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A Statewide Survey Of Fetal Alcohol Syndrome

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A STATEWIDE SURVEY OF FETAL ALCOHOL SYNDROME

BACH

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A Statewide Survey of Fetal Alcohol Syndrome

(TITLE)

BY

Kathryn S. Bach

THESIS

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ABSTRACT

Fetal alcohol syndrome (FAS) is one of the leading causes of mental retardation in the Western world and is the most preventable. It is one of many syndromes confronting speech-language pathologists, presenting them with complicated assessment and intervention challenges. A child with fetal alcohol syndrome (FAS) is not just a child with congenital anomalies and mental retardation but is a child with multihandicaps that affect all organs and sensory modalities.

Many features of FAS may have a direct impact on the speech-language-hearing abilities of the child affected, yet these influences have been minimally addressed in speech-language-hearing literature. In fact, little has previously been known about FAS' prevalence in the caseloads of SLPs.

The purpose of this research project was, then, to investigate the prevalence of fetal alcohol syndrome (FAS) and fetal alcohol effects (FAE) in SLPs' caseloads and to examine the speech-language-hearing deficits associated with them. A survey of 328 licensed Illinois speech-language pathologists was conducted to yield key prevalence information and to serve as a basis for a line of subsequent research related to appropriate FAS and FAE speech-language-hearing assessment and intervention. Specifically, the study surveyed the facial anomalies exhibited by patients with FAS or FAE, the reported cognitive functioning levels of these patients, the reported behaviors of the population, and the reported deficits in

hearing, articulation, voice, fluency, and language in individuals with FAS or FAE. All surveys were group analyzed for both the diagnosed (D) and evidenced characteristics (EC) subgroups with each survey section treated separately during data analyses. Response similarities and response differences were calculated. On multiple speech-language-hearing aspects statistical significant difference were found between the two subgroups. Implications for future research are reviewed.

DEDICATION

To my husband, Chris Bach, who has been beside me throughout my graduate career and has helped to motivate and support me during this research project. His understanding and love have guided me and helped me grow through this learning experience. His willingness to share in my frustrations and exaltations has been endless and completely unselfish.

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CHAPTER I

INTRODUCTION

Definition

Recently, research has focused attention to the effects alcohol may have on an infant's physical, social, and cognitive development. In 1973, Jones, Smith, Ulleland and Streissguth labeled the association between maternal alcoholism and morphogenesis in their children as fetal alcohol syndrome (FAS). Fetal alcohol syndrome has been reported in all races and at varying ages from neonate to young adulthood (Little & Streissguth, 1981).

FAS is a specific pattern of altered growth, structure and function seen in the offspring of alcoholic women who drink heavily throughout pregnancy (Jones et al., 1973). The Fetal Alcohol Study Group of the Research Society of Alcoholism has defined the minimal criteria necessary to establish a diagnosis of FAS as being: (a) prenatal and/or postnatal growth deficiency; (b) central nervous system involvement (neurological abnormalities, developmental delay, intellectual impairment), and; (c) characteristic facial dysmorphology with at least two of the following: microcephaly, microphthalmia, and/or short palpebral fissures, poorly developed philtrum, thin upper lip, and flattened maxillary area (Hill, Hegemier, & Tennyson, 1989). (See glossary for terminology.) Clarren (1981) also included major

organ malfunctions as part of the FAS criteria. The principle features of FAS can be further reviewed in Table 1 with specific features relating to speech-language-hearing deficits being located in Table 2.

FAS and Speech-Language Pathology

Fetal alcohol syndrome is one of many syndromes confronting speech-language pathologists (SLPs). A person with fetal alcohol syndrome (FAS) is not just a person with congenital anomalies and mental retardation but is a person with multihandicaps that affect all organs and sensory modalities. Many features of FAS have a direct impact on the speech-language-hearing abilities of the individual affected, yet these influences have been only minimally addressed in present speech-language-hearing literature. In fact, little is even known about the prevalence of FAS in the current caseload of SLPs. A statewide survey of Illinois speech-language pathologists who consult, assess, and provide intervention services for individuals with FAS could yield key prevalence information and serve as a basis for a line of subsequent speech-language-hearing research related to appropriate FAS assessment and intervention.

FAS and FAE

For every child who experiences the complete teratogenetic effects of fetal alcohol syndrome (FAS), another

Table 1 Major Abnormalities of FAS

Central Nervous System:
- Microcephaly
- Hydrocephaly
- Anencephaly
- Porencephaly
- Meningomyelocele
- Lumbrosacral lipoma
- Seizures

Cutaneous:
- Hemangiomas
- Hirtuitism in infancy
- Palmar crease abnormalities
- Abnormal fingerprints

Muscular:
- Hernias of diaphragm, umbilicus, or groin

Skeletal:
- Prenatal and postnatal growth deficiency
- Hypoplastic nails
- Shortened fifth digits
- Radioulnar contractures
- Flexion contractures
- Camptodactyly
- Clinodactyly
- Pectus excavatum and carinatum
- Klippel-Feil syndrome
- Hemivertebrae
- Scoliosis
- Orthopedic problems in extremities
- Hypotonia

Cardiac:
- Atrial eptal defects
- Vetricular septal defects
- Aberrant great vessels
- Teralogy of Fallot

Embryonal tumors
Genitalia malformations
Renal anomalies
Immune deficiencies

Expanded from Burd & Martsolf, 1989; Clarren, 1981.

Table 2 FAS Features Affecting Speech-Language-Hearing

Respiration:
Upper airway obstructions
Respiratory distress syndrome
Head:
Facial assymetry
Eyes:
Short palpebral fissures
Epicanthal folds
Ptosis
Strabismus
Myopia
Nose:
Short upturned nose
Flat nasal bridge
Hypoplastic philtrum
Maxilla:
Flattened
Hypoplasia
Mouth:
Thinned upper vermilion
Cleft lip and/or palate
Prominent lateral palatine ridge
Mandible:
Retrognathia in infancy; micrognathia or relative prognathia in adolescence
Ears:
Hyperacusis
Posterior rotation
Abnormal concha
Recurrent serous otitis media
Sensori-neural hearing loss
Low set ears
Dentition:
Malalignment
Malocclusions
Small teeth

Expanded from Burd & Martsolf, 1989; Clarren, 1981; Gerkin & Church, 1988.

four children exhibit incomplete forms which are termed "suspected fetal alcohol effects" (FAE) (Clarren & Smith, 1978; Gitlow & Seixas, 1988). Additional terms have been applied to infants who do not meet all the FAS criteria but have malformations and a history of maternal alcohol consumption. These terms include: the partial fetal alcohol syndrome, alcohol-related birth defects, the expanded fetal alcohol syndrome, and fetal alcohol effects (the most commonly used and more generally accepted term) (Hill et al., 1989).

Alcohol

Alcohol is a lipophilie that has relatively low molecular weight which enables it to freely pass from the maternal to fetal circulatory system (Chasnoff, 1988). Concentrations of alcohol in the unborn infant are at least as high or higher than those in the mother. These concentrations have the potential to cause damage to fetal organ development (Sparks, 1984). In addition, there are a number of compounding factors that may further contribute to adverse fetal development, such as poor nutrition and/or the dual use of alcohol and another substance, (e.g., cigarettes, marijuana, cocaine, coffee, and/or other psychoactive drugs) (Chasnoff, 1988). Unlike other substance abuses, FAS is a clinically observable entity with specific parameters for diagnosis and will thus be studied in this research project as a single entity.

Research Questions

The prevalence of FAS in the caseload of SLPs is as yet undocumented. Appropriate assessment and intervention must be addressed to enable SLPs to better serve those with FAS, but first a prevalence figure for the syndrome must be determined. Therefore, the following research questions have been asked in regard to the speech-language-hearing deficits of persons with fetal alcohol syndrome (FAS) and fetal alcohol effects (FAE):

1. How many patients with a diagnosis of FAS/FAE or patients who evidence characteristics of FAS/FAE are part of a speech-language pathologist's caseload in the state of Illinois?

2. What types of speech-language-hearing deficits specific to FAS/FAE are being serviced by speech-language pathologists in Illinois?

3. Are the IQs of patients with diagnoses of FAS/FAE or those who evidence characteristics of FAS/FAE consistent with those noted in current literature findings?

4. Are the behaviors exhibited by patients with diagnoses of FAS/FAE or those who evidence characteristics of FAS/FAE consistent with those noted in current research?

5. What facial anomalies are exhibited by patients who have diagnoses of FAS/FAE or evidence characteristics of FAS/FAE?

6. Is there a relationship between facial malformations and IQ and oral motor dysfunctions and IQ for patients who have diagnoses of FAS/FAE or evidence characteristics of FAS/FAE?

CHAPTER II

REVIEW OF LITERATURE

"What must become of an infant who is conceived in gin, with the poisonous distillations of which it is nourished, both in the womb and at the breast?" (Fielding, 1751). While this question remains unanswered in terms of speech-language-hearing deficits, researchers are beginning to reveal how fetal alcohol exposure affects speech, language and hearing. The logical first step to discovering pertinent intervention issues related to serving persons with fetal alcohol syndrome is to do research. Physical, neuropsychiatric, and speech-language-hearing features specific to fetal alcohol syndrome as well as its incidence and economic impact will be addressed in the following literature review.

