitations constrain the amount of information fetal alcohol exposed children can manipulate when solving complex problems. Kodituwakku and his colleagues (1995) investigated the performance of 10 school-age children and adolescents with high prenatal alcohol exposure and 10 control peers, on difficult puzzles that involved manipulating information in memory. The subjects were matched on receptive vocabulary. The participants with alcohol exposure demonstrated "severely impaired performances" on tasks that required them to retain, manipulate, and manage more complex amounts of information. In a related study, Carmichael Olson, Feldman, Streissguth, Sampson & Bookstein (1998) also found difficulties in processing speed and accuracy in nine adolescents with FAS. Kerns, Don, Mateer and Streissguth (1997) administered a battery of intellectual and neuropsychological tests to 16 young adults with clinical conditions associated with prenatal alcohol exposure. Half the subjects had full scale IQs well within the normal range of intellectual functioning (range 90-118). Despite their average IQs, all eight subjects had remarkably lower performance levels than expected on tasks that required higher levels of processing. Collectively, these findings suggest that processing constraints may compromise planning and decision-making of children with high prenatal alcohol exposure.

Processing limitations may also interfere with social performance and language performance. Timler, Olswang, and Coggins (under review) assessed the social and neuropsychological development of three school-aged children with FAS. To document social competence and adaptive functioning, the investigators had the parents of these children complete the *Social Skills Rating System (SSRS)* (Greshem & Elliot, 1990). The

SSRS is "a broad assessment of social behaviors that can affect teacher-student relations, peer acceptance and academic performance" (p. 1). The parents rated their respective children as having remarkable difficulty interacting effectively, for example asking permission before using another person's property or controlling one's temper in conflict situations. As a result, the three children were enrolled in a treatment project designed to improve their effectiveness in solving social conflicts. As part of the pre-intervention assessment, the *Developmental Neuropsychological Assessment (NEPSY)* (Korkman, Kirk, & Kemp, 1998) was administered to each child. The *NEPSY* examines processing abilities considered critical for learning. The results of the *SSRS* and *NEPSY* are presented in Figure 2.

Insert Figure 2 about here

The standard scores of all three children on the Problem Behavior Domain of the *SSRS* placed them in the "clinical range". Results of the *NEPSY* revealed that the three children demonstrated an array of processing deficits. These findings are consistent with the variable processing abilities reported by Kodituwakku and colleagues (1995), Carmichael Olson and colleagues (1998) and Kerns and colleagues (1997). Timler and Olswang (2001) have also suggested that processing limitations may interfere with both social performance and complex language performance of children with FAS, especially as environmental demands increase.

Social

A diverse collection of social problems has been reported for children with prenatal alcohol exposure. The evidence has been gathered from three different perspectives: 1) parental report (e.g., Caldwell, 1993; Dorris, 1989; Wright, 1992); 2); case study (e.g., Rathbun, 1993); and, 3) controlled clinical investigations (e.g., Carmichael Olson, Morse & Huffine, 1998; Thomas, Kelly, Mattson & Riley, 1998; Timler, 2000). All three lines of inquiry have documented the difficulty these children have in establishing and maintaining social relationships. Overall, it appears that many of the social problems that are manifest exceed what would be expected for IQ level. Moreover, the evidence suggests that these problematic behaviors become more challenging as children grow older and social demands increase.

Hinde (1993) has observed that children with alcohol spectrum disorders have "a hard time figuring out what is going on in social life and how they should behave in different situations" (p. 139). Caldwell (1993) has noted that children with prenatal alcohol exposure also seem to have genuine difficulty anticipating the consequences of their actions, which is compounded by the seeming inability to empathize.

Clinical researchers have also documented an array of social problems in this population. Steinhausen and colleagues (1993) investigated 158 subjects with FAS and prenatal alcohol exposure who ranged in age from three to 18. The Steinhausen research team followed their subjects for various intervals, ranging from three to ten years. During the study, caregivers and teachers completed several adaptive behavior measures during the school-age years. Compared to the normative sample, Steinhausen's subjects were deficient when it came to solving social problems. Moreover, these deficits were consistent over time and observed by both the subjects' parents and teachers. The limited

"social savvy" displayed by this clinical population seriously compromised their interpersonal interactions, social uses of communication and placed them at heightened risk for "secondary disabilities", such as mental health problems, disruptions in school or employment and legal trouble (Streissguth, Barr, Kogan & Bookstein, 1996).

Streissguth and colleagues (1997) have provided evidence from a large cohort that links social problems with heavy prenatal alcohol exposure. The research team interviewed the caregivers of 415 participants with alcohol spectrum disorders between the ages of six and 51 to determine the nature and prevalence of "secondary disabilities". The Streissguth team defined "secondary disabilities as problems in lifestyle and daily function believed to be a consequence of primary cognitive difficulties. Mental health problems were found in 94% of the sample while 60% of the older subjects experienced disrupted school experiences. Closer examination of caregiver interview data for 80 adolescent and adult subjects revealed more than 50% of the participants had limited ability to use language to manage socially frustrating experiences. Not surprisingly, all of these subjects reported employment difficulties.

Social problems associated with teratogenic levels of prenatal alcohol exposure are not solely the result of decreased cognitive functioning (Streissguth, Barr & Kogan & Bookstein, 1996; Thomas, Kelly, Mattson & Riley, 1998). Thomas and colleagues (1998) compared the social behaviors of 15 children with the complete expression of FAS to 15 children with similar verbal IQ scores (VIQ), and 15 typically developing controls (TDC), all between the ages of 5;7 and 12;11 years. Social behaviors were measured with the *Vineland Adaptive Behavior Scales-Summary Version (VABS)* via interviews with caregivers. The research team found significant between-group

differences on the VABS, with TDC>VIQ>FAS. Differences persisted even when socioeconomic status was controlled. An inspection of the Socialization subtest of the *VABS* revealed that "interpersonal relationships" was the most substantially impaired area of Socialization. Further, there was a significant positive correlation between age and performance for the FAS participants but not for the other two groups (i.e., VIQ and TDC). Thomas and colleagues argued that socialization deficits in children with FAS went beyond what could be explained by lower IQ. They suggested that these children were not simply developmentally delayed in their social skills, as would be the case if they continued to lag a few years behind same-age peers. Instead, they reasoned that "children with FAS appear to plateau in social abilities at about the 4- to 6-year level, which suggests arrested development" (p. 532).

Timler (2000) documented the social difficulties of nine children with high levels of prenatal alcohol exposure through the use of parent and teacher reports. She examined social behaviors using two norm-referenced behavioral rating scales of social competence: *Social Skills Rating System (SSRS)* (Gresham & Elliot, 1990) and *Taxonomy of Problematic Social Situations for Children (TOPS*) (Dodge, McClaskey & Feldman, 1985). As noted above, the *SSRS* uses rating scales to identify children at risk for social behavior difficulties and poor academic performance. The *TOPS* is a 44-item, five point rating scale to identify the presence and severity of children's social difficulties across six distinct situations: 1) peer entry (e.g., child does not attempt to join a group at recess); 2) response to peer provocation (e.g., child responds aggressively to peer teasing); 3) response to failure (e.g., child does not ask for assistance when needed); 4) response to success (e.g., child performs better than a peer at a game); 5) social

expectations (e.g., child does not cooperate with peers during group activity); and, 6) teacher expectations (e.g., child does not follow classroom directions).

