

LANGUAGE IMPAIRMENTS IN CHILDREN WITH FETAL ALCOHOL SPECTRUM DISORDER

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ABSTRACT

Background

Fetal Alcohol Spectrum Disorder (FASD) is associated with a range of disabilities, including physical, behavioural, and cognitive deficits. One specific area of concern in children with FASD is the use and development of speech and language. Language deficits in FASD have been linked to learning problems and social difficulties.

Objectives

The current study sought to examine the language difficulties of children with FASD, and to identify areas of deficit that may be particularly pronounced among these children.

Methods

Fifty children, aged 5 to 13, (27 with FASD, 23 control children) were tested on the CREVT-2, the TOLD-P:3, and the TOLD-I:3.

Results

Children with FASD had significantly lower scores than control children on both receptive and expressive subtests of the CREVT-2. Younger children scored significantly lower than controls on the Relational Vocabulary and Sentence Imitation subtests of the TOLD-P:3, and older children were significantly delayed on the Word Ordering, Grammatical Comprehension, and Malapropisms subtests of the TOLD-I:3.

Conclusions

This study identified several areas of marked difficulty in children with FASD, adding to the current understanding of language development in this population. The results have implications for tailoring early interventions, and for providing evidence-based support to children prenatally exposed to alcohol.

Key Words: *Fetal Alcohol Spectrum Disorder; language; communication*

Children with Fetal Alcohol Spectrum Disorder (FASD) display an array of physical, mental, cognitive, behavioural, and learning deficits.¹ Cognition is an area of particular concern, as children with FASD are shown to perform poorly on tasks of attention, intelligence, academic achievement, executive functioning, visual spatial ability, and memory. Another impairment that has been documented in children with FASD is a disrupted development and use of language.²⁻⁵ In fact, Church and

Kaltenbach⁶ suggest that Fetal Alcohol Syndrome (FAS) may be one of the primary causes of hearing, speech, and language problems in children. Due to these impairments, individuals with FASD may struggle with social communication, particularly with respect to interpersonal language.⁷ Many of these children display a limited use of interpersonal communication, especially in complex social interactions. Language impairments in FASD have also been associated with learning

difficulties,⁸ difficulties initiating and maintaining conversation,⁸ behaviour problems,⁹ handling peer interactions and following social norms, social reasoning, and information processing.¹⁰

Although the evidence of language impairments in individuals with FASD is mixed, Mattson and Riley⁵ indicate that, overall, the literature suggests significant speech and language delays in this population. Specifically, children with FASD may exhibit impairments in areas such as word articulation, naming ability, word comprehension, and both receptive and expressive language skills.⁵ Some studies also suggest that children with FASD display a greater deficit on language-based measures of intelligence (Verbal IQ) than on visual or hands-on measures of intelligence (Performance IQ).^{8,11-14} Moreover, deficits in verbal comprehension and spoken language,¹⁵ language comprehension,¹⁶ inappropriate use of pragmatic language,³ poor linguistic understanding,¹⁷ delayed language acquisition,¹⁸ as well as delayed speech development, voice dysfunction, articulation disorders, and fluency and rate problems⁹ have all been documented in children with prenatal alcohol exposure (PAE). Neuroimaging research in FASD has also reported functional impairment (as measured by functional magnetic resonance imaging (fMRI)) in multiple areas of the brain, including the temporal lobe, which is involved in language and learning (among other functions).¹⁹

As early as 1968, Lemoine, Harousseau, Borteyru, and Menuet²⁰ (as cited in Becker et al.²) reported speech and language impairments in children (n = 127) born to women with chronic alcoholism. Similar impairments were found in Iosub et al.'s study⁹ of 45 individuals with FASD, where 80% were found to have delays in speech and language ability. Becker et al.² also found deficits in grammatical, semantic, and articulation ability, as well as poorer linguistic memory skills in children with FASD.