One of the most critical points to be presented in the literature is that FAS is one of the most common preventable causes of birth defects in the United States (Abel, 1986). The critical amount of alcohol that would elicit the full spectrum of congenital abnormalities known as FAS has not been determined; however, according to Jones, Smith, Streissguth and Myriantholoulos (1974) FAS occurs in 30% to 45% of infants born to chronic, heavy, daily drinkers. Binge drinking and moderate drinking, especially in the first trimester of

pregnancy, carry a lower yet known risk (Clarren, 1981).

Drinking alcohol during pregnancy has also been observed to lead to increased risks for spontaneous abortions, stillbirths, and low birth weight (Gitlow & Seixas, 1988). Variables that influence the presence and amount of damage each fetus may sustain include the amount of alcohol consumed, the timing of the exposure, duration of the exposure, presence of other damaging agents, and individual susceptibility. Clinical studies have shown that even moderate drinking during the first few weeks of pregnancy may cause adverse effects to the developing fetus (Smith, Sandor, MacLeod, Tredwell, Wood, & Newman, 1979). The first trimester has been reported as being a vulnerable time for fetal organ malformations, as well as for overall fetal growth, while the third trimester has been reported as especially crucial for neurological growth (Eliason & Williams, 1990). To date there has been no documented upper level of consumption that allows for prediction of definite fetal damage nor lower level of alcohol consumption that excludes the possibility of fetal harm (Clarren, 1981).

Prenatal alcohol exposure may lead to neurological alterations in the newborn. Central nervous system (CNS) damage is a consistent feature of FAS. The damage to the CNS may include mental retardation, temperamental and behavioral alterations, hyperactivity, learning disabilities, and speech

and language disorders (Adler & Raphael, 1983; Bell & Cohen, 1981; Cantwell, 1972; Coles, Smith & Falek, 1987; Steinhausen, Gobel, & Nestler, 1984; Steinhausen, Nestler & Spohr, 1982). In addition, infants who are intoxicated at birth metabolize ethanol extremely slowly and show sleep disturbances, irritability, tremors, hyperacusis, and may possess a weak suck (Clarren, 1981; Coles, Smith & Palek, 1987). Further, children with FAS appear to be slow to habituate to stimuli and have decreased alertness with lower levels of arousal (Landesman-Dwyer, Keller, & Streissguth, 1978; Streissguth, Barr & Martin, 1980).

Intellectual Abilities

Mental retardation is a cardinal feature of FAS; the syndrome has been found to be one of the three most identifiable causes of mental retardation and neurological abnormalities in the Western world (Abel, 1984; Abel & Sokol, 1986; Abel & Sokol, 1988; Jones & Smith, 1973). The average IQ of children with FAS has been found to be in the mild range of retardation (i.e., 60 to 75) (Clarren, 1981; Jones et al., 1973; Streissguth, Herman & Smith, 1978), but can range from normal to profound levels of retardation (Becker, Warr-Leeper, & Leeper, 1990). The IQ of the child with FAS does not reflect the total picture of potential handicaps. Even when there is a child with FAS with an average IQ the child is at a

greater risk for needing special education services and has a greater likelihood of being retained in school than age matched peers (Hill et al., 1989).

Learning Disabilities

Parent alcoholism has been linked to both learning disabilities and hyperactivity in the children with FAS, with characteristics being similar to those noted in children with minimal brain dysfuction (Becker et al., 1990; Gold & Sherry, 1984; Lippmann, 1980). In fact, 13% of children enrolled in learning disabilities classes are believed to have alcoholic mothers (Gitlow & Seixas, 1988). Current research has not specified, however, how many children in learning disabilities classes, whose mothers are alcoholic, carry diagnoses of FAS or FAE.

Clarren (1981) indicated that FAS newborns have extremely disorganized brains caused by cerebral structural deviancies. The continued presence of alcohol in the infant's system may exacerbate the disorganization of the infant's brain. This brain dysfunction has typical characteristics including hyperactivity, difficulty with attention span and concentration, impulsivity, cognitive deficits, perceptual deficits, and speech impairments (Bellak, 1977; Hill et al., 1989). Minimal brain dysfunctions can lead to multiple problems in school and social performance.

Research indicates that the child with FAS may remain

undiagnosed until he is found to have social, emotional and/or cognitive deficits (Rogan, 1985; Streissguth, 1983). Some children are even misdiagnosed with Down syndrome, Noonan syndrome or Pierre Robin sequence (Gerkin & Church, 1987).

Coles, Smith and Falek (1987) described the incidence and persistence of CNS related behavioral alterations in groups of infants born to low socioeconomic status African American women. Groups consisted of one group whose mothers never drank during pregnancy, one whose mothers stopped drinking during pregnancy, and a final group whose mothers drank throughout pregnancy. Results indicated that moderate to heavy alcohol use during gestation may lead to behavioral alterations in the neonatal period, even in the absence of significant growth retardation or physical dysmorphic features. Infants whose mothers continued to drink during pregnancy evidenced more abnormal reflexes, lower motor maturity and increased levels of activity, tremors and startling than infants in either of the other two groups. Even the "stopped drinking" group infants were not free from deficits related to their mothers' earlier alcoholic consumptions. At age three days, these infants demonstrated alterations in reflexes, activity levels and motor maturity. An assessment of the infants at thirty days indicated neurological behaviors consistent with alcohol withdrawal.

Behavior of the thirty-day-old infants from the "never drank" and the "stopped drinking" groups did not differ, while the infants whose mothers drank throughout pregnancy remained impaired in areas of reflexive behaviors and autonomic nervous system control. The mean mental score for the "continued drinking" group was found to be ten points lower than infants in the other two groups at three and thirty days.

Behavior

As mentioned, emotional instability, short attention span, restlessness and distractibility are associated with FAS (Landesman-Dwyer, Ragozin, & Little, 1981). A higher incidence of insecurity and disorganization as compared to children in the general population is also evidenced. The level of insecurity and disorganization increases proportionately to the volume of alcohol consumed by the mother (O'Connor, Sigman & Brill, 1987). Table 3 contains a list of neuropsychiatric characteristics associated with FAS.

Table 3 Neuropsychiatric Features Associated With FAS

Irritability in infancy	Attention deficit
Hyperactivity	Short memory span
Schzophrenia	Impulsivity
Enuresis	Emotional instability
Encopresis	Abnormal EEG
Echolalia	Tremors
Seizures	Mental retardation
Cerebral palsy	Abnormal fine motor functions
Developmental Delays	

Expanded from Burd & Martsolf 1989.

Dysmorphia

Children with FAS evidence various anomalies. The anomalies associated with FAS include skeletal, facial and cerebral abnormalities. Microcephaly is usually the first sign of CNS dysfunction (Clarren, 1981). Skeletal anomalies include abnormalities of the thoracic cage, hypoplasia of the radial head, and delayed skeletal maturation. Spinal anomalies occur in 43% of infants with FAS and may contribute to the short neck associated with children with FAS (Smith, Sandor, Macleod et al., 1979). Facial anomalies of children with FAS include short palpebral fissure, short upturned nose, hypoplastic philtrum, hypoplastic maxillary (flat midface), thin upper vermilion, and mild retinal aberrations (Clarren & Smith, 1978). It has been noted that the lower the IQ the greater the facial dysmorphia (Hill et al., 1989; Streissguth et al., 1978). Common cerebral anomalies include cerebral dysgenesis and cerebral hypoplasia. Infant size has been noted to be inversely related to alcohol use. Growth deficiency is usually moderate, but children with FAS are typically below the third percentile for both height and weight due to reduced adipose tissue. Little can be done to enhance the growth of a child with FAS. Growth in the nose and mandible of older children and adults with FAS may change the physical appearance somewhat but the head remains small,