Using these scales, Timler compared the social skills of nine children with FAS and clinical conditions associated with prenatal alcohol exposure to nine typically developing peers matched for age, gender, and receptive vocabulary. None of the children in Timler's study had been formally diagnosed with a social-emotional or behavioral disorder. Teachers completed the *SSRS* and *TOPS*, and parents rated the occurrence of problem behaviors using the *SSRS*. The data revealed significantly higher scores for the alcohol-exposed group from their parents and teachers on the Problem Behaviors domain of the *SSRS*. Further, compared to typically developing peers, the participants with high prenatal alcohol exposure had significantly higher scores on four situation subscales on the *TOPS*. The subscales included peer entry, response to peer provocation, response to failure and social expectations. These results imply an important possibility: that peer-related social problems observed in children with prenatal alcohol exposure may reflect a compromised ability in deploying effective problem-solving strategies rather than an underlying social-emotional/behavioral disorder (Redmond & Rice, 1998).

In an effort to describe these social problems further, Timler (2000) presented 12 *social conflict vignettes* to her nine subjects with fetal alcohol exposure and nine typically developing controls. Each hypothetical vignette described a conflict with a peer that the children were to resolve. A sample conflict vignette follows.

"You and some friends are playing soccer. It is a close game and you are excited to see who will win. The soccer ball flies off the field and another friend who is not in the game runs to get it. She/he will not give the ball back to you."

Children were shown each vignette via computer presentation then asked an open-ended statement to elicit strategies for resolving the conflict (i.e., "Tell me all the things you can say or do!) Following the open-ended statement, they were presented with possible choices of strategies for resolving the conflict (i.e., "Tell me what is the first thing you would say or do." "If you said or did *child's "first" strategy here*, what will your friends say or do?" Finally, they were asked what they hoped to accomplish with the strategies (e.g., "Tell me why you would say or do that.").

Results indicated no significant differences in the goals that the nine children selected. However, significant between group differences were found in the strategies selected to achieve those goals. In the open-ended condition, typically developing children selected more *pro-social* strategies. Pro-social strategies included accommodating the needs of both parties, suggesting ways to compromise, asking for more information, or making polite requests. The nine children in the experimental group selected more *anti-social* strategies (hostile/coercive comments, assertive behaviors, adult-seeking and passive remarks) more often than their matched peers. Further, all but one typically child developing produced more pro-social strategies than other categories; conversely, eight of the nine children with an alcohol spectrum disorder produced more anti-social strategies than pro-social strategies. In the forced-choice condition, again the typically developing children produced significantly more pro-social conflict resolution strategies. The alcohol-exposed children, on the other hand, produced

significantly more hostile-coercive strategies. These results suggest that children with high prenatal alcohol exposure are likely to have considerable difficulty with the social abilities necessary to resolve social conflicts, specifically those involved in strategy selection.

Language and Social Communication

To date, the preponderance of evidence regarding language behavior in this clinical population has been gathered using standardized, norm-referenced tests (Abkarian, 1992; Becker, Warr-Leeper & Leeper, 1990; Church, Eldis, Blakley & Bawle, 1997; Fried, O'Connell & Watkinson, 1992; Gentry, Griffith & Dancer, 1998; Jazen, Nanson & Block, 1995). The overall goal of these studies has been to determine how well children with teratogenic levels of prenatal alcohol exposure comprehend and/or produce the form (i.e., syntax, morphology and phonology) and content (i.e., semantics) of their language. While the findings from these investigations have revealed a variety of language limitations, no core deficit or identifiable profile has yet emerged.

A few researchers have used non-standardized, criterion-referenced measures to explore the language performance of children with FAS and related clinical conditions. Rather than concentrating on the structural aspect of language in contrived contexts, Hamilton (1981) and Coggins, Friet & Morgan (1998) considered language within social contexts . The collective findings from these investigations suggest that children with FAS have difficulty using language appropriately as context variables increase. If substantiated, this finding may help investigators to interpret performance variability in the clinical and experimental literature.

In one of the better-controlled investigations, Becker and colleagues (1990) administered a battery of standardized language tests to six prenatal alcohol exposed Native American Indian (NAI) children with six non-exposed NAI children. The mean age of the alcohol exposed group was 6;5 years (range: 4;8 – 9;4 years) while the mean age of the non-alcohol exposed group was 5;7 years (3;7 – 6;7 years). Participants were also matched on a measure of nonverbal intelligence. The investigators completed four standardized language measures: *Test of Auditory Comprehension of Language*, *TOKEN Test*, *Illinois Test of Psycholinguistic Abilities* and the *Clinical Evaluation of Language Fundamentals*. The investigators found several quantitative differences in the semantic and syntactic abilities of the alcohol exposed children when compared to typically developing peers matched for chronological age. The youngsters with high prenatal alcohol exposure did not comprehend as many single words, morphological structures or syntactic forms as the non-alcohol exposed controls. Further, these children generated fewer accurate and complete sentences in their spontaneous productions. However, when the investigators compared the alcohol exposed children with MA matched controls, significant differences evaporated.

Hamilton (1981) used both standardized measures and an analysis of spontaneous language to document developmental patterns of 10 youngsters with the complete FAS diagnosis. The 10 particpants, ranging in age from 4;5 – 6;10 years, were matched with two groups of non-alcohol exposed controls. One control group was comprised of younger peers whose average mean length of utterance (mean length of utterance/morphemes = 3.78) was similar to average sentence length of the experimental FAS group (mean length of utterance/morphemes = 3.80). The second control group was

made up of intellectually matched (IQ) same-age peers. IQ was established using either the *Stanford-Binet* or the *Weschsler Preschool and Primary Scale of Intelligence.* The participants completed three standardized language measures: *Detroit Test of Learning Aptitudes*, *Northwestern Syntax Screening Test and Peabody Picture Vocabulary Test*. Hamilton also collected a 100-utterance language sample during a low structured interaction with each participant. Hamilton found that while her experimental participants performed more poorly than language-matched controls in forming grammatically complete sentences, they outperformed ten cognitively matched typical control subjects on all standardized syntactic and semantic measures.

Arguably, Hamilton's most interesting discovery concerned her subjects' spontaneous language during conversational interactions. The one significant difference between children with FAS and their language-matched peers was the number of communicatively *adequate* responses during conversation. Children with high prenatal alcohol exposure produced significantly fewer responses that extended or elaborated their conversational partner's utterances. For example, to the question, "what is on your shoes?", children with FAS were far less likely to respond "dirt" (an adequate response) than they were to say "I have new shoes (an "inadequate" response) or "I don't want to tell you" (an ambiguous response). This conversational profile was inconsistent with their general cognitive ability. The significant number of inadequate responses suggests that children with FAS were attempting to fulfill their conversational obligation with little apparent regard for whether their utterances were communicatively appropriate. To our knowledge, Hamilton's research was the first to document a disconnection between

conversational behaviors in children with fetal alcohol exposure and their general cognitive and language abilities.