In 1991, Carney and Chermak²¹ examined language development in ten children with FAS and 17 typically developing control children, between ages 4 and 12 years. Using the Test of Language Development – Primary (TOLD-P) and Test of Language Development – Intermediate (TOLD-I), Carney and Chermak²¹ measured the phonologic, semantic, and syntactic elements of both receptive and expressive language in these

children. Children with FAS displayed significant deficits on all but one subtest (*Word Articulation*) of the TOLD-P, and performed poorly on three (*Sentence Combining*, *Word Ordering*, and *Grammatical Comprehension*) out of five subtests on the TOLD-I as compared to controls. Carney and Chermak²¹ suggest that older children with FAS experience deficits primarily with respect to the syntactic aspects of language, whereas younger children display more global language deficits. One explanation for this age-related difference is that as children age, their knowledge of vocabulary grows, but they still struggle to understand the grammatical and morphological aspects of language.²¹

More recently, Coggins et al.³ examined communication deficits among a large sample (n = 393) of school-aged children with FASD. These children completed numerous standardized tests of language performance, which assessed their fundamental language skills, language comprehension, language development, overall language competence, and word knowledge. Nearly three-quarters of the children displayed significant language deficits, with 31% scoring in the mildly impaired range and 38% classified as moderately-to-severely impaired.³ It is important to note, however, that many of these children had experienced adverse environmental conditions (e.g., abuse, neglect, unpredictable or negative caregiving, etc.), which may have confounded the effects of PAE alone.³

In another recent study, McGee, Bjorkquist, Riley, and Mattson²² tested 25 children (aged 3 to 5 years) with *heavy* PAE (minimum of 4 drinks per occasion, once or more per week, or 14 drinks per week during pregnancy). They found that these children had significant deficits in both receptive and expressive language, and that expressive language was more severely impaired. Interestingly, McGee et al.²² suggest that when general intellectual ability is taken into consideration, language is neither a strength nor a weakness in children with FASD (i.e., receptive and expressive language functioning is no more or less impaired than overall IQ). Nonetheless, they also note that language deficits have an impact on social communication and behavioural adjustment, and may lead to social rejection and problems later in life.²²

Some of the factors believed to underlie the language deficits found in FASD include hearing impairments, dentofacial abnormalities, and overall cognitive impairment.²³ Children with FASD who have language impairments very often also have hearing disorders,²³ and central hearing deficits are hugely influential on language development, comprehension, and academic achievement. Dentofacial defects often require surgery and orthodontic intervention and influence speech production in individuals with FASD. Adnams et al.²⁴ suggest that a fundamental deficit in phonological awareness may also contribute to language and literacy problems in children with FASD.

Contrary to the vast body of research reporting language impairments in FASD, Greene, Ernhart, Martier, Sokol, and Ager²⁵ studied a group of over 250 children prenatally exposed to alcohol (without an FASD diagnosis) and found that language development was not related to alcohol exposure. Similarly, another study examining the relationship between prenatal exposure to teratogens (marijuana, cigarettes, and alcohol) and language development found no effect of alcohol on these abilities.²⁶ O'Leary, Zubrick, Taylor, Dixon, and Bower²⁷ also found that low levels of PAE were not related to language delays in later life. However, they noted a threefold (albeit nonsignificant) increase in risk of language delay in children of mothers who binge drank during late pregnancy.²⁷

Several potential explanations for these contradictory findings exist. First, studies finding no effect of PAE on language difficulties may be explained by low levels of maternal alcohol consumption²⁶ and the use of less complex language measures,²⁸ whereas studies that report significant results employ tasks that also rely on phonological working memory.²⁹ The timing and pattern of drinking may also play a role in the degree of impairment, as heavy exposure in late pregnancy is associated with greater risk of language delay.²⁷ Also, Abkarian³⁰ suggests that even among children with PAE who have no documented or apparent problems with the use of verbal language (or cognitive functioning), there are often difficulties with comprehension and social communication ability. It has also been suggested that although children with FAS seem to have adequate social speech skills, the content

of their speech is often irrelevant or off-topic.³⁰ Thus, while some children with PAE seem to have appropriate conversational skills on a superficial level, they may nonetheless struggle with higher-level linguistics. Furthermore, Hamilton³¹ (as cited in Coggins et al.⁷) found that children with FAS were significantly more likely than controls to communicate using inappropriate responses during conversation. That is, children with FAS were less likely to elaborate on or extend the comments of their conversation partner. Finally, Coggins et al.⁷ point out that when children with FASD are examined in less structured, more naturalistic environments (i.e., in social contexts and conversational narratives rather than standardized testing conditions), they display greater limitations than would be predicted based on their standardized test scores.

