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Academic and Behavioral Interventions for Children and Youth with Fetal Alcohol Syndrome or Fetal Alcohol Spectrum Disorders

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Academic and Behavioral Interventions for Children and Youth with Fetal Alcohol Syndrome or Fetal Alcohol Spectrum Disorders

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Chapter 1: Introduction

Approximately 40 years ago, fetal alcohol syndrome (FAS) was identified to be one of the leading causes of disabilities with known causation, as well as the most common preventable cause of birth defects in the western world (Fagerlund et al., 2012; Green, 2007; Nunez, Roussotte, & Sowell, 2011; Paley & O'Conner, 2011). There are various consequences of alcohol exposure in utero, but the most severe is fetal alcohol syndrome (Paley & O'Conner, 2011).

Fetal alcohol syndrome (FAS) is a distinct constellation of characteristic facial anomalies, growth retardation, and central nervous system dysfunction caused by prenatal alcohol exposure. Fetal alcohol spectrum disorders (FASD) are different from FAS in that it is a term used to describe the range of disabilities that are caused by prenatal alcohol exposure. Individuals who are said to have FASD do not display all the characteristics of an individual with FAS (Paley & O'Conner, 2011). Because the literature and studies often do not differentiate between the two conditions, I will most often refer to the syndrome as FASD unless there is a distinct difference mentioned in the literature.

It is estimated that FASD affects about 9.1 of every 1000 live births, and FAS is estimated to affect anywhere from .5 to 2 of every 1000 births in the United States (Green, 2007; Paley & O'Conner, 2011). The estimates are similar in other westernized countries, but may be even higher in other parts of the world with high poverty rates. This information suggests that FASD is more common than what has been thought and may occur more often than other developmental disabilities (Paley & O'Conner, 2011).

Although it is important that FASD are detected early so early intervention may take place in order to mitigate other problems, there are many barriers that prevent early detection. For example, parents may be hesitant to admit they consumed alcohol during pregnancy, which is a requirement for an individual to have an official diagnosis of FASD. Another barrier is that many nonphysical characteristics are associated with FASD, and it is often misdiagnosed or undiagnosed if the individual does not have the physical characteristics that go along with the disability (Fagerlund et al., 2012).

In the United States, the cost for an individual with FAS is estimated to be about $2 million, which is primarily for costs associated with special education and medical and mental health treatment. Research has shown that these costs are similar in other countries. Fetal Alcohol Spectrum Disorders are not included in the $2 million and are estimated to be considerably higher, although the costs are unknown (Paley & O'Conner, 2011).

With the high cost of assistance to those with FASD, it is important that special education professionals understand the various in-school and out-of-school interventions that are available to those with this disability. This paper explores various interventions that have been attempted with students who have been diagnosed with FASD.

FASD Characteristics

Fetal alcohol syndrome is characterized by facial anomalies, growth retardation, and central nervous system dysfunction (Green, 2007; Kerns, Macsween, Vander Wekken, & Gruppuso, 2010; Murawski, Moore, Thomas, & Riley, 2015; Paley & O'Conner, 2011). The extent of the damage that prenatal alcohol exposure can cause varies and depends on things such as dosage, timing of exposure, pattern of exposure, maternal age, body mass, and

genetics. These deficits can make learning, behavior, and social interactions more difficult and even maladaptive for the individuals affected by prenatal exposure to alcohol. These individuals are also at a greater risk of secondary disabilities that may include school failure, delinquency, and alcohol and substance abuse problems (Paley & O'Conner, 2011).

Children with FAS or FASD are characterized by both physical and neuropsychological symptoms. Although each individual may not exhibit all these characteristics, it is common that those with FAS would have many of these and would display the physical characteristics. Individuals with FASD may display few or many of these characteristics and would not have all of the distinctive physical characteristics. The remainder of this section describes these characteristics and the corresponding research.

Physical Characteristics

As mentioned previously, individuals born with exposure to high levels of alcohol in utero often have a distinct set of facial characteristics that include microcephaly, a smooth philtrum, short palpebral fissures, and a thin upper lip. Other features may include epicanthi folds, a low nasal bridge, minor ear anomalies, and micrognathia. Prenatal alcohol exposure impacts every area of physical growth equally and may or may not change during puberty growth spurts (Davis, Desrocher, & Moore, 2010).