Coggins and his colleagues (1998) have provided further evidence that older alcohol-exposed children may have compromised language, particularly in social contexts. This clinical research team examined the narrative abilities of adolescents with FAS. Narratives are extended units of discourse that occur frequently in a variety of meaningful social contexts. Children who can handle the communicative demands inherent in a narrative seem to be able to access multiple pieces of information with which to capture and convey complex events in words (Berman & Slobin, 1994).

A narrative was gathered from two adolescents with FAS using Mercer Mayer's (1969) *Frog, Where are You?,* an adventure story about a boy and his dog who search for a missing frog. Both adolescents (CA: 14;3 years, 16:10 years) had full-scale IQ scores within the average range and were enrolled in regular public school classrooms (though both received resource room assistance). To establish an initial level of typical performance, Coggins and colleagues (1998) also collected, transcribed and scored *Frog* narratives from twelve typically developing students. Six narratives were from students with a mean age of 14:3 years while six were from older students with a mean age of 16;7 years.

The narratives for all participants were examined for "story cohesion" (i.e., the ability to connect a series of events into logical systems or structures) and "story coherence" (i.e., the ability to clearly express essential story elements). According to Trabasso & Rodkin (1994), a cohesive narrative is built around a plot structure that consists of an initiating event and a series of related episodes. The initiating event in the

Frog story (a pet frog escapes through an open widow) is followed by a series of logically related episodes each consisting of a goal (i.e., desire or intention of characters), attempts (i.e., overt actions to satisfy or obtain goals) and an outcome (i.e., attainment or non-attainment of goals). To be given credit for a story episode, all three components must be encoded. Story coherence is concerned with being informative. The ability to communicate unambiguous information to a listener often means going beyond listing the contents of pictures, beyond commenting on the obvious and beyond the static descriptions of the characters. A coherent narrative requires that a narrator leave no doubt in the listener's mind as to what is intended.

The performance profiles between the adolescents with FAS and their typically developing, chronological-age matched peers were clearly different. While the *Frog* narratives of the typically developing adolescents reflected logical organizational schemes, neither FAS participant generated stories that contained a basic plot structure. Both youngsters lacked an initiating event at the beginning of their stories and failed to use language to link goals, attempts and outcomes into story episodes. As a result, their *Frog* stories were, for all intent and purposes, a truncated set of utterances largely devoid of hierarchical connections.

In sum, literature exploring the language abilities of children with prenatal alcohol exposure has yet to reveal a distinctive profile. However, most of the evidence on which this observation rests has been gathered from children in contrived contexts using standardized instruments. Interestingly, when language is examined under conditions that resemble unstructured, naturalistic environments, including conversations and narratives, performance is more limited than would be predicted from standardized tests,

and dissimilar to chronological age-matched or mental-age matched, non alcohol-exposed peers. This finding suggests that contextual variables may exert a powerful influence on the language performance of children with FAS and associated clinical conditions. Following this argument, one might expect a child to have more difficulty using language in real world social situations that demand higher levels of inference, social reasoning and information processing. Understanding the complex relationship between these underlying competencies and language performance is critical for the development of efficacious assessment and intervention.

A Framework for Examining Communicative Behavior in Social Interactions

Communication and Context

The following discussion presents the reader with a conceptual framework for considering social communication competence. We believe that this framework provides a reference for understanding and examining why children with alcohol spectrum disorders have such difficulty using language in interpersonally appropriate ways. In our view, this social communicative framework may also function as a viable structure for future research and clinical services that address children with high prenatal alcohol exposure.

A solid linguistic foundation is necessary for successful and satisfying social interactions (Brinton, Fujiki, Spencer & Robinson, 1997; Guralnick, 1999). In order to communicate effectively in social situations, children must be able to use their language to handle a variety of sophisticated environmental demands. Researchers have argued that a communicatively competent speaker is one who can retain and process multiple pieces of incoming information in the context of, and embedded in, real time events

(Chapman, 1992; Matson, Goodman, Caine, Delis & Riley, 1999; Sullivan, Zaitchik & Tager-Flusberg, 1994). Children who have language limitations, in addition to limitations in processing capacity, stand at high risk for social communication deficits.

The literature has revealed an increase in the prevalence and variety of language problems in children with high prenatal alcohol exposure. Researchers have not, however, been able to identify a common performance profile in these children or establish a core set of linguistic deficits. In our view, there are at least two important reasons that the search for a common profile is unlikely to yield a recognizable pattern. First, the teratogenic effects of alcohol typically result in diffuse organic brain involvement rather than a specific type of brain dysfunction. Not only is there a wide variety in the types of damage and places in the brain for damage to occur, but also the degree of damage varies tremendously (Clarren & Astely, 1997). Given this variability, it would be rather surprising to find a similar set of linguistic deficits in such a heterogeneous population. Second, we believe that the organic abnormalities linked to prenatal alcohol exposure may not compromise the basic linguistic abilities children need to perform appropriately in highly structured contexts (i.e., standardized testing). Rather, diffuse brain dysfunction seems to impair one's aptitude to recruit those abilities to meet the often implicit, and challenging demands, of unstructured situations that constitute daily social interactions. This belief is supported by the fact that most children with prenatal alcohol exposure who have been assessed with standardized language measures score broadly within the normal range (Abkarian, 1992; Church & Kaltenbach, 1997: Janzen, Nanson & Block, 1995; Weinberg, 1997). In short, language problems in this

clinical population are not typically manifested under highly structured conditions with tasks that create discrete response opportunities.

Language problems in fetal alcohol exposed children become increasingly obvious during unstructured social interactions that are more typical of everyday life. The ability to use language in interpersonally appropriate ways, particularly in social interactive contexts, is frequently compromised. Children often seem perplexed in situations that require an array of attentional, social, linguistic, and non-linguistic information processing resources (e.g., entering a peer group; resolving a conflit). In these more complex social contexts, they give little evidence of knowing about the social aspects of language use.

Being a socially competent communicator requires more than simply having the necessary language for social interactions. Socially competent communicators know how and when to use language appropriately in dynamic interactions occurring in real time. A competent communicator is able to integrate, synthesize and organize knowledge and resources across sequences of social exchanges in order to solve the diverse and complex challenges encountered in daily living. Presently, we can only speculate whether children with FAS and associated conditions are aware of the rules governing the use of language in different social contexts. Appreciating the factors that influence children's social communicative competence is an important step in understanding the relationship between language and problem social behaviors these children exhibit.

A Conceptual Framework

Figure 3 presents a conceptual model of social communication competence. The model is an attempt to understand basic factors that interact and influence school-age

children's communication during social interactions. The model reflects the social information processing paradigm proposed by Crick and Dodge (1994), the social behavior construct advanced by Campbell and Siperstein (1994) and Guralnick's (1999) model of peer-related social competence.