Although significant broad language impairments have been documented in both children and adults with FASD, there is a lack of data on the effect of PAE on specific linguistic processes.²⁸ Moreover, much attention has been devoted to understanding how well individuals with PAE understand and produce language, but no core deficit, profile, or consistent pattern of difficulties has yet been identified in this population.^{3,5,7} Also, although deficits in both receptive and expressive language as well as language acquisition have been documented in children with FAS, less research has focused on the unique speech and language characteristics of these children.³² Thus, the aim of the current study was to explore language abilities in children with FASD, and to add to the current understanding of the language profile in this population. Identifying a pattern of language deficits in children with FASD has diagnostic implications because language is one of the key neurobehavioural areas assessed in the diagnosis of FASD. Two broad, standardized measures of language were administered to identify the most severe areas of language deficit in children with FASD, with the ultimate goal of informing intervention research.

METHODS

Participants

Fifty children participated in this study: 27 children (10 females) with FASD, and 23 typically-developing control children (9 females).

All children with FASD had previously been medically diagnosed with an alcohol-related disorder falling under the umbrella term FASD (Neurobehavioural Disorder: Alcohol Exposed [NBD:AE], $n = 13$; Static Encephalopathy: Alcohol Exposed [SE: AE], $n = 8$; partial Fetal Alcohol Syndrome [pFAS], $n = 1$; Fetal Alcohol Syndrome [FAS], $n = 2$). Three participants had confirmed FASD, but a more specific diagnosis was not recorded in their clinical files. All children in the FASD group were recruited and diagnosed through the Glenrose Rehabilitation Hospital FASD clinic. They underwent an extensive multidisciplinary assessment according to the four-digit diagnostic code described by Astley.³³ Specifically, for brain dysfunction, a code of 1 indicated no evidence of brain damage, 2 indicated mild to moderate delay of dysfunction, and 3 indicated significant dysfunction. A brain code of 4 is given only to those with definite brain damage as indicated by structural evidence (e.g., microcephaly, structural abnormalities on MRI). Assignment of a brain code of 3 required significant impairment across three or more

neurobehavioural domains (sensory/motor, communication, attention, intellectual, academic achievement, memory, executive functioning, adaptive functioning), whereas a brain code of 2 was assigned when current data did not support a ranking of 3 or 4 despite a strong history of significant cognitive and/or behavioural problems. For alcohol, a code of 1 indicates no risk, 2 unknown, 3 some risk, and 4 high risk. The clinic coordinator confirmed alcohol exposure prior to acceptance into the clinic, with scores of 3 and 4 seen as significant enough to lead to brain damage and thus acceptable for clinic admission. Confirmation of alcohol use was obtained from birth records, Child and Youth Services documentation, from the birth mother directly, or other reliable sources. Except for birth mother report, corroborative evidence of PAE was required. Rankings of growth deficiency and facial phenotype (where a code of 1 indicates unlikely, 2 possible, 3 probable, and 4 definite) were made by a developmental pediatrician. See Table 1 for a more comprehensive breakdown of diagnostic information for children with FASD.

TABLE 1Breakdown of Diagnoses of Children With FASD (Astley³³)

Score	Growth	Face*	Brain Function	Alcohol Exposure
1	59.3% (16)	40.7% (11)	0% (0)	0% (0)
2	3.7% (1)	29.6% (8)	44.4% (12)	0% (0)
3	3.7% (1)	3.7% (1)	37.0% (10)	33.3% (9)
4	14.8% (4)	3.7% (1)	0% (0)	48.1% (13)

Note: Growth, Face, and Brain function scores: 1 = unlikely, 2 = possible, 3 = probable, 4 = definite. Alcohol exposure, Prenatal, and Postnatal scores: 1 = no risk, 2 = unknown risk, 3 = some risk, 4 = high risk.

*One participant had a cleft palate, thus a face score was unobtainable.

Additional data was obtained from the Glenrose FASD clinic database on potentially confounding variables, including exposure to other teratogens, comorbidities, number of placements, current placement, and IQ scores. Seven children in the FASD group had confirmed exposure (and one suspected exposure) to cocaine, one was exposed to heroine, six to tobacco, two to marijuana, two to “other” intravenous drugs, three to suspected/unspecified teratogens, eight unknown, and four were not exposed to any

teratogens other than alcohol. Seven children had comorbid ADHD diagnoses (one with an ODD diagnosis as well), and two met the criteria for mental retardation. The average number of placements that children with FASD had experienced was 2.04 with a range of 1 to 4 (placement data was unavailable for three participants). Eleven children lived with biological family members (five with mother, one with father, four with grandparents, one with extended family), five were living in foster

placements, and eight had been permanently adopted. Fourteen children had been placed in their current homes between birth and 1 year of age, and seven between the ages of 1 to 4. Information regarding timing of placement was unavailable for six children. IQ scores were available for 20 children with FASD, with a mean of 85 (range 58-111).