These physical characteristics are not present in every aspect of the FASD spectrum and are dependent upon the timing and degree of exposure to alcohol. It should also be noted that FAS cannot be diagnosed based solely upon these features because other syndromes present with similar features (e.g., Cornelia de Lange Syndrome). However, to be diagnosed with FAS these

features must be present; an FASD diagnosis does not require the presence of these features (Davis et al., 2010).

Neuropsychological Characteristics

Davis et al. (2010) reported that the magnetic resonance images (MRIs) of individuals diagnosed with FAS reveal a smaller brain size and areas that are underdeveloped, specifically the parietal lobes that have the purpose of integrating visual sensory input and interpreting sensations and perceptions. They also discovered that white matter in the brain, which is responsible for carrying nerve impulses between nerve cells, is more susceptible to heavy prenatal alcohol exposure when compared to grey matter. Grey matter has a number of functions, but is largely associated with speech and emotions (Davis et al., 2010).

One of the most widespread findings of FASD research involves its detrimental effects on overall intelligence (Davis et al., 2010). Even though overall intellectual functioning is found to be lower in general in this population, intelligence scores vary greatly. Some research has shown that cognitive functioning was affected even without the presence of physical characteristics (Davis et al., 2010). Neurological damage associated with prenatal alcohol exposure affects learning and memory, language, reaction time, motor functioning, visuospatial functioning, executive functioning, behavioral functioning, and social skills.

Learning and memory. Children with FASD have been known to manifest difficulties in learning and retaining information after a period of time. This is thought to exist in those with FASD due to the reduction in the size of the hippocampus. The hippocampus' primary role is to consolidate short-term memories into long-term memories (Davis et al., 2010; Pei, Job, Kully-Martens, & Rasmussen, 2011). As one could imagine, this would make it difficult to learn new

tasks, even ones that are done daily. It is important for teachers to have a highly structured environment and highly structured tasks within their classrooms in order to assist the student with prenatal alcohol exposure in remembering daily tasks and procedures (Kalberg & Buckley, 2007).

Language. Language is yet another area in which children with FASD manifest deficits. Research has shown that children with FASD perform more poorly on tasks that measure word comprehension and naming (Davis et al., 2010). Due to the deficits in this area, teachers must work closely with the students in order to develop a specific learning profile so that they can assist the student in learning in a way that suits their disability (Kalberg & Buckley, 2007).

Reaction time. Slow processing speed has been frequently reported in research by studies that examine the reaction time of children with FASD. Children with prenatal alcohol exposure have slower information processing and reaction times when compared to controls in both areas of premotor and motor conditions. Premotor reaction time is used to describe the time it takes for the first change of the electrical activity in the muscle that is prompted for use in the individual. Motor reaction time is the amount of times it takes the individual to carry out the actual motor activity after being prompted to do so (Davis et al., 2010). To aid students who have delays in reaction time, they must be given more time to complete tasks and given allowed processing time in order to be able to complete a task successfully.

Motor functioning. Damage to the cerebellum due to prenatal alcohol exposure is thought to be the cause of many of the motor issues. Deficits are seen in delayed motor development and fine motor skills. Individuals often have tremors, weak grasps, and poor eye-

hand coordination (Davis et al., 2010). With a motor functioning deficit, it can be understood how many daily tasks may be difficult for the individual. Modifying the environment and or tasks for these individuals can aid in reducing some of the difficulty related to motor functioning deficits.

Visuospatial functioning. Visuospatial functioning is another deficit of individuals exposed prenatally to alcohol. The deficits here may lead to writing difficulty as well as difficulty processing fine details of visual input (Davis et al., 2010). Kalberg and Buckley (2007) suggested that the visual environment be kept as simple as possible when working with a student with FASD.

Executive functioning. Executive functioning deficits of children with prenatal alcohol exposure are primarily in the areas of: (a) cognitive flexibility, the ability to change and be adaptable in thinking; (b) response inhibition, the ability to stop an inappropriate response for the situation; and (c) working memory, which is important for comprehension, learning, planning, and reasoning (Davis et al., 2010). Individuals with frontal lobe lesions are also known to exhibit some of the same deficits, which reinforces the idea that the frontal lobes are affected in those with FASD (Davis et al., 2010). These deficits may also help to explain some of the social and behavioral deficits that are commonly reported in children with prenatal alcohol exposure.