Insert Figure 3 about here

As illustrated in Figure 3, social communicative competence is governed by three interrelated components. The language component includes the necessary syntactic, semantic and pragmatic abilities that school-age children need to be competent social communicators. The social cognitive component focuses on social understanding and is concerned with a child's ability to appreciate what others think, know or believe. The third foundational component is executive function. The primary goals of executive functions are decision-making and strategic planning. We have nested language and social cognitive components within higher-order executive functions because socially competent communicators must integrate, sequence and/or modify their language and social cognitive abilities in accordance with demands of particular situations. The purposeful integration of abilities of more fundamental components results in social communicative behaviors. These communication behaviors are the actions children perform that characterize social communicative competence. A disruption in one or more of the fundamental components is likely to result in less capable, if not impaired ability to use language appropriately during interpersonal interactions. We also believe that the extent and nature of these disruptions are likely to vary in individual children, which

inevitably results in variable social communicative abilities. Each of the fundamental components is described in greater detail in the following sections.

Language Behaviors. Social communicative competence is predicated on linguistic competence (Guralnick, 1999). Indeed, language is the primary means by which children succeed in establishing and maintaining social relationships at home, school and with peers. The pivotal role that language plays in interpersonal interactions places children with compromised language not only at a social communicative risk, but also jeopardizes their ability to participate in social environments (Gresham, 1998).

A socially competent communicator must have basic and advanced semantic, syntactic and pragmatic abilities. Semantic skills include having the vocabulary to allow for sophisticated forms of information exchange as needed in social exchanges. Lack of flexibility in word knowledge can create misunderstandings in interpersonal communication and confusion when deciphering linguistic information. For example, appropriately offering help or resolving conflicts necessitates an adequate vocabulary and production of word relations. Very often successful interpersonal relations among school-aged children requires an ability to appreciate synonyms, analogies, idioms and other forms of figurative language (e.g., "Are you going back on your word?" "Don't let the cat out of the bag." "Are you biting off more than you can chew?").

School-age social communication also requires adequate syntax for formulating complex sentences. Facility with comprehension and production of complex constructions, especially embedded clauses, is necessary for elaboration of abstract ideas that occur in social interactions. Syntax used for such social behaviors as negotiating interactions is typically rather sophisticated, including compound and complex sentence

types (e.g., "I'd like to help, but I'm late for school." "If the movies are over early, we can go bowling afterwards.").

Finally, school-aged children must have advanced pragmatic knowledge. Arguably, this may be the most significant component of language as it relates to communicative competence in social situations. Pragmatics refers to how children use semantic and syntax abilities in interactions with others. It reflects a child's knowledge of how communication should vary in different contexts, allowing a child to know how to talk and behave in different situations with different people. For example, consider two children trying to decide who gets the first turn on the classroom computer. To resolve this potential peer conflict, one child might use language to accommodate the needs of other the other child (e.g., "I know, Let's flip a coin"). These are the abilities that are necessary for determining how to appropriately behave in the classroom as a child interacts with peers and teachers.

Social Cognitive Abilities. Children strive to make sense of their world. While they actively seek to interpret the physical events in their world, they also spend much of their time trying to understand the social world in which they live. Since language is learned during dynamic social interactions with other people, children are naturally curious about people around them. They try and make sense of social situations by figuring out why people act in particular ways and what they are likely to do next. Social cognition focuses is concerned with how children conceptualize and think about their social world—the people they observe, the relations between people, and the groups in which they participate.

An important area of social cognitive research is Theory of Mind (TOM). The primary focus of TOM has been on child's knowledge of mental states. The TOM paradigm is concerned with how child learn to appreciate, imagine or represent states of mind in themselves and other people in order to make sense of social interactions, and behave competently in social situations. Since communication is the vehicle for social interaction, children would seem to need a well-defined TOM in order to exchange information, initiate and develop satisfying social relationships, cope with changing environmental demands and appropriately assert their needs, desires and preferences. The TOM literature has revealed that preschool and school-age children have extensive and sophisticated skills for interpreting the behavior of other people in terms of mental states.

Crick and Dodge (1994) have postulated six social cognitive processes that operate while children try and interpret (i.e., make sense of) social interactions. The six processes include: 1) encoding of cues (children selectively attends to and encodes particular situational and internal cues) 2) interpretation of cues (making inferences about the perspectives of others in the situation, including inferences regarding the meaning of prior and present exchanges); 3) clarification of goals (selects a desired outcome relative to the situation at hand); 4) response access or construction (generate verbal and non-verbal strategies to achieve selected goal); 5) response decision (evaluate strategies and select the one most likely to achieve desired goal); and, 6) behavioral enactment (implement chosen strategy). Difficulties in any of these processes can lead to ineffective strategies.

Executive Functions. The over-arching component in our model is executive function. Executive functions are higher-order, decision-making and planning processes invoked in the face of novel challenges (Singer & Bashir, 1999). These processes encompass a range of abilities that overarch "all contexts and content domains" (Denckla & Reader, 1993, p. 443). As such, executive functions allow children to disengage from the immediate context and reason about interpersonal goals; a fundamental ability in forming and maintaining positive social relationships.

Executive functioning is primarily concerned with the ability to utilize information. In other words, these functions play a deciding role in how children use what they know. Although different disciplines have defined higher-order executive functions in somewhat different terms, there is general agreement regarding the following six control components: 1) inhibiting actions; 2) restraining and delaying responses; 3) attending selectively; 4) setting goals; 5) planning strategically; and, 6) maintaining and shifting sets.

The ability to communicate in social situations implicates executive function. According to Tannock and Schachar (1996), executive strategies that are involved in social communication include: 1) recognizing social and information demands in the situation; 2) knowing the appropriate linguistic forms to use to code underlying meaning for the situation at hand; 3) organizing and encoding thoughts through several modalities simultaneously; and, 4) making rapid, "on-line" changes according to real time changes in the situation. Dysfunction in any of these strategies, alone or in combination, could compromise a child's social communicative competence.

Social Communication Behaviors. Social communication behaviors are specific, observable actions. The decision to place these behaviors near the top of our model reflects Campbell and Siperstein's (1994) social behavior hypothesis. This research team has identified a series of important social behaviors that communicatively competent children use during verbal interactions with peers. Some principle social behaviors include entering peer groups, collaborating with peers, explaining behaviors, resolving conflicts and negotiating interactions. The execution of these behaviors in particular social situations provides the evidence for determining how effectively a child has integrated underlying components processes and abilities. A child who effectively and appropriately uses these communicative behaviors during social interactions, either in isolation or combination, would be judged a competent social communicator (Guralnick, 1999).

Summary. The essential focus of our social communication model is its emphasis on the dynamic relationships between language, social cognitive and executive function components. Indeed, the essence of social communication is the successful integration and execution of these underlying components in relation to important environmental variables and demands. Social interactive contexts serve as the basis for interpreting both the effectiveness and appropriateness of children's social communicative behaviors. Communicative differences that exist among children should be reflected during important social interactions such as entering a peer group or resolving a conflict where performance and expectations vary as a function of environmental demands. The effectiveness and appropriateness with which children use language to resolve diverse

problems of a social nature is a primary basis for determining communicative competence.