Control children were recruited through colleagues, and none were diagnosed with FASD or any other neurobehavioural disorder (including ADHD and LD). Children with FASD ranged in age (in years-months) from 5-0 to 13-3, with a mean age of 9-0, and control children ranged in age from 5-0 to 13-3, with a mean age of 8-8. There was no significant difference in age between the two groups, ($F(1,46) = .32, p = .57$). All control participants resided in their biological parents' homes. Information regarding socioeconomic status (SES) was not available for either group.

Procedure

All children were tested on two measures of language ability: the Comprehensive Receptive and Expressive Vocabulary Test – Second Edition (CREVT-2³⁴) and the Test of Language Development – Third Edition (TOLD-3³⁵). There are two different versions of the TOLD-3 (primary and intermediate), designed for children of distinct younger and older age ranges. Thus children aged 5 through 8 years (12 FASD and 13 control) completed four subtests of the primary version of the TOLD-3 (TOLD-P:3³⁵), and children aged 9 through 13 years (14 FASD and 10 control) completed four subtests of the intermediate version (TOLD-I:3³⁶). All children completed the same version of the CREVT-2. These tests were consistently administered and scored by one research assistant. Children with FASD were tested as part of a more comprehensive cognitive battery, with the TOLD:3 and CREVT-2 administered at the end of the testing session. Control children were tested on language measures only, completing the TOLD:3 first, and the CREVT-2 second. Breaks were provided to all children as needed. Approval for this study was obtained from the Health Research Ethics Board at the University of Alberta.

CREVT-2³⁴

Receptive Vocabulary

This task measures receptive oral vocabulary. The examiner reads a series of words, and the participant must point to a picture that best matches the word.

Expressive Vocabulary

This task measures expressive oral vocabulary. The examiner reads a series of words, and the participant is asked to describe their meanings.

TOLD-P:3³⁵

Relational Vocabulary

This task measures participants' understanding and oral expression of the relationship between two words. Children must describe how two words are alike. For example, the examiner asks, "How are a pen and pencil alike?" and the child must respond with "they are writing tools," or some similar variation.

Grammatical Understanding

This syntactic task measures participants' comprehension of the meaning of sentences. The examiner reads a sentence, and the child must select one of three pictures that best matches the stimulus sentence.

Sentence Imitation

This task assesses participants' ability to produce correct sentences. The examiner reads a sentence and the child must imitate it exactly.

Grammatical Completion

This task measures a child's ability to recognize, use, and understand common English morphological forms, and focuses particularly on their knowledge of inflections. The examiner reads an incomplete sentence, and the child must finish the sentence by supplying the missing morphological form. For example, the examiner reads, "Carla has a dress. Denise has a dress. They have two _____" (pause), and the child must respond with "dresses."

TOLD-I:3³⁶

Word Ordering

This task involves both listening and speaking skills, but focuses more on speaking ability, and measures syntactic ability. The examiner supplies the child with a string of randomly ordered words, and the child must rearrange the words to make a proper sentence. For example, when the examiner

reads “big, am, I,” the child may respond with “I am big,” or “am I big?”

Generals

This is primarily a speaking task, and measures semantic ability. The examiner reads three words, and the child must tell how they are alike. For example, the examiner reads “Mars, Venus, Pluto,” and the child must state that they are all planets.

Grammatical Comprehension

This task mainly involves listening, and measures syntactic ability. It assesses a child’s ability to recognize incorrect grammar in a spoken sentence. The examiner reads a series of sentences and the child is asked to identify whether they are correct or incorrect.