Behavioral and social functioning. When compared with children with ADHD, those with FASD had more difficult encoding and shifting than those with ADHD (Davis et al., 2010). That is, they have difficulty converting information so that it can be stored and retrieved at a later time. It is also difficult for individuals to quickly transition or change what they are

doing and move on to a completely new task. Kalberg and Buckley (2007) recommended that tasks and activities for students with FASD be tightly structured with specific expectations.

Other behavioral characteristics of FASD include higher levels of depression, delinquency, anxiety, withdrawal, hyperactivity, psychosis, and social skill deficits (Davis et al., 2010; Duquette, Strodel, Fullarton, & Hagglund, 2006). Nash et al. (2006) showed that children with FASD scored higher on measures of hyperactivity, inattention, lying and cheating, lack of guilt, and disobedience. They were also shown to act younger than their age and scored higher than children with ADHD in the areas of cruelty and stealing.

Summary

The characteristics described in this section illustrate the impact of prenatal alcohol exposure upon one's physical and neuropsychological functioning. These deficits also contribute to many other secondary disabilities such as mental health problems, disrupted school experience, trouble with the law, confinement for inpatient treatment or incarceration, inappropriate sexual behavior, and alcohol/drug problems (Streissguth, Barr, Kogan, & Brookstein, 1997). Thus, the deleterious effects of prenatal alcohol exposure can result in a significant burden not only for the individual, but also for schools and communities.

Historical Background

The damaging effects of prenatal exposure to alcohol were first reported as far back as 1834. In 1834, the British House of Commons was established to study drunkenness. Evidence presented to that committee by an unknown source indicated that children born to alcoholic women looked "starved, shriveled, and imperfect" (as cited in Jones & Streissguth, 2010,

p. 347). In 1899, Dr. William Sullivan was one of the first to note the high fetus and infant mortality rates when the mothers were alcoholics. Even though these findings were worrisome, further research was not yet a priority (Jones & Streissguth, 2010). In 1973, Jones and Smith published an article regarding the effects of alcohol on the unborn fetus; the term *Fetal Alcohol Syndrome* was introduced at this time. The Jones and Smith research marked the beginning of acknowledging FASD as a disability related to alcohol use in mothers and set the stage for further research on the topic of children born to alcoholic mothers. Although prior to this time, some speculated that alcohol had detrimental effects on the fetus; it was not widespread knowledge (Jones & Streissguth, 2010; May et al., 2009; Paley & O'Conner, 2011).

Dr. Christine Ulleland took an interest in the effects of alcohol on the unborn fetus when she was a resident doctor and worked with a mother who was an alcoholic. She also later joined Jones and Smith in research efforts to further understand characteristics of children born to alcoholic mothers (May et al., 2009). When she was unable to find any previous information about the effects of alcohol on the unborn child, she searched and found 11 babies who were born to alcoholic mothers. Although she was unable to continue her research, she shared her findings with Dr. Shirley Anderson, who continued Ulleland's research.

Anderson identified the same specific physical characteristics in children who had disabilities that did not fit the category of any other known disability. She discovered that these children were all born to mothers who were alcoholics. We now know these specific characteristics as the physical characteristics of FAS. These characteristics include microcephaly, short palpebral fissures, and a smooth philtrum. Further research led her to look into files of undiagnosed disabilities at birth. When looking for those features in the files of

children with unidentified disabilities, Anderson also noted that the mothers of these children were alcoholics (Jones & Streissguth, 2010).

Historically, most research has focused on the role of maternal alcohol consumption as the only cause of FASD, although animal studies have demonstrated the negative effects of paternal alcohol consumption on the developing fetus (Emanuele et al., 2001). Cicero (1994) speculated that alcoholism affects the male reproduction process and may result in abnormal sperm and atrophy of the seminiferous tubules that are responsible for making and storing the sperm. Gearing, McNeill, and Lozier (2005) identified several negative effects associated with paternal alcohol use: (a) birth malfunctions and abnormalities, including increased risk of spontaneous abortion; (b) health problems in children such as increases in ventricular sepal deficits (defects of the heart) and hormonal and nervous system abnormalities; (c) impaired intelligence and cognitive ability in children, and (d) hyperactivity and oppositional behavioral problems in children. McGue (1999) suggested that genes altered by alcoholism can be passed to the unborn child.