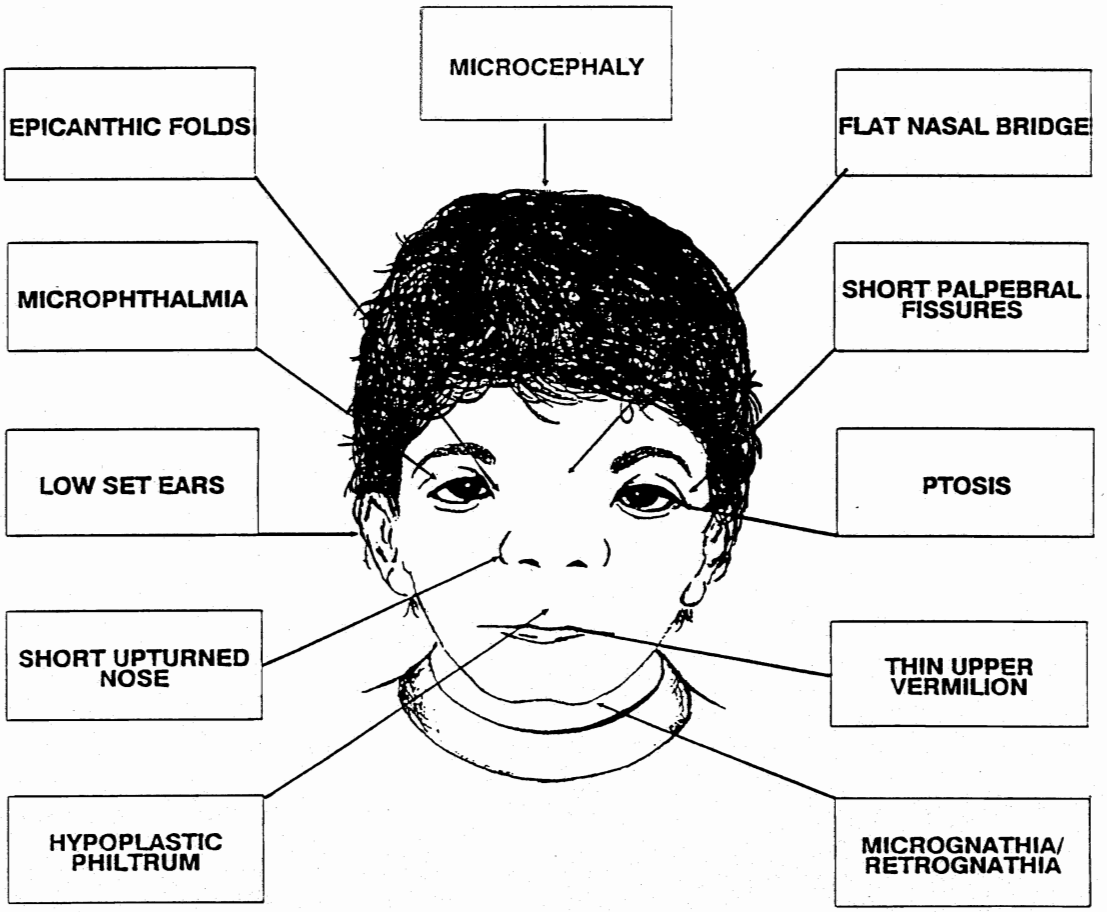
and retrognathia persists (Clarren, 1981). Figure 1 is an illustration of a person with many of the features characteristic of FAS.

Multiple dental problems related to facial dysmorphias, retrognathia, and dysharmonic growth of the midplane of the face often exist. These include: malalignments, malocclusions, severe overbite, mesial tipping of the molars, crowding, mixed dentition, and absence of permanent teeth (Streissguth, Clarren & Jones 1985; Wood, 1977). Other oral abnormalities often include a high arched palate and/or cleft palate (Majewski, 1981).

Failure to thrive and feeding problems are well documented in children with FAS. A weak, limited sucking pattern and easy tiring during feedings may be noted (Hill et al., 1989). Complete oral feedings may not be attained until 14 to 18 months of age (Van Dyke, Mackay, & Zaiylek, 1982). Older children may have no desire to eat which may be caused by a metabolic abnormality (lipodystrophy) which is also observed in many adults who are alcoholic (Hill et al., 1989). Infants with FAS have been noted to exhibit upper airway obstructions which may lead to chronic hypoxia, severe obstructive apnea and respiratory arrest (Usowicz, Golabi, & Curry, 1986). Apnea places infants at high risk for sudden infant death syndrome, while chronic hypoxia places them at high risk for development of pulmonary hypertension

(Guilleminault, Ariagno, Forno, Nagel, Baldwin, & Owen, 1979). Still further, chronic upper airway obstructions may contribute to growth failure, since the amount of energy spent breathing is excessive. Infants with upper airway anomalies may also exhibit severe feeding difficulties (Levy, Tabakin, Hanson, et al., 1967).

Figure 1 Illustration courtesy of Charlotte A. Wasson.



Motor Control and Visual Defects

General hypotonicity is found in those children with FAS/FAE who display cerebral dysfunction (Clarren, 1981). Durham (1991) found that children with FAS exhibit delays in motor development and have deficits in coordination. Older children with FAS may present clumsiness and impulsivity.

Furthermore, a decrease in visual perceptual skills in infants with FAS with normal cognitive abilities is well documented (Aronson, Kyllerman, Sabel, Sandin, & Olegard, 1985). Visual acuity of only 20/70 has been noted in as many as 94% of infants with FAS, while abnormal visual evoked responses have been noted in approximately one-fourth of infants with FAS/FAE. In addition, deficits in perception and integration of visual stimuli have been reported (Hill et al., 1989).

Environmental Factors

Children exposed to alcohol in utero often grow up in a childhood environment where the mother continues to abuse alcohol and where there may be limited mother-child interactions and learning experiences. The child may thus be placed at both biological and environmental risk (Aylward, 1990). The infant's abnormal behaviors may interfere with mother-infant bonding (Hill et al., 1989). Further, environmental risks may exist in the infant's feedings. Some children will be given alcohol in their bottles when they are

hard to console, while others may be breast fed by women who drink. The presence of alcohol in either the breast or bottle milk poses a risk because the infant's brain continues to develop well after birth (Burd & Martsolf, 1989).

Studies indicate that the effects of the environment on cognitive development are not the cause of cognitive deficits (Jones et al., 1974, Streissguth, 1976). No significant differences in the IQs of children with FAS reared by natural mothers as compared to those being reared by foster parents have been found. It has, in fact, been noted that intelligence scores cannot be increased with improved home and social environment. In addition, children with FAS may continue to exhibit failure to thrive and delayed development even in the best environments. On the other hand, a stable home environment may result in an improvement in the emotional behaviors of the child with FAS (Hill et al., 1989; Streissguth, Herman & Smith, 1978).

Incidence

Research suggests that the currently documented incidence of FAS is most likely an underestimate (Little & Streissguth, 1981). The incidence of FAS in the United States ranges from .4 - 3.5 per 1,000 births. Incidence varies widely depending on geographical location, and in European countries incidence figures range from 1.7 -3.3 per 1,000 births. The average

worldwide incidence of FAS, then, is 1.9 per 1,000 live births (Abel & Sokol, 1987). In some U.S. studies, the incidence has been estimated to be one in 750 live births, making FAS more prevalent than Down syndrome (Streissguth, Barr, & Martin, 1980; Little & Streissguth, 1981). More than 40,000 babies are born each year in the United States with characteristics of FAS, yet only 5,000 cases are actually diagnosed (Waldman, 1989). The estimate of FAS among chronically alcoholic women has been estimated at 25 per 1,000 births, a figure 20 times higher than that in the general population (Abel, 1984; Abel, 1988; Abel & Sokol, 1986; Abel & Sokol, 1987). In some American Indian populations, the incidence may be as high as 20 -150 per 1,000 births (Hill et al., 1989). Fetal alcohol effect (FAE) incidence estimates range from one per 220 to one per 1,000 live births (Abel & Sokol, 1987). Abel and Sokol (1989) also provided a conservative estimate of FAE occurrence of 3.2% (3 per 100) of live-born infants. This estimate makes FAE the leading known cause of mental retardation and learning disabilities.

Economic Issues

Economic issues associated with FAS have significant implications (Abel & Sokol, 1987). The cost of medical care for the treatment of FAS related growth retardation, surgical repair, organic anomalies, treatment for sensori-neural hearing loss, vision deficits and mental retardation could

exceed 320 million dollars annually in the United States. In addition, costs of institutional care for persons with FAS and mental retardation may exceed one billion dollars annually in the United States (Abel & Sokol, 1987). Services for the less severe phenotypes of FAS may cost 2 to 4 billion dollars a year for medical expenses, special education services, foster care, and alternative living placements. This significant FAE cost figure relates to the estimated six to eight times more common occurrence of the milder form of fetal related disorders.

Speech-Language-Hearing Studies

Literature specific to speech-language-hearing and FAS is limited. While most literature does not specifically address speech-language-hearing disorders as a main focus, research summaries do mention speech-language and hearing as areas of delay and deviance. Lemoine, Haronsseau and Borteryre (1968) were the first to describe the psychomotor and language delays of children with FAS. Much later, Iosub, Fuchs, Bingol and Gromisch (1981) assessed selected communication abilities in 45 subjects with FAS, finding that 80% of the subjects were impaired in speech and language acquisition, voice and fluency. One subject had a cleft palate.

Hill et al. (1989) found that 73% of their child subjects with FAS had speech that was delayed at 18 months of age,

while 82% had no simple sentence structures at age three, and 93% of the subjects had delays in both receptive and expressive language. Additionally, 77% had voice dysfunctions, 84% articulatory errors, and 82% problems with fluency and rate. While not the sole contributor, mental retardation was noted to be a contributing factor for the delay in speech and language functions. Some children with FAS may never develop clear speech. FAS speech may be slurred, guttural, dysarthric, animal-like or monotonous (Hill et al., 1989).

Hamilton (1981) identified both qualitative and quantitative differences in linguistic abilities of children with FAS. Syntactically complex grammatical structures were not produced. Although subjects initiated conversational turns, responses were pragmatically inappropriate. Variability was noted more in language production tasks than in language comprehension tasks. Still further, short-term memory deficits were noted.

Becker, Warr-Leeper and Leeper (1990) determined that subjects with FAS demonstrated more severe impairments in production of speech sounds than did control subjects. In contrast to the Hamilton et al. (1981) research, the Becker et al. (1990) research showed that there is a qualitative difference in the subjects' with FAS abilities to comprehend grammatical markers of syntactic structures. Burd and

Martsolf (1989) found that language production is more severely affected than comprehension. Speech and language skills are lower than social skills and the children's use of prolific verbal output (i.e., "cocktail party syndrome") is noted in other developmental disorders (Streissguth, 1986).