Implications for Research and Practice

Researchers and clinicians have relied heavily on standardized language instruments to provide an overall appraisal of children's functioning. These global measures, which occur under controlled and contrived conditions, have allowed investigators to compare an individual child's performance to normative data. The obtained results, however, provide little insight into how children perform during everyday social interactions.

Different social interactions have different demands that require different amounts of effort for communication to be successful. Moreover, as context demands increase, the processing resources a child utilizes may increase proportionally (Evans, 1996). Unfortunately, it is not possible to predict how any given child will deploy his or her resources to meet the demands of a particular task or social interaction. Thus, communication must be sampled under conditions that more accurately reflect the integration, organization and sequencing required of children to solve most interpersonal problems. Only in this way will researchers and clinicians be able to reconcile variability in children's social communication performance (Coggins, Olswang & Guthrie, 1987).

From this perspective, a representative sample of a child's social communication is likely to be gathered in natural contexts. Direct (behavioral) observation is perhaps the most socially valid method of collecting authentic and functional performance since it is embedded within actual communicative contexts (Kovarsky & Damico, 1997; Sillman & Wilkinson, 1994; Westby, Stevens-Dominguez & Oetter, 1966). Because direct

observation allows an examination of language performance in real time, it allows inspection of how environmental variables may support or impede social interactions. Although behavioral observation is a useful methodology for discriminating children with social communicative deficits, observing children in natural contexts presents non-trivial challenges with respect to both data collection (e.g., "Do I follow the child around, making a log of behaviors as they occur, or record a pre-determined set of behaviors?") and data reduction (e.g., "How can I summarize the data in a time efficient manner?") (Olswang, Coggins & Timler, 2001). The social communication model we have proposed provides an initial response to these methodological challenges.

As discussed above, problems with specific social communication behaviors may arise because of compromises in one or more underlying components. Figure 4 presents an experimental questionnaire that we have begun to use with school-based, speech-language pathologists to profile the source(s) of problematic social communication in their students (see http://depts.washington.edu/soccomm).

Insert Figure 4 about here

The questionnaire is organized around the three foundation components we believe are necessary for children to use social communicative behaviors appropriately: language, social-cognition and executive functioning. The specific items for each developmental process were gleaned from the clinical and experimental research literature in child development, thus, content validity appears robust. The judgments made by speech-language pathologists are summary, evaluative conclusions based on

first-hand observations of a "child of concern" during important school settings. As a general principle, the professionals who complete the questionnaire are clinically competent, have a basic understanding of standardized and non-standardized testing and overall knowledge of child development. In completing the questionnaire, speech-language pathologists draw on their direct observations during real-time social interactions that occur across different school contexts. Their responses can reveal the source(s) of a child's social communicative impairment (i.e., language, social cognitive and/or executive function), type of social behavior problem (e.g., entering peer groups, resolving conflicts) and/or how context may be influencing performance (e.g., school situations). We trust that the profile may ultimately become an important non-standardized assessment tool for those who seek a more functional assessment of a child's social communicative competence.

Conclusion

Over the last three decades, we have learned much about the panoply of problems that characterize children with prenatal alcohol exposure. The revealing results of our colleagues lead us to hypothesize that the difficulty these children exhibit in being competent communicators during social situations is a key deficit in this clinical population. In this paper, we have suggested that the variability in social performance associated with children who have teratogenic alcohol exposure may, in part, be a reflection of underlying difficulties in how language, social cognitive and/or executive function fuse together to meet the demands of varying social interactions. We have offered this perspective as a framework for studying children who do not adequately communicate in real world (i.e., school) situations.

References

Abkarian, G. (1992). Communication effects of prenatal alcohol exposure. Journal of Communication Disorders, 25, 221-240.

Astley, S. & Clarren, S. (1997). Diagnostic guide for fetal alcohol syndrome and related conditions: the 4-digit diagnostic code. Seattle, WA: FAS Diagnostic and Prevention Network, University of Washington.

Astley S. & Clarren S. (2000). Diagnosing the full spectrum of fetal alcohol exposed individuals: Introducing the 4-Digit Diagnostic Code. Alcohol & Alcoholism, 35, 400-410.

Astley, S. & Clarren S. (2001). Measuring the facial phenotype of individuals with prenatal alcohol exposure: correlations with brain dysfunction. Alcohol & Alcoholism, 36, 147-159.

Astley S., Clarren S., Stachowiak, J., & Clausen, C. (2001). FAS Screening in a foster care population using the FAS DPN computerized facial photographic screening tool: interim results. Alcoholism: Clinical and Experimental Research, 25, 77A.

Astely, S. Magnuson, S., Omnell, L., & Clarren, S. (1999). Fetal alcohol syndrome: Changes in craniofacial form with age, cognition and timing of ethanol exposure in the macaque. Teratology, 59, 163-172.

Becker, M., Warr-Leeper, G. & Leeper, H. (1990). Fetal alcohol syndrome: A description of oral motor, articulatory, short term memory, grammatical, and semantic abilities. Journal of Communication Disorders, 23, 97-124.

Berman, R. & Slobin. D. (1994). Relating events in narrative: A cross linguistic development study. Hillsdale, NJ: Lawerence Erlbaum Asociates, Inc.

Brinton, B., Fujiki, M., Spencer, J. & Robinson, L. (1997). The ability of children with specific language impairment to access and participate in ongoing interaction. Journal of Speech, Language, and Hearing Research, 40, 1011-1025.

Caldwell, S. (1993). Nuturing the delicate rose. In J. Kleinfeld & S. Wescott (eds.), Fantastic Antone succeeds! Experiences in educating children with fetal alcohol syndrome (pp.97-129). Anchorage, AK: University of Alaska Press

Campbell, P. & Siperstein, G. (1994). Improving social competence. Allyn & Bacon Publishing.

Carmichael Olson, H., Feldman, J.J., Streissguth, A.P., Sampson, P.D. & Bookstein, F.L. (1998). Neuropsychological deficits in adolescents with fetal alcohol syndrome: Clinical findings. Alcoholism: Clinical and Experimental Research 20, 1998-2012.

Carmichael Olson, H., Morse, B.A., & Huffine, C. (1998). Development and psychopathology: FAS and related conditions. Seminars in Clinical Neuropsychiatry, 3, 262-284.

Carmichael Olson H, Gendler B, Kraegel P, Rosengren D., Clarren S, Astley S. (under review). A targeted approach to FAS prevention: the FAS DPN first bridges program. Alcoholism: Clinical and Experimental Research.

Carney, L. & Chermak, G. (1991). Performance of American Indian children with Fetal Alcohol Syndrome on the Test of Language Development. Journal of Communication Disorders, 24, 123-134.

Chalmers, J. & Townsend, M. (1990). The effects of training in social perspective taking on socially maladjusted girls. Child Development, 61, 178-190.