Even with increasing knowledge of what can happen due to prenatal alcohol exposure, diagnosis of FASD typically occurs in school-age children. This makes it difficult for children to receive the early intervention that is beneficial due to brain plasticity in the younger years (Paley & O'Conner, 2009). In addition, because FASD is often misdiagnosed as Attention Deficit Hyperactivity Disorder, teachers may be implementing interventions that are not effective for students with FASD (Kerns et al., 2010). Even though teachers may be unprepared or uneducated to work specifically with students specifically with a FASD or FAS, they are in our public education system.

In public education, students with FAS or FASD are typically served under the special education label of cognitive disabilities or other health disabilities (OHD). If they do have an actual diagnosis of FAS or FASD, they are served under the under a 504 plan in general education settings (Minnesota Department of Education, 2015). Even though the research conducted since the 1970s has contributed to the development of educational interventions for students with FAS or FASD, further research and professional education on this topic is still lacking (Paley & O'Conner, 2009). It is important the teachers understand the characteristics that are typical of those with FAS or FASD. This way, they are able to use the specific interventions that have been proven to be effective for those students and are best able to manage these students in the least restrictive educational environment.

Research Question

One research question is investigated in this starred paper: How effective are behavioral and academic approaches designed to address the deficits associated with FASD?

Focus of the Paper

To date, I have located nine studies that examined the effectiveness of behavioral and academic interventions with children and youth who have FAS or FASD. The studies in this paper are from 1993 or later and were included in Chapter 2 if they provided qualitative or quantitative data that evaluated the effects of interventions or provided insight into FAS or FASD. Study participants were delimited to K-grade 12 students in school or clinical settings. Both domestic and international studies were included for review.

In order to find literature on my topic I used Academic Search Premier and PsychInfo databases to locate journal articles and studies on my topic. When searching, I used various

word combinations including the words: *FAS, FASD, interventions, behavioral interventions, learning interventions, school, academic, history, children,* and *teenagers.* I was also able to use the Fetal Alcohol Spectrum Disorders Center for Excellence website which provided search abilities as well as basic information about FASD and the Minnesota Organization of Fetal Alcohol Syndrome (MOFAS) website.

Importance of Topic

Even though research about FAS and FASD has been ongoing for over 40 years, there is still relatively little information available regarding behavioral interventions that may help individuals affected by this disorder. Unfortunately, most children are not diagnosed early enough to benefit from interventions.

It is estimated that only about one-third are diagnosed before the age of 4, and the average age is around 9½ (Paley & O'Conner, 2009). It is most beneficial to diagnose individuals at the earliest age possible, but even diagnosing in first grade can lead to interventions that help individuals lead relatively normal lives (May et al., 2009)

Educators play an important role in mitigating the deficits associated with the diagnosis because most are school age when diagnosed and are most often referred to special education for academic and behavioral deficits. As a special education teacher in a program designed specifically for students with FAS or FASD, I have a professional interest in the best methods of intervention that attribute to student success. Through my current position in the Students Addressing Fetal Alcohol Spectrum Disorders through Education (SAFE) program at Intermediate District 287, I have been involved in conferences and trainings around the topic of FAS and FASD, but little addresses specific interventions for the education setting. Even though

many of the interventions that are done out of the school setting can also be carried into the school setting, I find it valuable to look for specific interventions for the school setting that will allow students to be incorporated into the least restrictive educational setting. The hope is that individuals with FAS or FASD will have a reduced rate of secondary disabilities and that they will improve their daily functioning skills.

Definition of Terms

Cerebellum: an area of the brain important for coordinating motor function, as well as playing a role in simple learning and attention (Murawski et al., 2015).

Effect Size**:** a numerical way of expressing the strength or magnitude of a reported relationship, be it casual or not. Typically, effect size is interpreted with 0.20 = small change; 0.50 = a medium change and 0.80 = a large change. It is suggested by Wolf (1986) that a standardized mean effect size of 0.25 is educationally significant and 0.50 is clinically significant (Gay, Mills, & Airasian, 2006).