Malapropisms

This semantic task focuses primarily on receptive language skills. The examiner reads sentences that include malapropisms, which are words that sound appropriate, but are incorrect given the context of the sentence. The child must identify the malapropism, and provide the appropriate word. For example, when the examiner reads,

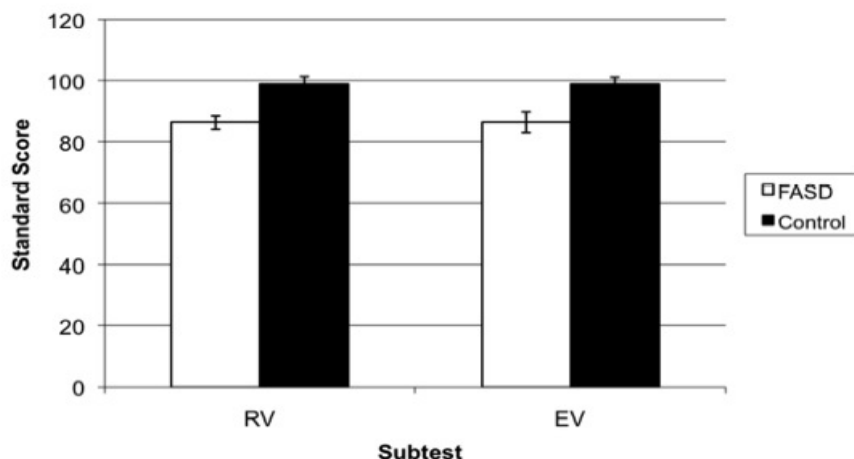
“Mary had a little *ham*,” the children must state that *ham* should be replaced with *lamb*.

RESULTS

Mean scores and group comparisons are presented in Figure 1. Performance on the CREVT-2 was analyzed with a 2(Group: FASD, Control) x 2(Gender) x 2(Subtest: Expressive Vocabulary, Receptive Vocabulary) ANOVA with repeated measures on the last variable. Across all children, there was no significant difference between performance on the Receptive and Expressive subtests of the CREVT-2 $F(1, 43) = .036$ ($p > 0.05$), and there was no interaction between Group $F(1, 43) = .035$ ($p > 0.05$) or Gender $F(1, 43) = .991$ ($p > 0.05$). However, between-subject analysis revealed that there was a significant effect of Group, indicating that, overall, children with FASD had lower scores on the CREVT-2 than control children $F(1, 43) = 13.70$ ($p < 0.01$), $\eta^2 = .24$. Because there was no effect of Gender in the CREVT-2 analysis, this variable was removed from all further analyses.

FIG. 1 Mean scores and group comparisons among children with FASD and control children on the CREVT-2

Figure 1



Note. RV = Receptive Vocabulary; EV = Expressive Vocabulary

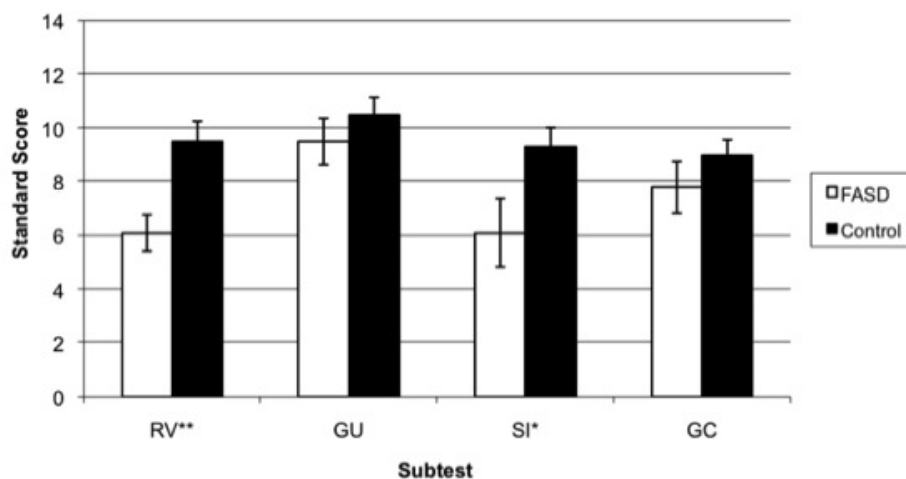
Due to the different age ranges in the TOLD-3 measures, the sample sizes in the following analyses were approximately half of the entire sample. In the TOLD-P:3 analyses, there were 12 children with FASD and 13 control children, and in the TOLD-I:3, there were 14 children with FASD and 10 controls. Mean scores and group comparisons for the TOLD-P:3 are presented in Figure 2. To compare the effect of Group on the different TOLD-P:3 subtests, separate one-way between-subjects ANOVAs were performed. Children with FASD performed significantly poorer than control children on the Relational Vocabulary $F(1, 23) = 10.96$ ($p < 0.01$) and Sentence Imitation $F(1, 22) = 5.23$ ($p < 0.05$) subtests, but differences were not significant on

Grammatical Understanding $F(1, 23) = 1.09$ ($p > 0.05$) or Grammatical Completion $F(1, 23) = 1.22$ ($p > 0.05$).