Chapman, R. (1992). Processes in language acquisition and disorders. St. Louis, MO:

Church, M. & Kaltenbach, J. (1997). Hearing, speech, language, and vestibular disorders in the Fetal Alcohol Syndrome: A literature review. Alcoholism: Clinical and Experimental Research 21, 495-512.

Church, M., Eldis, F., Blakley, B. & Bawle, E. (1997). Hearing, language, speech, vestibular, and dentofacial disorders in fetal alcohol syndrome. Alcoholism: Clinical and Experimental Research, 21, 227-237.

Clarren, S. and Astely, S. (1997). The development of fetal alcohol syndrome diagnostic and prevention network in Washington State. In A. Streissguth & J. Kanter (eds.), The challenge of fetal alcohol syndrome: Overcoming secondary disabilities (pp. 40-51). Seattle, WA: University of Washington Press

Clarren, S. & Smith, D. (1978). Fetal alcohol syndrome. New England Journal of Medicine, 298, 1063-1067.

Clarren, S. Carmichael Olson, H., Clarren, S. & Astley, S. (2000). A child with fetal alcohol syndrome. In M. Guralnick (ed.), Handbook of clinical Assessment for young children with developmental disabilities (pp.307-326). Baltimore, MD: Paul H. Brookes.

Coggins, T., Olswang, L. & Guthre, J. (1987). Assessing communicative intents in young children: low structured observation or elicitation tasks? Journal of Speech and Hearing Disorders, 532, 44-49.

Coggins, T., Friet, T. & Morgan, T. (1998). Analyzing narrative productions in older school-age children and adolescents with fetal alcohol syndrome: An experimental tool for clinical applications. Clinical Linguistics & Phonetics, 12, 221-236.

Coles, C.D., Platzman, K.A., Raskind-Hood, C.L., Brown, R.T., Falek, A. & Smith, I.E. (1997). A comparison of children affected by prenatal alcohol exposure and attention deficit, hyperactivity disorder. Alcoholism: Clinical and Experimental Research, 21, 150-161.

Conry, J. (1990). Neuropsycholoigcal deficits in fetal alcohol syndrome anda fetal alcohol effects. Alcoholism: Clinical and Experimental Research, 14, 650-655.

Crick, N. & Dodge, K. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. Psychological Bulletin, 11, 74-101.

Denkla, M. & Reader, M. (1993). Education and psychological interventions. Executive dysfunction and its consequences. In R. Kulan (ed.), Handbook of Tourette's syndrome and related tic and behavior disorders (pp. 431-451). New York: Marcel Dekker.

Dodge, K., McClaskey, C., & Feldman, E. (1985). A situational approach to the assessment of social competence in children. Journal of Consulting and Clinical Psychology, 53, 344-353.

Dorris, M. (1989). The broken cord. New York, NY: Harper Perennial.

Driscoll, C. Streissguth, A. & Riley, E. (1990). Prental alcohol exposure: Compariability of effects in humans and animal models. Neurotoxicology and Teratology, 12, 2231-237.

Evans, J. (1996). Plotting the complexities of language sample analysis: Linear and nonlinear dynamic models of assessment. In K. Cole, P. Dale, & D. Thal (eds.), Communication and language intervention series: Vol. 6. Assessment of communication and language (pp. 207-256). Baltimore: Brookes.

Fried, P, O'Connell, C, & Watkinson, B (1992). 60 and 72-month follow-up of children prenatally exposed to marijuana, cigarettes, and alcohol: cognitive and language assessment. Developmental and Behavioral Pediatrics, 13, 383-391.

Gentry, B., Griffith, L., & Dancer, J. (1998). Prenatal alcohol exposure and communication, behavior, and nonverbal intelligence of 3 school-age children. Perceptual and Motor Skills, 86,1089-1090.

Gresham, F. (1998). Social skills training with children: Social learning and applied behavioral analytic approaches. In T. Watson & F. Gresham (eds.), Handbook of Child Behavior Therapy pp. 475-497). New York: Plenum Press.

Gresham, F. & Elliot, S. (1990). Social Skills Rating System. Circle Pines, MN: American Guidance Service, Inc

Guralnick, M. (1999). Family and child influences on the peer-related social competence of young children with developmental delays. Mental Retardation and Developmental Disabilities. 5, 21-29.

Hamilton, M. (1981). Linguistic abilities of children with fetal alcohol syndrome. Unpublished doctoral dissertation. Seattle: University of Washington.

Hinde, J. (1993). Early intervention for alcohol-affected children. In J. Kleinfeld & S. Wescott (eds.), Fantastic Antone Succeeds! Experiences in education children with Fetal Alcohol Syndrome (pp. 131-147). Anchorage, AK: University of Alaska Press.

Institute of Medicine, U.S. (1996). Division of Biobehavioral Sciences and Mental Disorders, Committtee to Study Fetal Alcohol Syndrome. In K. Stratton, C. Howe, & F. Battaglia (eds.), Fetal alcohol syndrome: Diagnosis, epidemiology, prevention, and treatment. Washington, DC: National Academy Press.

Jacobson, J. & Jacobson, S. (1997). Prenatal exposure to alcohol: Is there a distinctive neurobehavioral profile. Extramural Scientific Advisory Board Meeting on FAS. May 12-13, 1997.

Janzen, L., Nanson, J. & Block, G. (1995). Neuropsychological evaluation of preschoolers with Fetal Alcohol Syndrome. Neurotoxicology and Teratology, 17, 273-279.

Jones, K. & Smith, D. (1973). Recognition of the fetal alcohol syndrome in early infancy. Lancet, 22, 999-1001.

Kerns, J., Don, A., Mateer, C., & Streissguth, A. (1997). Cognitive deficits in nonretarded adults with fetal alcohol syndrome. Journal of Leaning Disabilities, 30, 685-693.

Kleinfeld, J. & Wescott, S. (1993). Fantastic Antone Succeeds! Experiences in educating children with Fetal Alcohol Syndrome. Anchorage, AK: University of Alaska Press.

Kodituwakku, P., Handmaker, N., Cutler, S., Weathersby, E. & Handmaker, S. (1995). Specific impairments in self-regulation in children exposed to alcohol prenatally. Alcoholism: Clinical & Experimental Research, 19, 1558-1564.

Kopara-Frye, K., Dehaene, S., & Streissguth, A. (1996). Impairments of number processing induced by prenatal alcohol exposure. Neuropsychologica, 34, 87-1196.

Korkman, M., Kirk., & Kemp, S. (1998). A developmental neuropsychological assessment. New York: The Psychological Corporation.

Kovarsky, D. & Damico, J. (1997). Language and context: Some issues of practice. Language, Speech, and Hearing Services in Schools, 28, 1808-1805.

Mattson, S., Goodman, A., Caine, C.,Delis, D., & Riley, E. (1999). Executive functioning in children with heavy prenatal alcohol exposure. Alcoholism: Clinical and Experimental Research, 23, 1808-1815.

Mattson, S.& Riley, E. (1998). A review of the neurobehavioral deficits in children with fetal alcohol syndrome or prenatal exposure to alcohol. Alcoholism: Clinical & Experimental Research, 22, 279-294.