Epicanthic Fold: a prolongation of a fold of the skin of the upper eyelid over the inner angle or both angles of the eye (Merriam-Webster, n.d.).

Fetal Alcohol Spectrum Disorder (FASD): the nondiagnostic umbrella term used to refer to the full range of effects that can occur following prenatal alcohol exposure (Murawski et al., 2015).

Fetal Alcohol Syndrome (FAS): a distinct constellation of characteristic facial anomalies, growth retardation, and central nervous system dysfunction caused by prenatal alcohol exposure (Paley & O'Conner, 2009).

Microcephaly: a condition of abnormal smallness of the head usually associated with mental retardation (Merriam-Webster, n.d.).

Micrognathia: an abnormal smallness of one or both jaws (Merriam-Webster, n.d.).

Palpebral Fissures: the opening between the upper and lower eyelids; length is measured as the distance between the inner to outer eye corners (Murawski et al., 2015).

Philtrum: the typically vertical groove between the upper lip and nose (Murawski et al., 2015).

Psychoeducation: the education offered to individuals with a mental health condition and their families to help empower them and deal with their condition in an optimal way (Kable, Coles, & Taddeo, 2007).

Chapter 2: Review of the Literature

The purpose of this chapter is to review nine studies that examine the outcomes of interventions implemented with individuals who are diagnosed with Fetal Alcohol Spectrum Disorder (FASD). The chapter is divided into two sections: one includes interventions that target academic skills and the other includes interventions that target behavioral skills.

Academic Interventions

The five studies in this section examine how various academic interventions affected outcomes for children with FASD. Functional safety skills and mathematics and literature interventions were examined.

Cognitive limitations and behavioral challenges make teaching safety skills to children with FASD difficult. Padgett, Strickland, and Coles (2006) used a computer game to teach fire safety skills to children with FASD. Five children ages 5-7 participated in this study, which included a pretest, posttest, and 1-week follow-up test. The tests consisted of the participant arranging pictures of three fire safety steps. In order to assure that the steps were unfamiliar to the participant, they were asked at the beginning what they would do if they saw a fire. None of the participants replied with any of the three steps that were to be taught in the game:

1. Recognize fire danger.
2. Go outside by the shortest safe route.
3. Wait at the designated meeting place.

As mentioned, the pretest results demonstrated that no child was able to answer any of the questions or arrange the pictures correctly. Participants were then given up to four opportunities to play the virtual reality game. After the completion of the game, all five

participants were able to identify the steps in the virtual reality computer game. Four of the five children were able to demonstrate that they could generalize the knowledge immediately after the computer game by sequencing the pictures correctly.

At follow-up, three of the five participants were able to demonstrate generalizability by completing the picture sequencing steps with 100% accuracy. The other two were unwilling or unable to do so. All five participants at follow-up were able to complete the steps with accuracy on the computer game.

The results of this study suggest that computer games may be an effective tool in teaching children with FASD about safety. Because the sample size was small, it may be difficult to generalize this study to other children affected by FASD. However, caregivers and professionals should investigate the use of computer games for teaching important topics to those with FASD.

Coles, Strickland, Padgett, and Bellmoff (2007) also evaluated the use of computer games to teach fire and street safety to children with FASD. This study included 32 children ages 4-10 who were all diagnosed with FASD.

The 32 participants were randomly assigned to two groups of 16 each. One group was exposed to the fire safety program; the other to the street safety program. All participants completed a pretest for both skill sets. The games used to teach the skill set were created on a PC using 3D game software. After they had mastered the game to which they were assigned, all participants completed a posttest on both sets of skills and were reassessed 1 week after the intervention to measure retention. At the 1-week follow-up they were also asked to demonstrate what they had learned in order to measure real-world generalizability.

Results showed that children who were exposed to the specific skill game had a significant greater knowledge gain than those who were not exposed to that specific skill via the computer game (pretest-posttest street: $F_{(1, 31)} = 16.3$ $p < .000$; pretest-posttest fire: $F_{(1, 31)} = 18.94$, $p < .000$). When measuring generalized behavior, participants were asked to perform four steps of the safety process for their skill that was taught to them via the game. In the fire safety group 87.5% of the participants performed three of the four steps correctly immediately after the intervention, and 81.3% performed three of the four steps correctly at the 1-week follow-up. In the street safety group, 81.3% performed three of the four steps correctly immediately, and 75.1% scored three of the four steps correctly at the 1-week follow-up.