Carney and Chermak (1991) established that mean performance of American Indian children with FAS on the TOLD-P and the TOLD-I was significantly poorer than a control group on all subtests for the TOLD-P except the word articulation subtest, and for three of five TOLD-I subtests: sentence combination, word ordering, and grammatical comprehension. Total performance scores below the 16th percentile were obtained by all American Indian children with FAS. The older children with FAS exhibited primarily syntactic deficits while the younger children presented more global language disorders. Results were consistent with previous studies.

Church and Gerkin (1988), in the first systematic investigation of hearing disorders in children with FAS, found prenatal ethanol exposure to be a risk factor in infant hearing disorders. Craniofacial anomalies consistent with FAS have been associated with hearing disorders in this population. As many as 55% of infants with FAS may have impaired hearing, and many of these same infants have visual

impairments (Church & Gerkin, 1988). A correlation between hearing impairments and cleft palate and lip exists in children with FAS (Iosub et al., 1981). Hyperacusis and otitis proneness in children with FAS are reported (Hill et al., 1989). The high incidence of serous otitis media may be due to eustachian tube dysfunction, decreased immunity, or from influences of the dysmorphologies of the face. While the speech and language disorders in children with FAS may be related in some instances to the children's cognitive disabilities or their abnormal oral-dental configurations, the conditions are exacerbated by their hearing disorders.

A similarity in subjects with FAS and other children with craniofacial anomalies in relationship to the occurrence of serous otitis media (SOM) and sensori-neural hearing loss exists (Church & Gerkin, 1988). One third of subjects with FAS evidenced external ear anomalies, including low set ears, posteriorly rotated, lop ears or microtias. Recurrent upper respiratory tract infections may trigger subsequent bouts of recurrent otitis media. FAS then, may actually account for more cases of hearing impairments than SLPs suspect.

Conclusion

Speech-language-hearing deficits are often mentioned in medical literature on FAS, but there is little specific information (Sparks, 1984). There is, it seems, a growing need for speech-language pathologists to identify, assess and

provide appropriate services to individuals with fetal alcohol syndrome. The present survey study represents the first of a line of planned FAS studies. Future, longitudinal research based on this data collection and analyses is planned. Subsequent research may emphasize the nature and outcome of short and long term speech-language-hearing intervention programs for individuals with FAS.

CHAPTER III

METHODS

Subjects and Patients

The patients for the investigation consisted of 151 individuals who made up the caseloads of 328 licensed speech-language pathologists in the state of Illinois. This number of 328 subjects (respondents) represents those speech-language pathologists who completed and returned surveys from a pool of 1306 SLPs to whom surveys were sent (i.e., a random 40% sampling of the 3265 licensed SLPs in the state). Patients included 60 individuals with diagnoses of FAS and 91 individuals who evidenced characteristics of FAS/FAE. Submects made mention of 3526 individuals in their caseload who had no diagnoses nor characteristics of FAS or FAE.

Construction and Validation of Survey

Based on information gathered from an exhaustive literature review, a compilation of major characteristics associated with FAS/FAE related speech-language-hearing deficits allowed for construction of a mailable survey with good face validity. Survey items were grouped into ten major sections, with a first section devoted to demographic information, eight mid-sections which sought to elicit specific, detailed information regarding various features and characteristics exhibited by the subject's patients, and a

final section allowing for respondent comments.

The initial survey was reviewed by three speech-language pathologists to further establish validity and to refine survey clarity to promote ease of completion. The three SLPs who assisted in the survey pilot had a range of clinical experience from 4 to 19 years with a mean professional experience of 8.66 years. All three reported some prior knowledge and clinical experience related to FAS/FAE. None of these SLPs resided in, worked in, nor were licensed in the state of Illinois. This precaution was taken to maintain an untapped pool of SLPs in Illinois since a random sampling was planned.

Feedback from the three SLPs regarding validity, clarity and ease of completion was positive. Their minor adjustment suggestions were implemented and a final form of the survey was prepared for use in the 40% sampling. This survey contained both open-ended and branching questions about the prevalence and characteristics of speech-language-hearing deficits in individuals with FAS/FAE being served by Illinois SLPs. A copy of the survey is located in Appendix B.

Procedures

The cross-sectional survey, along with an explanatory cover letter (Appendix C), a definition of fetal alcohol syndrome and fetal alcohol effects (Appendix D), a glossary (Appendix E), and a figure depicting major facial

dysmorphologies (Appendix E) was mailed to a randomly selected 40% of licensed speech-language pathologists in the state of Illinois. A listing of currently licensed SLPs was obtained from the state's Department of Professional Regulations Board, and a table of random numbers (Borg & Gall, 1983) was used to identify the random 40% sampling. Stamped, addressed envelopes were enclosed in the mailing and all responses were requested by a date three weeks following the anticipated arrival of the surveys. Surveys which were received more than one week past the published closure date were not accepted, but in reality only a small number of surveys arrived late (n = 12).

All returned surveys were group analyzed using the Statistical Package for Social Sciences (SPSSx) (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1986). Each section of the survey was treated separately during data analyses. Unanswered items from the incomplete surveys were judged to be "missing data" for the subsequent analyses. A total number of response similarities and response differences was calculated and are discussed in the results section (Chapter 4).

Reliability

Standard reliability procedures were not applicable to this investigation because subject judgments were assumed to be accurate. To guarantee accurate data input the researcher

randomly selected 10% of the surveys to rescore three weeks following the initial survey analyses. This intrajudge rescoring procedure resulted in 93% agreement. An additional 10% of the surveys were randomly selected and evaluated by a graduate student in Communication Disorders and Sciences who had no less than 150 clock hours of clinical experience. This interjudge rescoring procedure resulted in 93% agreement.

CHAPTER IV

RESULTS

The purpose of this study was to examine multiple aspects of fetal alcohol syndrome and fetal alcohol effects. Three hundred twenty-eight licensed speech-language pathologists served as subjects and supplied survey information. These subjects represented the actual number of SLPs who returned surveys from a random 40% (1306) sampling of the 3265 licensed SLPs in the state of Illinois. Subjects provided information regarding 151 patients who were either diagnosed (D) with FAS or evidenced characteristics (EC) of FAS or FAE. These 151 individuals, then, became the patients for the study.

Population

The initial research question of this study related to identifying incidence figures for FAS and FAE in the caseloads of Illinois licensed SLPs. Incidence data was, thus, elicited from the survey's 328 subjects. The 328 subjects reported a total caseload of 3416. Sixty patients with diagnoses of FAS were reported, while 91 patients were reported to evidence characteristics of FAS/FAE, yielding the total of 151 patients with FAS/FAE. A mean of 27.37 of the subjects had reported cases of FAS or FAE in their caseloads. A summary of mean and median for the representation of FAS and FAE is provided in Table 4.

Table 4 Cases of Reported FAS/FAE in SLP Caseloads

	Diagnosed patients (D) Evidence Characteristic patients (EC)	
Total D	Total EC	Total Both Subgroups
60	91	151
Median	28.00%	
Mean	27.37	

Note. Column value represents total caseload for D & EC.

Cautious interpretation of this data is recommended. The evidencing characteristics subgroup may represent some patients who might not meet the criteria for medical diagnosis of FAS. Subjects were simply reporting that 91 individuals in their caseloads displayed multiple characteristics which are also noted in individuals who have FAS diagnoses. In addition, incidence figures elicited from SLP caseloads (a population of individuals with known disorders and/or disabilities) may not be representative of the population at large.

Additional data analyses were done to determine distribution of patients by age. Of the 151 FAS/FAE patients, 16.3% ranged in age from 0 to 3 years, 33.7% were 4-6 years old, 35.6% were 7-12 years, and 14.4% were 13-18 years old. No patients over age eighteen were reported. The lack of representation of older patients may relate to the heavy

influence of public school work settings of the subjects, or it may also be an influence of the relative currency of FAS information in SLP literature. Figure 2 summarizes patients with FAS/FAE by age.

Figure 2 Age Distribution of FAS/FAE Patients By Years

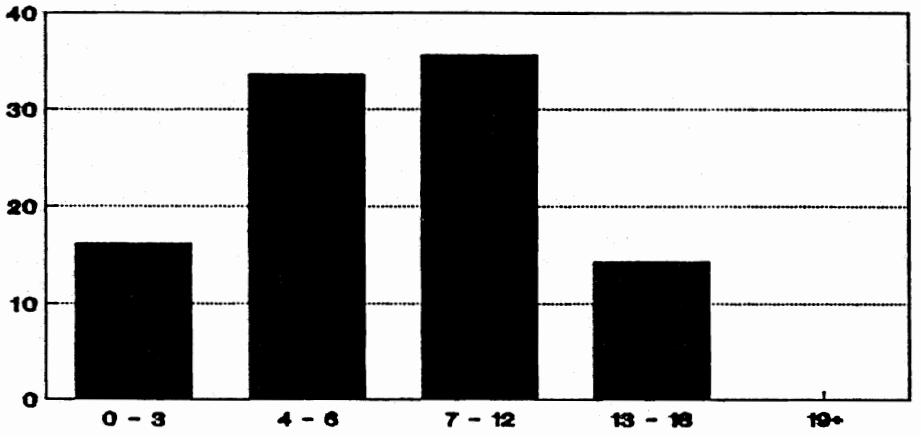
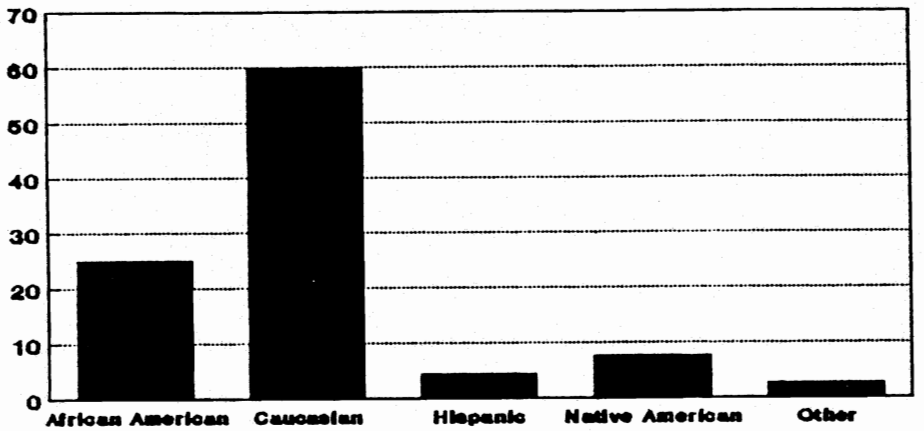