Mean scores and group comparisons for the TOLD-I:3 are presented in Figure 3. Separate one-way between-subjects ANOVAs were conducted again to compare the effect of Group on the different TOLD-I:3 subtests. Children with FASD performed significantly poorer than control children on the Word Ordering $F(1, 23) = 16.12$ ($p < 0.01$), Grammatical Comprehension $F(1, 23) = 24.77$ ($p < 0.01$), and Malapropisms $F(1, 23) = 20.63$ ($p < 0.01$) subtests, but differences were not significant on the Generals subtest $F(1, 23) = 1.70$ ($p > 0.05$).

FIG. 2 Mean scores and group comparisons among children with FASD and control children on the TOLD-P:3

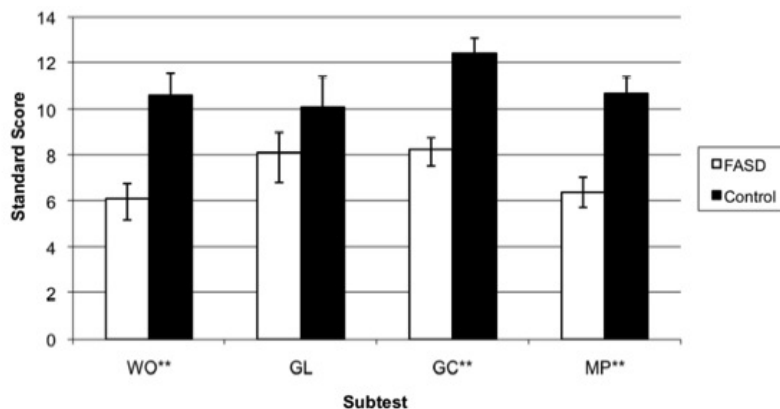
Figure 2



Note. * $p < 0.05$, ** $p < 0.01$; RV = Relational Vocabulary; GU = Grammatical Understanding; SI = Sentence Imitation; GC = Grammatical Completion

FIG. 3 Mean scores and group comparisons among children with FASD and control children on the TOLD-I:3

Figure 3



Note. * $p < 0.05$, ** $p < 0.01$; WO = Word Ordering; GL = Generals; GC = Grammatical Comprehension; MP = Malapropisms

To examine whether severity of FASD was related to severity of language impairment, two separate one-way ANOVAs were conducted. The first compared performance of children with a moderate diagnosis (Neurobehavioural Disorder: Alcohol Exposed) to performance of children with more severe diagnoses (Static Encephalopathy: Alcohol Exposed, partial Fetal Alcohol Syndrome, and Fetal Alcohol Syndrome). There was no significant difference between diagnostic groups on any language subtest (see Table 2 for a report of statistical values). A second ANOVA was conducted comparing children with a CNS code of 2 (indicating moderate dysfunction) and children with a CNS code of 3 (indicating severe dysfunction) based on Astley's³³ 4-digit code system. No significant differences were found between the two groups. Age was not correlated with any of the subtests administered except for the CREVT-2 Expressive Vocabulary subtest in control children only $r(20) = 0.51$.

To investigate whether home instability (i.e., multiple placements after birth) affected performance on language measures in children with FASD, we conducted a one-way ANOVA

comparing scores of children who remained in one home after birth (biological or foster/adopted) and children who had experienced multiple placements. Due to small sample sizes for both TOLD:3 measures, we only analyzed scores on the CREVT-2 subtests. There was no significant difference between children with a single home placement and those with multiple placements on either of the CREVT-2 subtests, $F(1, 22) = 0.10$ ($p > 0.05$) and $F(1, 21) = 0.76$ ($p > 0.05$) for CREVT-2 Receptive vocabulary and Expressive vocabulary, respectively.