Mattson, S., Riley, E., Delis, D., & Jones, K. (1996). Verbal learning and memory in children with fetal alcohol syndrome. Alcoholism: Clinical and Experimental Research, 20, 810-816.

Mayer, M. (1969). Frog, where are you? New York: Dial Book for Young Readers

Nanson, J. (1990). Behavior in children with fetal alcohol syndrome. In W. Fraser (ed.), Key issues in mental retardation research. London: Blackwell.

National Institute on Alcohol Abuse & Alcoholism (NIAAA) (1997). Ninth special report to the U.S. Congress on Alcohol and Health, NIH Publication, No. 97-4017. Washington, DC: U.S. Department of Health & Human Services.

Olswang, L., Coggins, T., & Timler, G. (2001). Outcome measures for school-age children with social communication problems. Topics in Language Disorders, 22, 50-73.

O'Malley, K. & Hagerman, R. (1998). Developing Clinical Practice Guidelines for Pharmacological Interventions in Alcohol-Affected Children. In K. O'Malley & R. Hagerman (eds.), Intervening with Children Affected by Prenatal Alcohol Exposure . Monograph from the Interagency Coordinating Committee on Fetal Alcohol Syndrome Special Focus Session. Chevy Chase, MD: Centers for Disease Control and Prevention.

Plumridge, D., Bennett, R., Dinno, N, & Branson, C. (1993). The student with a genetic disorder: Educational implications for special education teachers and for physical therapists, occupational therapists and speech pathologists. Springfield, IL: Charles C. Thomas.

Rathbun, A. (1993). Overcoming the cycle of failure and frustration. In J. Kleinfeld, & S. Wescott (eds.), Fantastic Antone Succeeds! Experiences in educating children with fetal alcohol syndrome (pp. 295-313). Anchorage, AK: University of Alaska Press.

Redmond, S. & Rice, M. (1998). The socio-emotional behaviors of children with SLI: Social adaptation or social deviance? Journal of Speech, Language, & Hearing, 41, 688-700.

Redmond, S., & Rice, M. (2002). Stability of behavioral ratings of children with SLI. Journal of Speech, Language, Hearing Research, 45, 190-201.

Roebuck, T., Mattson, S., & Riley, E. (1999). Behavioral and psychosocial profiles of alcohol-exposed children. Alcoholism: Clinical and Experimental Research, 23, 1070-1076.

Rosett, H. & Weiner, L. (1984). Alcohol and the Fetus: A Clinical Perspective. New York: Oxford.

Sampson, P., Kerr, B., Carmichael Olson, H., Streissguth, A., Hunt, E., Barr, H., Bookstein, F., & Thiede, K. (1997). The effects of prenatal alcohol exposure on adolescent cognitive processing: A speed-accuracy tradeoff. Intelligence, 24, 329-353.

Sillman, E. & Wilkinson, C. (1994). Observation is more than looking. New York. Merrill Publishing.

Singer, B. & Bashir, A. (1999). What are executive functions and self-regulation and what do they have to do with language-learning disorders? Language, Speech, and Hearing Services in Schools, 30, 265-273.

Spohr, J-L., Willms, J., & Steinhausen, J-C. (1993). Prenatal alcohol exposure and long-term developmental consequences. Lancet, 341, 907-910.

Spohr, J-L., Willms, J. & Steinhausen, J-C. (1994). The fetal alcohol syndrome in adolescence. Acta Paediatrica, 83, 19-26.

Steinhausen, H.-C., Willms, J., & Spohr, H.-L. (1993). Long-term psychopathological and cognitive outcome of children with fetal alcohol syndrome. Journal of the American Academy of Child and Adolescent Psychiatry, 32, 990-994.

Streissguth, A. (1997). Fetal alcohol syndrome: A guide for families and communities. Baltimore: Paul H. Brookes Publishing Co.

Streissguth, A., Barr, H., Kogan, J., & Bookstein, F. (1996). Understanding the occurrence of secondary disabilities in clients with fetal alcohol syndrome (FAS) and fetal alcohol effects (FAE): Final report to the Centers for Disease Control and Prevention on Grant No. R04/CCR008515 (Tech. Report No. 96060). Seattle: University of Washington Fetal Alcohol and Drug Unit.

Streissguth, A., Barr, J., Kogan, J., & Bookstein, F. (1997). Primary and secondary disabilities in fetal alcohol syndrome. In A. Stressguth, & J. Kanter (eds.). The challenge of fetal alcohol syndrome: overcoming secondary disabilities (pp. 25-39). Seattle, WA: University of Washington Press.

Sullivan, K., Zaitchik, D., & Tager-Flusberg, H. (1994). Preschoolers can attribute second-order beliefs. Developmental Psychology, 30, 395-402.

Tannock, R. & Schachar, R. (1996). Executive dysfunction as an underlying mechanism of behavior and language problems in attention deficit hyperactivity disorder. In J. Bleitchman, N. Cohen, M. Konstantareas, & R. Tannock (eds.), Language, learning, and behavior disorders. Cambridge, UK: Cambridge University Press.

Thomas, S., Kelly, S., Mattson, S., & Riley, E. (1998). Comparison of social abilities of children with fetal alcohol syndrome to those of children with similar IQ scores and normal controls. Alcoholism: Clinical and Experimental Research 22, 528-533.

Trabasso, T. & Rodkin, P. (1994). Knowledge of goal/plans: A conceptual basis for narrating *Frog, Where Are You*? In D. Berman and D. Slobin (eds.), Relating events in narrative: A cross-linguistic developmental study. Hillsdale, NJ: Lawrence Erlbaum.

Timler, G. (2000). Investigation of social communication skills during peer conflict tasks in school-age children with alcohol-related disabilities. Unpublished doctoral dissertation. University of Washington, Seattle, WA.

Timler, G. & Olswang, G. (2001). Variable structure/variable performance: Caregiver and teacher perspectives of a school-age child with fetal alcohol syndrome. Journal of Positive Behavior Interventions, 3, 48-56.

Timler, G., Olswang, L., & Coggins, T. (under review). Do I know what I need to do? A treatment package for school-age children with social communication deficits.

Uecker, A. & Nadel, L. (1996). Spatial locations gone awry: Object and spatial memory deficits in children with fetal alcohol syndrome. Neuropsychologia, 34, 209-223.

Weinberg, N. (1997). Cognitive and behavioral deficits associated with prenatal alcohol use. Journal of the American Academy of Child and Adolescent Psychiatry, 36, 1177-1186.

Westby, C., Stevens-Dominguez, M., & Oetter, P. (1996). A performance/competence model of observational assessment. Language, Speech and Hearing Services in Schools, 27, 144-156.

Wright, R. (1992). One step forward: Using information about FAE to help my son. Iceberg, ,1, 3-4.

Zucker, R., Fitzgerald, H., Refior, S., Puttler, L., Pallas, D., & Ellis, D. (2000). The clinical and social ecology of childhood for children of alcoholics: Description of a study and implications for a differentiated social policy. In H. Fitzgerald, B. Lester & B. Zuckerman (eds.), Children of addition: Research, health, and public policy (pp. 109-142). New York: Falmer Press.