Figure 3 summarizes the racial distribution of the 151 patients. These figures indicate that most of the patients (60%) were Caucasian, while 25% were African American, 4.5% Hispanic, and 7.7% Native American. Racial distribution of the entire caseloads of the SLP subjects was not elicited for comparative purposes, yet some comparisons of survey information can be made with information in recent literature. Although FAS has been reported in all races (Little & Streissguth, 1981), literature has indicated that the highest incidence is in the Native American population (Hill et al., 1989). The racial distribution of Illinois may have limited

United States applicability.

Figure 3 Racial Distribution of FAS/FAE Patients



Speech-Language-Hearing Disorders

The second research question related to identification of the speech-language-hearing deficits of the 151 patients as reported by the 328 subjects.

Hearing.

Information regarding degree and type of hearing loss was elicited and is displayed in Table 5. Analyses of the data specific to degree of loss indicated an equal distribution of mild and moderate hearing loss (43.8%) for patients with diagnoses of FAS, with an additional 12.5% having a severe hearing loss. No patient with an FAS diagnosis had a profound loss. A high incidence of mild hearing loss (87.7%) was reported for patients evidencing characteristics of FAS/FAE. Moderate losses in the EC subgroup accounted for another 14.3%

of patients and no one in this subgroup had severe or profound losses. Chi Square analysis revealed that the occurrence of moderate hearing losses for the D subgroup was significantly greater than for moderate losses for the EC subgroup (x^2 = 5.98; $p < .01$).

Individuals from both the diagnosed and evidenced characteristics subgroups displayed a range of types of hearing loss, including conductive, mixed and sensor-neural. Figures for type of loss are located in Table 5. The percent of occurrence of otitis media was similar for both the D and EC subgroups, 21.7% and 29.7% respectively. The incidence of otitis media in the general population has been reported as being approximately 12% in a pediatric population of 488 children (Church & Gerkin, 1988), a figure which is lower than that evidenced in this study.

Table 5 Patients With FAS/FAE Evidencing Hearing Loss

	D	EC	Total	
Conductive	50.0%	73.3%	61.3%	
Mixed	31.3%	6.7%	19.4%	
Sensori-Neural	18.8%	20.0%	19.4%	
Mild	43.8%	85.7%	63.3%	
Moderate	43.8%	14.3%	30.0%	* (x^2 = 5.98;
Severe	12.5%	0.0%	6.7%	$p < .05$)
Profound	0.0%	0.0%	0.0%	
Otitis Media	21.7%	29.7%	26.5%	

Note. Sample size was 16 and 14 respectively.

Articulation.

Data analyses specific to severity of articulation deficits indicated fairly equal distribution across the D and EC subgroups. For patients diagnosed with FAS, 37.9% evidenced a mild phonological deficit, 34.5% moderate and 27.6% a severe phonological deficit. Among the evidencing characteristic subgroup, 48.8% were reported to have a mild phonological deficit, 25.6% evidenced a moderate deficit and 25.6% were noted to have a severe phonological deficit. Among the patients reported to have an articulation deficit within the diagnosed FAS subgroup, 41.9% had a mild deficit, 35.5% had a moderate deficit and 22.6% had a severe articulation deficit. Additionally, 59.5% of the evidence characteristic subgroup had a mild deficit, 28.6% a moderate deficit, and 11.9% a severe articulation deficit. Two previous studies (Becker et al., 1990; Hill et al., 1989) indicated that articulation errors were a consistent deficit seen among individuals with FAS. This finding was confirmed by subject responses in the current survey. Further analyses of articulation data are located in Table 6.

Since information regarding articulation deficits indicated that patients were entered under articulation and phonological deficit classifications, cautious interpretation is necessary. Over representation of articulation and phonological deviancies may have occurred.

Conversely, under representation of potential articulation and phonological deficits is also likely, since some patients were not yet at a verbal stage and may, in fact, evidence articulation deficits at a later age. Still further, the effects of maturation and therapy could not be well accounted for in the survey format.

Table 6 Patients With FAS/FAE Evidencing Articulation Deficits

	D	EC	Total
Phonological			
Mild	37.9%	48.8%	44.4%
Moderate	34.5%	25.6%	29.2%
Severe	27.6%	25.6%	26.4%
Articulation			
Mild	41.9%	59.5%	52.1%
Moderate	35.5%	28.6%	31.5%
Severe	22.6%	11.9%	16.4%

Note. Sample size was 29 and 43 respectively.

Voice.

Although there was not a high incidence of voice disorders in the D and EC subgroups, subjects did display a range of disorders including breathiness, harsh/hoarseness, increased pitch, increased intensity, monotone and decreased intensity. Figures for voice deviancy incidences are located in Table 7. Voice disorders were analyzed for statistical significance using Chi Square analysis. Occurrence of voice disorders was not significantly different for the D subgroup

than the EC subgroup. Survey figures on voice disorders is lower than those cited in recent literature (Hill et al., 1989). Again, age of patients may be an influencing factor in the overall data analyses, since younger patients may not have yet reached a verbal stage which would allow an accurate assessment of vocal behavior.

Table 7 Patients With FAS/FAE Evidencing Voice Disorders

	D	EC	Total
Breathiness	16.7%	6.6%	10.6%
Harsh/Hoarse	18.3%	9.9%	13.2%
Increased Pitch	13.3%	9.9%	11.3%
Increased Inten.	13.3%	6.6%	9.3%
Monotone	16.7%	18.7%	17.9%
Decreased Inten.	11.7%	11.0%	11.3%
Other	10.0%	3.3%	6.0%

Note. Sample size was 60 and 91 respectively.

Dysfluency.

Chi Square analysis regarding dysfluencies indicated that 11.7% of the diagnosed patients and 14.3% of the evidence characteristic patients exhibited some type of fluency disorders. More specifically, the percent of repetitions (1.7%), air flow blockage (8.3%), and prolongations (3.3%) for the D patients was considerably lower than for the EC patients ($x^2 = 5.36$; $p < .01$). Data for repetitions, air flow blockages, and prolongations for the evidencing characteristics subgroup were 12.1%, 7.7% and 6.6%, respectively. Age and stage of verbal development may have

again influenced information on dysfluency. Table 8 summarizes percent of patients evidencing fluency disorders.

Table 8 Patients With FAS/FAE Evidencing Fluency Disorders

	D	EC	Total	
Dysfluent	11.7%	14.3%	13.2%	
Repetitions	1.7%	12.1%	7.9%	* (x^2 = 5.36;
Air Flow Blocks	8.3%	7.7%	7.9%	p< .01)
Prolongations	3.3%	6.6%	5.3%	

Note. Sample size was 60 and 91 respectively.

Language.

Data regarding language revealed that 85.2% of patients in the D subgroup showed both a receptive and expressive delay; 16.7% of these diagnosed patients were reported to exhibit morphologic/syntactic disorders, 11.7% semantic disorders, and 18.3% pragmatic disorders. Still further in this D subgroup, 51.7% were reported to have a combination of morphologic/syntactic, semantic, and pragmatic disorders.

For patients in the EC subgroup, 80.2% had both a receptive and expressive delay, 7.7% evidenced morphologic/syntactic delay, 18.7% semantic, 18.7% pragmatic and 56.0% exhibited a combination of the language disorders. Patient's age and level of verbal development may again have been a factor in the data report and analyses. A summary of language delay/disorder information is located in Table 9.

Table 9 Patients With FAS/FAE Evidencing Language Disorders

	D	EC	Total
Language Delay			
Receptive	1.9%	7.0%	5.0%
Expressive	13.0%	12.8%	12.9%
Both	85.2%	80.2%	82.1%
Morphology/Syntax	16.7%	7.7%	11.3%
Semantics	11.7%	18.7%	15.9%
Pragmatics	18.3%	18.7%	18.5%
Combination	51.7%	56.0%	54.3%

Note. Sample size was 60 and 91 respectively.