DISCUSSION

Ample research has been conducted to examine language development in individuals prenatally exposed to alcohol, both with and without FASD diagnoses. Many of these individuals tend to be delayed in fundamental language skills and acquisition, comprehension, language and speech development, overall language competence, and knowledge of words.³ Deficits range from lower levels of language functioning, such as word articulation, naming, and comprehension⁵ to more

complex communication abilities, such as semantics, grammar, syntax, linguistic understanding and memory, and inappropriate use of pragmatic language.^{2,3,17,21}

Despite the fact that such considerable language deficits have been documented in individuals with PAE, relatively little attention has been devoted to identifying unique patterns or profile of impairment in these individuals.^{3,5,7,32} Thus, the aim of the current study was to ascertain what aspects of language are most significantly affected in children with FASD, and to identify a profile of language impairments. Children with FASD performed significantly poorer than control children on both the receptive and expressive subtests of the CREVT-2, indicating that these children struggle to match pictures to spoken words, and accurately describe the meanings of commonly used words. There was no difference in performance between the Receptive and Expressive subtests, suggesting that both components of oral vocabulary are impaired in children with FASD.

To examine whether there is a profile of language impairment in children with FASD, we compared FASD and control children on the subtests of the TOLD-3 (separately for the primary and intermediate versions). Children with FASD had significantly lower scores on two subtests of the TOLD-P:3 – Relational Vocabulary and Sentence Imitation – but not Grammatical Understanding or Grammatical Completion, and on three subtests of the TOLD-I:3 – Word Ordering, Grammatical Comprehension, and Malapropisms – but not on Generals. This suggests that younger children with FASD struggle most with understanding and expressing the relationship between words and imitating spoken sentences. Yet they are not impaired in comprehending sentences or recognizing, using, and understanding common morphological forms. Older children seem to have the most difficulty with speaking and syntactic ability, recognizing and correcting incorrect grammar, and identifying and correcting malapropisms. Semantic ability in these older children appears to be unaffected. These results are slightly different than those reported by Carney and Chermak,²¹ who suggest that younger children possess a more global deficit, whereas older children primarily have difficulty with the syntactic elements of language.

That is, the results from this study may indicate that older children are impaired in more areas of functioning. This discrepancy may be due to the fact that Carney and Chermak's²¹ sample size ($n = 10$) was slightly smaller than that of the current study ($n = 24$), and only included American Indian children, thus representing a very specific population. Their results may also have differed from the current study because they tested children with the most severe diagnosis in the FASD spectrum (FAS), whereas the diagnoses of children in this study ranged from NBD:AE to full FAS. Regardless, both Carney and Chermak's²¹ and the current study suggest that children with FASD are significantly impaired in numerous areas of language development, particularly with regard to syntax.

Language difficulties are shown to have broad implications, as individuals with FASD tend to struggle with interpersonal language, peer interaction, appropriate conversation content, social reasoning, and information processing, especially as the complexity of social interaction increases.^{7,8,10,30} Further, language deficits in individuals with FASD have been linked to learning and behaviour problems,^{8,9} as well as “secondary disabilities” including difficulties with school and work, health problems, and legal issues.⁷

As described by Coggins et al.⁷ and others, these language deficits have a long-lasting and profound impact on the lives of affected individuals, and are interconnected with a variety of factors. Research has also examined language within the context of social interaction. Results of these studies suggest that as the complexity of the social situation increases, children with FASD experience more difficulty using language appropriately.⁷ As the demands of unstructured social interactions rise, the ability to use interpersonal language appropriately declines in children with FASD. This is an important finding, as such unstructured conditions are much more typical of everyday life than are the conditions of a standardized testing session. Simply having the necessary language does not suffice for competent communication; it is the ability to know *how* and *when* to use language that leads to success in social environments.

Coggins et al.⁷ provide a thorough examination of the social implications of language

delays in FASD. They suggest that the pervasive neuropsychological deficits in individuals with FASD impair their ability to interact and communicate in social situations. Moreover, this impairment has been linked to “secondary disabilities” including mental health issues, legal problems, and difficulties with school or work.⁷ As such, research that examines the specific language difficulties of individuals with FASD is important in designing interventions specifically tailored to this population.

A proper assessment of language ability may offer a significant clinical advantage for children with FASD, as the quality of narrative language skills in congruence with other abnormalities such as expressive language may be an indicator of PAE. Specifically, a distinct pattern of storytelling in social discourse may exist in children with FASD, regardless of their performance on a standardized expressive language task.³⁷ This suggests that, in addition to informing therapeutic intervention, language assessment may also have utility in the process of diagnosing FASD. For instance, children with FASD may display a particular pattern of pragmatic and semantic language deficits³⁷ which could inform the diagnostic process. Moreover, the existence of language and speech deficits in congruence with hearing dysfunction and craniofacial anomalies (e.g., cleft palate, cleft lip) may be important in the diagnostic process.²³ One factor to consider in the assessment of language and intelligence is hearing disorders, as they may impact the validity of language and intelligence measures.²³ Early evaluation and intervention for hearing, speech and language, and dentofacial dysfunction is critical, as receptive language, comprehension, language acquisition, and intellectual development may all be impaired by such deficits.²³