Figure 1. A diagnostic code grid for quantifying the spectrum of disabilities among children with fetal alcohol exposure (following Astley & Clarren, 2000; Astley & Clarren, 2001).

Significant	Severe	Definite	4			
Moderate	Moderate	Probable	3			
Mild	Mild	Possible	2			
None	Absent	Unlikely	1			
Growth Deficiency	**Facial Phenotype**	**Brain Dysfunction**	**Numeric Code**	Growth	Face	Brain

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High Risk	High Risk	High Risk	4			
Some Risk	Some Risk	Some Risk	3			
Unknown	Unknown	Unknown	2			
No Risk	No Risk	No Risk	1			
Prenatal Alcohol	**Pre-Natal Conditions**	**Post-Natal Conditions**	**Numeric Code**	Alcohol	Pre Natal	Post Natal

Figure 2. Results (quantitative and descriptive) of the Social Skills Rating System (*SSRS*) and Developmental Neuropsychological Assessment (*NEPSY*) for three school-age children with fetal alcohol syndrome.

C # C H I L D #	**CA**	Social Skills Rating Scale Problem Behaviors Domain (PBDSS) - (Scores>1SD are viewed as "clinical concern") - (Mean = 100; SD= 15)	*A Developmental Neuropsychological Assessment (NEPSY)* - Clinical Interpretation of performance
# 1	9;8	PBDSS 133	Difficulties in immediate and delayed visual memory, memory for visual-verbal paired-associate learning and retrieval. Problems in visual-motor precision; tendency to impulsively and rapidly complete tasks, trading reduced accuracy for increased speed in performance.
# 2	12;3	PBDSS 138	Loss of information from memory after a time delay; difficulties in processing speed
# 3	10;1	PBDSS 133	Considerable scatter in individual subtest scores. Difficulty with auditory attention, narrative memory, comprehension of spoken and complex instructions, verbal fluency.

Figure 3. A model of social communication

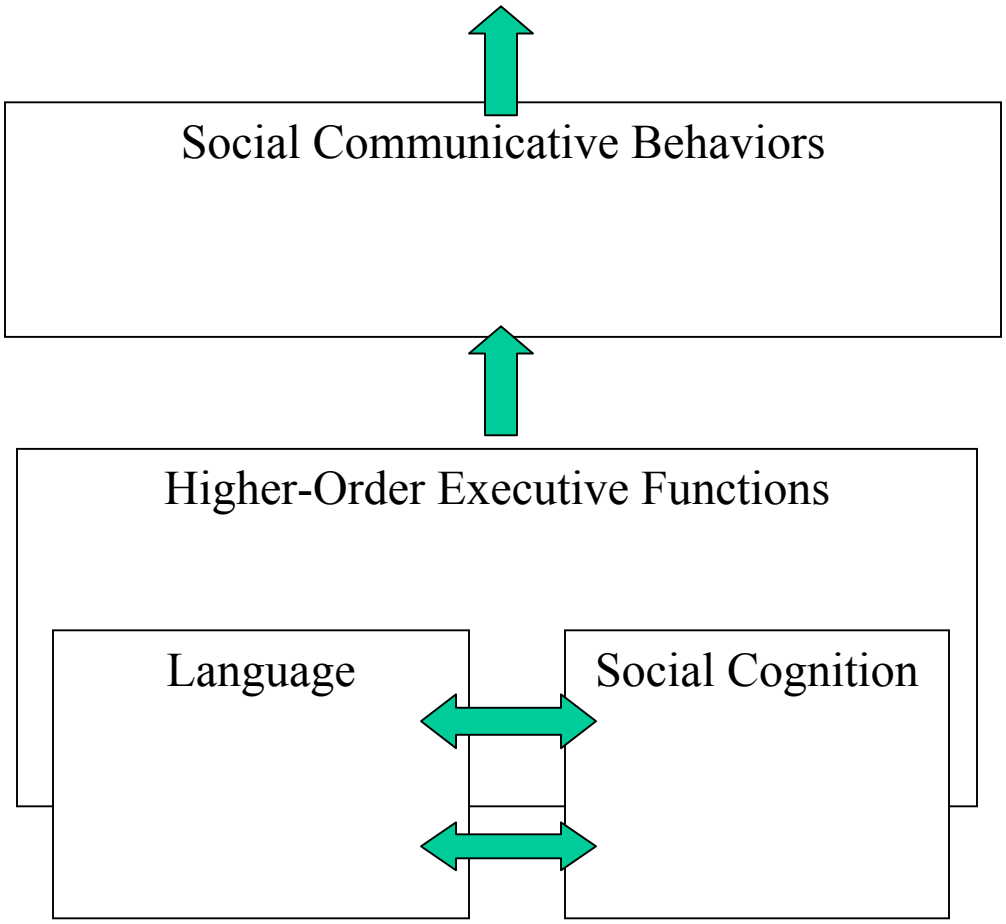

Figure 4. An experimental questionnaire for examining major components, behaviors and settings contributing to children's communicative competence during social interactions.

I. Does this child have difficulty with any of the following language abilities?

___ Using a diverse vocabulary

___ Using mental state verbs (e.g., think, know, believe)

___ Using emotion words (e.g., like, hate, confused)

___ Using complex syntactic forms

    ___ Relative clauses

    ___ Causal conjunctions

___ Clear referents for pronouns

___ Stating conversational topics

___ Maintaining conversations

___ Asking the right questions for needed information

___ Answering questions to provide relevant and sufficient information

___ Being polite

II. Does this child have difficulty with any of the following social cognitive abilities?

___ Interpreting social cues

___ Speculating why an event has occurred

___ Knowing what to do next in social situations

___ Appreciating beliefs, ideas and knowledge of others

___ Formulating and pursuing goals involving others

Selecting and using effective strategies for:

___ Entering a group

___ Resolving conflicts

___ Maintaining play

___ Using alternative strategies in solving social dilemmas

___ Understanding consequences of decisions

III. Does this child have difficulty with any of the following executive functions?

___ Planning for future activities, tasks or situations

___ Inhibiting competing or irrelevant responses

___ Analyzing situations before acting

___ Staying engaged with a task of appropriate length of time

___ Altering approach when confronted with failure

___ Adjusting style of interaction

___ Managing task-related anxiety

___Use of self-talk to control behavior

___ Managing social interactions

___ Coordinating multiple pieces of information

IV. Does this child have difficulty using communicative behaviors in the following social interactions?

___ Entering peer groups

___ Collaborating

___ Asking permission

___ Waiting for turn

___ Telling the truth

___ Explaining behaviors

___ Negotiating with peers

___ Making and keeping friends

V. In which school settings do these social communicative problems occur?

___ Classroom

- ___ Free time
- ___ Cooperative activities
- ___ Study time
- ___ Silent reading
- ___ Group discussion
- ___ Computer time

___ Recess

___ Lunch

___ Assembly

___ Transition between periods