Intelligence

Responses to the third question of the study answered whether or not the IQs of the patients in the present study were consistent with the IQs of patients with FAS/FAE discussed in the literature. Information regarding level of intelligence of the 151 patients with FAS/FAE was elicited from the 328 subjects and is displayed in Table 10. Analyses of data specific to the level of intelligence indicated equal distribution of 70+ IQs and 50-70 IQs in both D and EC subgroups. IQs of less than 50 were reported significantly more often for D patients (20.6%) than for EC patients (4.0%) using Chi Square analysis ($x^2 = 9.59$; $p < .01$). Clarren (1981), Jones et al. (1973) and Hill et al. (1989) indicated that the average IQ for individuals with FAS is within the moderate mentally retarded range. This literature report is

consistent with the data analyses from the present study for patients in both the diagnosed and evidencing characteristic subgroups.

Table 10 IQ of Patients With FAS/FAE

	D	EC	Total	
70+	56.8%	57.3%	57.1%	
50-70	22.7%	38.7%	32.8%	
Below 50	20.5%	4.0%	10.1%	* (x^2 = 9.59; p< .01)

Note. Sample size was 44 and 75 respectively.

Behaviors

The fourth question of this study focused on determining if the behaviors exhibited by the study's patients were consistent with those reported in the current research. Hyperactivity, lack of concentration, nervousness, slow response time, impulsivity and emotional instability were six frequently cited FAS behavioral deficits from this study's literature review and were the six sampled in the survey. Every patient in the survey evidenced some behavioral problem, with the highest percentage of behavior deficit being that of "lack of concentration". For this specific behavioral disorder, the D subgroup had a reported 78.3% occurrence, while the EC subgroup displayed the disorder at 82.4%. A summary of the percent of patients evidencing specific behavioral problems is located in Table 11. Overall, each

patient evidenced 3.6 of the six characteristics represented in the survey. Results corroborate literature which indicates that behavior problems are a consistent feature of persons diagnosed with FAS/FAE. Additionally, two patients were reported to exhibit friendly and affectionate behaviors and six patients reportedly exhibited aggressive behaviors. Two patients were reported to self abuse.

Table 11 Patients With FAS/FAE Evidencing Behavioral Problems

	D	EC	Total
Hyperactivity	48.3%	50.5%	49.7%
Lack Concentration	78.3%	82.4%	80.8%
Nervousness	33.3%	36.3%	35.1%
Slow Response Time	60.0%	69.2%	65.6%
Impulsivity	68.3%	65.9%	66.9%
Emotional Instability	53.3%	46.2%	49.0%
Other	18.3%	13.2%	15.2%

Total Sum of Behavioral Problems

	N	Mean	SD	SE
Diagnosed	60	3.60	1.65	.214
Evidence Char.	91	3.63	1.60	.167
Total	151	3.62	1.61	.131

Note. Sample size was 60 and 91 respectively.

Facial Dysmorphia

The fifth question related to determining the types of facial dysmorphias exhibited by patients in the study. Information regarding patients' facial dysmorphias may be found in Table 12. The D subgroup was reported to have an average of 4.73 of the 11 facial dysmorphias reported in

characteristics listed, while the EC subgroup had an average 3.69 of the 11 facial dysmorphia characteristics reported from the list in the survey. The highest dysmorphia reported was "wide nasal bridge", with 73.3% of the diagnosed subgroup and 64.8% of the evidencing characteristics subgroup exhibiting this dysmorphia.

Chi Square analysis indicated that there were significant differences between the subgroups under the heading of "other" ($x^2 = 6.14$; $p < .01$). The significant difference was that while 21.7% of the diagnosed subgroup were reported to have at least one additional dysmorphia characteristic not listed on the survey, only 7.7% of the evidence characteristic subgroup were reported to have an additional dysmorphia. Additional information reported under the "other" category included vestibular problems, seizure activity, ptosis, thin upper vermilion, microcephaly, and high prominent forehead. Although each of these additional dysmorphias have been reported in current literature (Burd & Martsolf, 1989; Clarren, 1988; Hill et al., 1989) this researcher had to limit the characteristics listed in the survey to those most prevalent.

Table 12 Patients With FAS/FAE Evidencing Facial Dysmorphia

	D	EC	Total	
Micro/Retro	53.3%	42.9%	47.0%	
Facial Asymmetry	33.3%	35.2%	34.4%	
Low Set Auricles	46.7%	44.0%	45.0%	
Epicanthic Folds	56.7%	47.3%	51.0%	
Short Pal Fissures	50.0%	35.2%	41.1%	
Wide Nasal Bridge	73.3%	64.8%	68.2%	
Short Upturn Nose	58.3%	53.8%	55.6%	
Hypoplast Philtrum	3.3%	36.3%	39.1%	
Cleft Palate	6.7%	1.1%	3.3%	
Cleft Lip	3.3%	0.0%	1.3%	
Visual Dysfunction	26.7%	20.9%	23.2%	
Other	21.7%	7.7%	13.2%	* (x^2 = 6.14; p< .01)

Total Sum of Facial Dysmorphia

	N	Mean	SD	SE
Diagnosed	60	4.73	2.55	.329
Evidence Char.	91	3.89	2.35	.247
Total	151	4.23	2.46	.200

Note. Sample size was 60 and 91 respectively.

Oral Motor Dysfuctions

In addition to information related to patient facial dysmorphias, data analyses was collected on nine specific oral motor dysfunctions; a summary of this oral motor information may be found in Table 13. While patients in the diagnosed subgroup were reported to exhibit 2.05 of the nine oral motor dysfunctions, 1.48 of the nine were reported for the patients in the EC subgroup. Although oral motor dysfunctions were not thoroughly discussed in literature, all of the oral motor dysfunctions listed in this survey were mentioned in the

literature. Current findings indicate a need for further investigation of oral motor dysfunctions in individuals with FAS/FAE.

Table 13 Patients With FAS/FAE Evidencing Oral Motor Dysfunctions

	D	EC	Total
Reduced ROM	30.0%	25.3%	27.2%
Reduced Strength	40.0%	25.3%	31.1%
Deviated Chewing	30.0%	17.6%	22.5%
Malocclusions	36.7%	34.1%	35.1%
Dev - Hard Palate	3.3%	7.7%	6.0%
Dev - Soft Palate	5.0%	2.2%	3.3%
Dev - Velo. Mech.	11.7%	9.9%	10.6%
Tongue			
Reverse Swallow	15.0%	5.5%	9.3%
Reduced Speed	18.3%	15.4%	16.6%
Other	15.0%	5.5%	9.3%

Total Sum of Oral Motor Dysfunctions

	N	Mean	SD	SE
Diagnosed	60	2.05	2.00	.259
Evidence Char.	91	1.48	1.83	.191
Total	151	1.71	1.91	.156

Note. Sample size was 60 and 91 respectively.

IQ and Facial Dysmorphias

The sixth and final research question related to determining if there was a relationship between facial dysmorphias and IQ as well as oral motor dysfunctions and IQ. Data analyses of the relationship between level of IQ and select facial malformations for persons diagnosed with FAS/FAE revealed significant differences using Chi Square analysis. Patients from the diagnosed subgroup with IQs below 50

evidenced statistically significant relations for their level of intelligence and facial dysmorphias of low set auricles ($x^2 = 7.40$; $p < .01$), cleft palate ($x^2 = 8.18$; $p < .01$), and "other" characteristics ($x^2 = 7.43$; $p < .01$). These results are consistent with those in literature which indicate that the lower the IQ the more facial anomalies present. Streissguth et al. (1978) reported that intellectual characteristics of children with FAS based on the severity of dysmorphia is inversely related to the severity of FAS. A summary of the relationship between IQ and extent of facial dysmorphia is located in Table 14.

Table 14 Relationship Between IQ and Facial Dysmorphias of Persons Diagnosed with FAS/FAE

Facial Dysmorphias	IQ Range +70	50-70	Below 50	
Micro/Retro	52.0%	40.0%	77.8%	
Facial Asymmetry	36.0%	30.0%	55.6%	
Low Set Auricles	44.8%	30.0%	88.9%	* ($x^2 = 7.40$; $p < .01$)
Epicanthic Folds	52.0%	60.0%	77.8%	
Short Pal Fissures	44.0%	40.0%	77.8%	
Wide Nasal Bridge	72.0%	70.0%	55.6%	
Short Upturn Nose	56.0%	60.0%	66.7%	
Hypopl Philtrum	40.0%	40.0%	55.6%	
Cleft Palate	4.0%	0.0%	33.3%	* ($x^2 = 8.18$; $p < .01$)
Cleft Lip	4.0%	0.0%	11.1%	
Visual Dys	20.0%	30.0%	55.6%	
Other	32.0%	0.0%	0.0%	* ($x^2 = 7.43$; $p < .01$)

Note. Sample size was 25, 10 and 9 respectively.

The relationship between IQ and facial malformations in persons evidencing characteristics did not reach statistical

significance using Chi Square analysis. A summary of information related to IQ and facial malformations for the evidence characteristic subgroup may be found in Table 15.

Table 15 Relationship Between IQ and Facial Dysmorphia of Persons Evidencing Characteristics of FAS/FAE

Facial Dysmorphias	IQ Range		
	+70	50-70	Below 50
Micro/Retro	46.5%	41.4%	66.7%
Facial Asymmetry	30.2%	37.9%	100.0%
Low Set Auricles	46.5%	48.3%	0.0%
Epicanthic Folds	51.2%	55.2%	33.3%
Short Pal Fissures	44.2%	37.9%	33.3%
Wide Nasal Bridge	72.1%	55.2%	66.7%
Short Upturn Nose	55.8%	55.3%	100.0%
Hypo Philtrum	44.2%	34.5%	66.7%
Cleft Palate	0.0%	3.4%	0.0%
Cleft Lip	57.3%	38.7%	4.0%
Visual Dys	20.9%	20.7%	33.3%
Other	9.3%	6.9%	0.0%

Note. Sample size was 43, 29 and 3 respectively.