Improperly identifying the neurodevelopmental deficits in children with FASD, and particularly those related to language, may lead to an underestimation of a child’s need for school-based interventions.³⁸ As well, since unrecognized language deficits may result in poor development of coping strategies, leading to problem behaviours, there is a great need for schools and speech-language pathologists (SLPs) to increase their understanding of the neurobehavioural deficits in children with FASD

(especially those who have experienced trauma), and tailor interventions to their specific needs.³⁸ Adopting a holistic and systemic perspective, which involves collaboration across disciplines, enables professionals to more effectively enhance the neurodevelopmental outcomes of children with FASD. Specifically, looking beyond the child to the familial and societal context in which he or she lives, as well as considering impairments beyond language ability (e.g., sensory and other cognitive deficits) is crucial in effectively meeting his or her needs and improving functioning.³⁹

One example of a holistic intervention is the brain-behaviour based approach, whereby special attention is devoted to the child’s unique difficulties, and aims to provide children with both physical and psychological safety in order to increase their ability to express their emotions and develop positive behaviours.³⁸ Another intervention was implemented by Adnams et al.²⁴ to ameliorate language deficits in children with FASD in South Africa. The intervention – Language Literacy Training (LLT) – is aimed at developing phonological awareness and other early literacy skills that contribute to efficacy in reading and spelling. The intervention was tested among three groups of children: children with FASD who received the intervention (LLT), children with FASD who did not receive the intervention (FASD-C), and control children without PAE who did not receive the intervention (NONEXP-C). The LLT group displayed significant relative gains over FASD-C on several language measures and caught up significantly to the NONEXP-C group on complex literacy skills.²⁴

Another environmental factor that affects language development in children with FASD is early caregiving experiences. During an alcohol-affected child’s first years of life, caregiving is suggested to have an especially important impact, not only on social and emotional development, but also on the neuropsychological functioning of the child (with concentration, attention, and language/speech problems being most significantly affected).⁴⁰ Specifically, placement in a long-term foster care setting and fewer traumatic experiences are associated with lower risk of problems in these areas.⁴⁰ Moreover, children who are exposed to alcohol in utero as

well as traumatic events in their early life have more severe neurodevelopmental impairments (including language deficits) than traumatized children without PAE.³⁸

Study Limitations

One limitation in this study is that we were only able to match control children on age and gender, and therefore unable to examine explicitly how SES and other environmental issues, emotional problems such as depression and anxiety, other comorbidities such as ADHD or LDs, or pattern and timing of maternal drinking may impact the language abilities of children with FASD. An inherent difficulty in FASD research is that it is virtually impossible to control for post-natal and environmental factors that influence a child's development after birth, particularly for those with FASD. A second limitation of this study is that the measures we used to test language impairment do not represent the entire spectrum of abilities that contribute to communication. For instance, measures of hearing, working memory, problem solving, social perception, as well as complex measures that involve conversation or higher-level narratives would provide a more complete understanding of the context surrounding language disabilities in FASD. Lastly, because of the age division on the TOLD:3, our sample size for this measure was rather small. Age differences on the TOLD:3 must be interpreted with caution because this study was not longitudinal, thus further longitudinal research on language development in FASD is important. Although the results of the current study add to the overall understanding of language development in children with FASD, it is not possible to say whether the documented language deficits are due to diagnosis alone. Research using more specific and complex measures with a larger population with well controlled variables is warranted to identify a specific profile in these children.

CONCLUSION

This study supports the literature suggesting significant language deficits in FASD. It demonstrates that children prenatally exposed to alcohol have problems with many of the basic language skills that are fundamental in cognitive,

behavioural, and social development. As Adnams et al.²⁴ note, one of the reasons for the lack of systematically researched interventions for children with FASD is that there is no consensus on a specific neurobehavioural or cognitive profile. Therefore, the current study contributes in terms of identifying areas of deficit displayed by these children. Most importantly, it highlights areas that may be considered in designing interventions for improving basic language skills, which may have implications for the development of learning and behaviour, interpersonal communication, and social skills in individuals with FASD.

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