IQ and Oral Motor Dysfunctions

Data analysis of the relationship between IQ and the oral motor dysfunctions evidenced in persons with diagnosed FAS/FAE indicated that there was a statistically significant difference between IQ and a number of oral motor dysfunctions. Reduced range of motion and deviation in chewing indicated that with Chi Square analysis there was a significant difference as the IQ became lower ($x^2 = 11.66$; $p < .01$ and $x^2 = 9.21$; $p < .01$). Another statistically significant relationship between IQ and oral motor dysfunctions was under

the heading "other" ($x^2 = 12.40$; $p < .01$). The subjects shared additional information about the patients' hypersensitivity to stimulation and texture, digital manipulation to clear food away from palate, restricted ferenum, and drooling due to a lack of lip closure. Literature in the area of oral motor dysfunctions has been minimal. Table 16 contains a summary of the correlation between IQ and oral motor dysfunctions for persons diagnosed with FAS/FAE.

Table 16 Relationship Between IQ and Oral Motor Dysfunctions of Persons Diagnosed with FAS/FAE

	+70	50-70	Below 50	
Reduced ROM	24.0%	10.0%	77.8% *	(x^2 =11.66;
Reduced Strength	36.0%	40.0%	44.4%	p< .01)
Deviated Chewing	20.0%	10.0%	66.7% *	(x^2 = 9.21;
Malocclusions	48.0%	30.0%	55.6%	p< .01)
Dev - Hard Palate	8.0%	0.0%	0.0%	
Dev - Soft Palate	8.0%	0.0%	11.1%	
Dev - Velo. Mech.	12.0%	10.0%	22.2%	
Tongue				
Reverse Swallow	12.0%	10.0%	22.2%	
Reduced Speed	16.0%	30.0%	22.2%	
Other	4.0%	0.0%	44.4% *	(x^2 = 12.40; p< .01)

Note. Sample size was 25, 10 and 9 respectively.

Data analysis of the relationship between IQ and oral motor dysfunctions for persons evidencing characteristics of FAS/FAE revealed a significant difference using Chi Square analysis for IQ and oral motor dysfunction for reduced range

of motion ($x^2 = 8.19$; $p < .01$) and reduced strength of the oral motor structure ($x^2 = 11.10$; $p < .01$). As patient IQ lowered, occurrence of reduced range of motion and reduced strength of structure increased. There was less data for the below 50 IQ group under the classification evidence characteristics because there were fewer patients with an IQ below 50. Table 17 summarizes the correlation between IQ and oral motor dysfunctions for the evidencing characteristic patients.

Table 17 Relationship Between IQ and Oral Motor Dysfunctions of Persons Evidencing Characteristics of FAS/FAE

	+70	50-70	Below 50	
Reduced ROM	23.3%	27.6%	100.0% *	($x^2 = 8.19$;
Deviated Chewing	9.3%	20.7%	33.3%	$p < .01$)
Reduced Strength	16.3%	27.6%	100.0% *	($x^2 = 11.10$;
Malocclusions	46.5%	27.6%	33.3%	$p < .01$)
Dev - Hard Palate	14.0%	3.4%	0.0%	
Dev - Soft Palate	2.3%	3.4%	0.0%	
Dev - Velo. Mech.	16.3%	3.4%	33.3%	
Tongue				
Reverse Swallow	7.0%	6.9%	0.0%	
reduced Speed	9.3%	24.1%	0.0%	
Other	2.3%	3.4%	0.0%	

Note. Sample size was 43, 29 and 3 respectively.

Of interest is the fact that both the diagnosed and evidences characteristics subgroups exhibited reduced range of motion as an oral motor dysfunction which statistically correlated with IQ level. This finding strengthens the validity that there is an oral motor component associated with FAS.

CHAPTER V

DISCUSSION

The purpose of the present study was to gain information about the prevalence of fetal alcohol syndrome (FAS) in Illinois licensed speech-language pathologists' caseloads as well as to further build an understanding of what types of speech-language-hearing deficits and related disorders exist. The results of the present study begin to identify the specific speech-language-hearing deficits evidenced in persons with fetal alcohol syndrome and fetal alcohol effects. The present study further qualifies the already existing information in the literature pertaining to the multiple characteristics of FAS.

Data regarding language revealed that SLPs judged patients from both the D and EC subgroups to exhibit both receptive and expressive delays. This differs somewhat from information gained in literature review. Becker et al. (1990), Carney and Chermak (1991), and Hamilton (1981) indicated that receptive language skills were more impaired than expressive language skills for individuals with FAS and FAE. Since the outcome of this survey differed, it may indicate that the language related questions used in the survey were too vague to elicit differentiation between receptive and expressive language or may reflect that Illinois SLPs have truly found that patients with FAS/FAE exhibit equal difficulties in both receptive and expressive

language abilities.

Data analyses for intelligence gained from the survey may underestimate the IQ of the patients. Subjects indicated that patients who carry a primary diagnosis of mental retardation may actually qualify for full diagnosis of the FAS syndrome. Thus, FAS may exist in patient's whose low IQ outweighs any other characteristics or labels.

Survey results indicated that although there were more EC patients than D patients, there was little difference in characteristics exhibited by members of the two subgroups. This finding suggests that subject judgments on the EC patients may have been quite accurate. Still further, this supports the probability that the figures for diagnosed cases of FAS may be an underestimate.

Clinical Implications

Information gathered in the research makes it clear that it is critical for speech-language pathologists to be aware of FAS/FAE and be trained to assess and treat the multiplicity of deficits which may be exhibited by an individual who has a diagnosis or evidences characteristics of fetal alcohol syndrome or fetal alcohol effects.

Limitations of Research

Some limitations to this research related to the survey design and study procedures. Upon review of the survey, it was apparent that there were design flaws. Specifically, the length and complexity of the survey may have discouraged some

respondents from completing and returning it. The complexity of directives may also have inhibited potential subjects from survey participation. However, the survey response rate of 25% is typical of what may be expected in a cross-sectional survey study (Nie et al., 1986).

The survey was sent out to a random group of individuals with the same title of speech-language pathologist. However, professional training, caseload type and job location may have influenced the type of responses made by the subjects. For instance, there were some subjects who stated that they had had no previous knowledge of FAS whereas other subjects reportedly had extensive knowledge. Similarly, subjects were limited in the sharing of information based on the location of their work. Several subjects stated that they worked primarily with adult neurogenics or primarily with adults with other disorders and some subjects were retired. These respondent-type variables are to be expected, however, in the execution of random sampling.

Implications for Further Research

Literature has consistently reported that further research on FAS is needed. Sparks (1984) has stated that it is of critical importance that FAS/FAE intervention strategies be developed and field tested in order to help children with FAS develop maximal speech and language skills. Becker et al. (1990) has further stated that there are a limited number of studies which accurately describe speech

and language characteristics of children with FAS. Becker et al. highlighted that there is a need for research which will look at larger samples of children with FAS to determine their communicative characteristics. A number of further studies and research questions emerge from the results of the current study.

1. A study of infants with FAS/FAE aimed at determining early signs of speech-language-hearing deficits would be appropriate. Early intervention may diminish the effects of the syndrome on speech, language and hearing deficits.
2. A follow-up survey would further validate the research findings from the current study. An abbreviated survey might be sent to the SLP sample that did not return the original survey.
3. A study could be conducted on a specific age group or age groups. Study of definitive age groups would help correct this survey's inability to all respondents to address all aspects of the speech-language-hearing deficits of specific aged patients.
4. Using the returned surveys from this present investigation, a researcher might contact respondents who shared detailed information about specific patients. Individual case studies would further contribute to the present body of information on FAS.
5. The present investigator might also re-analyze the survey data. Patients from both the D and EC subgroups could be

studied by age to yielded specific age group information. Other specific analyses (e.g., residential placement and diagnoses) could be conducted.

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APPENDIX A
Glossary

adipose - Relating to fat.

apnea - Absence of breathing.

dehydrogenase - Trivial name relating to those enzymes that catalyze removal of hydrogen from certain metabolites and transfer it to other substances.

dysgenesis - Defective embryonic development

hepatic - Relating to the liver.

hyperacusis - Abnormal acuteness of hearing due to increased irritability of the sensory neural mechanism.

hypoplasia - 1. Underdevelopment of a tissue or an organ, usually due to a decrease in the number of cells. 2. Atrophy due to destruction of some of the elements and not merely to their general reduction in size.

hypoplastic - Pertaining to or characterized by hypoplasia.

hypoxia - Subnormal levels of oxygen in air, blood, or tissue, short of anoxia.

lipodystrophy - Any abnormality in the metabolism or deposition of fats.

lipophilie - A substance with lipophilic properties.

microcephaly - Nanocephaly; abnormal smallness of the head.

micrognathia - Abnormal smallness of the jaws, especially of the mandible.

microphthalmia, microphthalmos - Nanophthalmia; nanophthalmos; abnormal smallness of one or both eyeballs.

morphogenesis - Differentiation of cells and tissues in the early embryo which results in establishing the form and structure of the various organs and parts of the body.

palpebral fissures- A deep furrow, cleft, or slit relating to an eyelid or the eyelids.

philtrum - The infranasal depression; the indentation in the midline of the upper lip.

prognathia - 1. Having a projecting jaw; 2. Denoting a forward projection of either or both of the jaws relative to the craniofacial skeleton.

ptosis - A drooping of the upper eyelids.

pulmonary hypertension - Persistent high blood pressure in the pulmonary circulation.

retrognathia - A condition of facial disharmony in which one or both jaws are posterior to normal in their craniofacial relationship.

strabismus - Hererotropia; squint; a manifest lack of parallelsim of the visual axes of the eyes.

teratogen - An agent that causes abnormal development.

teratogenesis - Teratogeny; the origin or mode of production of a malformed fetus.

vermilion - red external portion of the lip.

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SURVEY OF FETAL ALCOHOL SYNDROME

This survey will attempt to collect data on individuals who have been DIAGNOSED with FAS or FAE and on individuals who evidence characteristics but have not been diagnosed. To allow data collection on each individual with FAS/FAE in your caseload, please label each such client using a numeric code. (For example, a single client with FAS/FAE would be coded as # 1; an additional client would be labeled # 2). Please continue coding each client by the same number throughout the survey. In the section below, label by "D" those who have been diagnosed, and by "EC" those who evidence characteristics, but have not been diagnosed. Thank you.

1. ___D ___EC 2. ___D ___EC 3. ___D ___EC 4. ___D ___EC
5. ___D ___EC 6. ___D ___EC 7. ___D ___EC 8. ___D ___EC

Section I. General Information

(Please use code numbers to identify each client throughout the survey.)

1. How many individuals are in your total caseload? _____
2. How did you come to know about FAS/FAE?
   _____Inservice _____Convention Presentation _____Article _____Television
   Other_____
3. Does your caseload include clients with FAS/FAE? _____ yes _____ no
4. What are the ages of your clients with FAS/FAE?
   Age: _____ 0-3 _____4-6 _____7-12 _____13-18 _____19-60 _____61+
5. Which of your clients with FAS/FAE live with:
   _____biological parents _____ foster parents _____adoptive parents
   _____other (specify)?
6. Which of your clients with FAS/FAE are:
   _____African American _____Caucasian _____Hispanic _____Native American
   _____other (specify)?
7. In which setting are your clients being served?
   _____Preschool _____Elementary School _____Jr. High _____High School
   _____Hospital _____Institution
   _____Other

Section II. Intelligence Quotient

8. What are the reported IQs of your clients with FAS/FAE?
   _____70+ _____50-70 _____35-50 _____20-40 _____below 20
9. What measurement was used?
   _____WISC-R _____Stanford-Binet
   ____Other(specify):_____

SURVEY OF FETAL ALCOHOL SYNDROME

Section III. Behaviors

10. What are the behaviors exhibited by your clients with FAS/FAE?

Hyperactivity . . . . . _____
Lack of concentration . . . . . _____
Nervousness . . . . . _____
Slow response time . . . . . _____
Impulsivity . . . . . _____
Emotional instability . . . . . _____
Other_____

Section IV. Hearing

11. Which clients with FAS/FAE exhibit hearing loss?

Sensori-neural _____ Conductive _____ Mixed _____

12. What is the level of severity of the loss for each client?_____mild _____moderate _____severe _____profound

13. Which individuals evidence recurrent serous otitis media?_____

Section V. Facial Structure and Function

(Please refer to glossary and illustration.)

14. What facial anomalies are exhibited by each person with FAS/FAE?

Micrognathia or Retrognathia . _____
Facial asymmetry . . . . . _____
Low set auricles . . . . . _____
Epicanthic folds . . . . . _____
Short palpebral fissures . . . . . _____
Wide nasal bridge . . . . . _____
Short upturned nose . . . . . _____
Hypoplastic philtrum . . . . . _____
Cleft palate . . . . . _____
Cleft lip . . . . . _____
Visual dysfunctions . . . . . _____
Other_____

15. What are the oral motor dysfunctions exhibited by your clients with FAS/FAE?

Reduced range of motion . . . . _____
Reduced strength . . . . . _____
Deviation in chewing . . . . . _____
Malocclusions . . . . . _____
Deviation in hard palate . . . . . _____
Deviation in soft palate . . . . . _____
Deviation in velopharyngeal mechanism . . . . . _____
Tongue:
Reverse swallow_____ Reduced speed_____
Other _____

Section VI. Articulation

16. Which clients with FAS/FAE have phonological errors? _____mild _____ moderate _____severe
17. Which exhibit articulation errors? _____mild _____moderate _____severe

Section VII. Voice

18. What laryngeal mechanism deviations are exhibited by your clients with FAS/FAE?

Breathiness . . . . . _____
Harshness/Hoarseness . . . . . _____
Increased Pitch . . . . . _____
Increased Intensity . . . . . _____
Monotone . . . . . _____
Decreased Intensity . . . . . _____
Other_____

Section VIII. Fluency

19. Which of your clients with FAS/FAE exhibit signs of dysfluency? _____
20. What types of dysfluencies are exhibited? _____ repetitions _____air flow blocks ____prolongations

SURVEY OF FETAL ALCOHOL SYNDROME

Section IX. Language

21. Which of your clients with FAS/FAE have a language delay/disorder?

_____primarily receptive _____primarily expressive _____both receptive & expressive

22. Which clients with FAS/FAE have primarily morphologic/syntactic disorders? _____

23. Which clients with FAS/FAE have primarily semantic disorders? _____

24. Which clients with FAS/FAE have primarily pragmatic disorders? _____

25. Which clients with FAS/FAE have combined morphologic/syntactic/semantic/pragmatic disorders?

_____

Section X. Additional Comments or Questions

If you have any additional comments or questions, please specify below:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for your participation!
To assist us if we should have any questions, please print the name and phone number of the person who completed this survey on the following line.

_____ _____
Name Phone

Please return this survey in the enclosed envelope to:

_____ *Check here if you would like to receive a copy of the survey results.*

Kathryn S. Bach, B.S.
Fetal Alcohol Syndrome Survey
Dept. of Communication Disorders and Sciences
Eastern Illinois University
Charleston, IL 61920

Eastern
Illinois
University
BOARD OF GOVERNORS UNIVERSITIES

Communication Disorders and Sciences
Speech-Language-Hearing Clinic
7th and Hayes Streets
Charleston, Illinois 61920
217/581-2712

February 10, 1992

Dear Colleague:

I am a graduate candidate in the Department of Communication Disorders and Sciences at Eastern Illinois University conducting research on fetal alcohol syndrome. It is my hope that the research will significantly contribute to our profession's current knowledge of the influence of fetal alcohol syndrome and fetal alcohol effects on speech, language and hearing abilities. Your completion of the enclosed survey will aid in obtaining data representative of this population. Please return the completed survey in the enclosed preaddressed stamped enveloped by March 12, 1992.

Thank you for your participation.

Sincerely,

Kathryn S. Bach

Kathryn S. Bach, B.S.
Graduate Candidate

Charlotte A. Wasson

Charlotte A. Wasson, M.S.
Thesis Chair

Enclosures

SURVEY OF FETAL ALCOHOL SYNDROME

FETAL ALCOHOL SYNDROME (FAS) is a specific pattern of altered growth, structure and function seen in the offspring of alcoholic women who drink heavily throughout pregnancy. The minimal criteria necessary to establish a diagnosis of FAS is:

1. Prenatal and/or postnatal growth retardation;
2. CNS involvement (neurological abnormality, developmental delay, intellectual impairment);
3. Characteristic facial dysmorphology (TWO of the following: microcephaly, microphthalmia and/or short palpebral fissures, poorly developed philtrum, thin upper lip, flattened maxillary area. Please refer to glossary).

FETAL ALCOHOL EFFECT (FAE) is a term used to refer to an individual who does not meet all three criteria but has manifestations and a history of maternal alcohol consumption.

An illustration of an individual with FAS as well as a glossary have been provided. Please detach and keep for your records.

Glossary

hyperacusis - Abnormal acuteness of hearing due to increased irritability of the sensory neural mechanism.
hypoplasia - 1. Underdevelopment of a tissue or an organ, usually due to a decrease in the number of cells. 2. Atrophy due to destruction of some of the elements and not merely to their general reduction in size.
microcephaly - Nanocephaly; abnormal smallness of the head.
micrognathia - Abnormal smallness of the jaws, especially of the mandible.
microphthalmia, microphthalmos - Nanophthalmia; abnormal smallness of one or both eyeballs.
palpebral fissures - A deep furrow, cleft, or slit relating to an eyelid or eyelids.
philtrum - The infranasal depression; the indentation in the midline of the upper lip.
prognathia - 1. Having a projecting jaw; 2. Denoting a forward projection of either or both of the jaws relative to the craniofacial skeleton.
ptosis - A drooping of the upper eyelids.
retrognathia - A condition of facial disharmony in which one or both jaws are posterior to normal in their craniofacial relationship.
strabismus - Hererotropia; squint; a manifest lack of parallelism of the visual axes of the eyes.
teratogen - An agent that causes abnormal development.
vermilion - Red external portion of the lip.