The results of this study suggest that computer games are successful in teaching safety skills to children with FASD. Findings also suggest that the skills learned are generalizable outside of the computer game and can be maintained over some time.

Kable et al. (2007) examined the effectiveness of a math intervention program for children with FASD in Atlanta. Researchers examined medical records of participants identified with FASD to obtain participants, and they recruited participants via ads, mailings, and school contacts. The 87 children who participated in the study were between 3 and 10 years of age, had IQs greater than 50, and had no psychiatric diagnoses other than ADHD.

Pre-post math measures included the *Test of Early Mathematical Ability-2nd Edition* (TEMA-2; Ginsburg & Baroody, 1990), the *Bracken Early Concept Scales Revised* (Bracken, 1998), and the *Number Writing Task* (Coles, Kable, Dent, & Lee, 2004). Caregivers completed pre- and post-questionnaires that assessed internalizing and externalizing problem behaviors and their knowledge of FAS and behavioral regulation.

Participants were randomly assigned to either the math intervention group or the psychoeducational treatment group. The math intervention group received not only the standard psychoeducational services (evaluation, placement, and consulting), but also 6 weeks of tutoring services using the *Math Interactive Learning Experience* (MILE; Kable et al., 2007). The MILE key components included a slower pace of instruction, the use of tangible objects and tools (e.g., vertical number lines), and repetitive experiences (e.g., labeling their work). Because poor graphomotor skills (handwriting) may also impact math learning and computation, handwriting adaptive writing materials were incorporated. The control group received standard psychoeducational treatment only (evaluation, placement, and consulting).

Caregivers of those in the math intervention group received instruction on how to support math learning at home and were given home assignments weekly that went along with the individual tutoring sessions. The control group caregivers were also participants in the workshops but not required to provide at-home instruction.

Overall math development was measured by combining the raw scores from the *Test of Early Mathematics*, selected math subtests form the *Bracken Basic Concept Scale Revised*, and the *Number Writing Task*. A MANCOVA showed that participants in both groups made gains in math knowledge after controlling for pre-math functioning. Experimental group participants had significantly greater gains ($F_{(3, 43)} = 2.97$, $p < 0.04$) for a medium effect size. In the psychoeducational group, 23.1% of the 26 participants made math gains, whereas 58.6% of the 29 participants in the experimental group made math gains.

At the end of this study, caregivers also reported fewer problem behaviors in the areas of internalizing, externalizing, and total problem behaviors on the posttest. Caregivers also

reported they felt their knowledge increased in the areas of behavior regulation and caregiver advocacy from the information they gained in the workshops they attended. On a self-reporting 4-point Likert scale, average scores ranged from 3.63 to 3.85 after the treatment on scales measuring caregiver advocacy. On scales measuring how caregivers felt about behavior regulation, average scores ranged from 3.58-3.84.

These results imply that deficits associated with prenatal alcohol exposure may be remediated by directly addressing alcohol-related neurodevelopmental difficulties. The participants in the intervention group were more likely to make clinically significant gains than standard psychoeducational group participants. Even though the results are significant, the multiple program components made it difficult to determine if math gains were a result of the math program or the psychoeducational services the individual.

Adnams et al. (2007) investigated the efficacy of a classroom language and literacy intervention in 9- and 10-year-old children with FASD. The study took place in the Western Cape Providence of South Africa. Participants included 40 children with FASD and 25 non-exposed controls (NONEXP-C). Half of the FASD participants were randomly assigned to language and literacy intervention (LLT), and the other half served as controls who were not subject to the intervention (FASD-C).

Once groups were established, participants completed the *University of Cape Town Reading and Spelling Tests* and the *Phonological Awareness and Early Literacy Test* (PAELT, Byrne & Fielding-Barnsley, 1993). Other academic areas were also assessed in order to determine if language and literacy gains would increase generalize to other subjects. In addition

to the academic testing, participants passed both visual and hearing tests. Participants with FASD were significantly weaker than NONEXP-C on all language and literacy measures ($F_{(2,58)} = 10.82$, $p = .000$).

Teachers completed the *Achenbach Teachers' Report Form* (TRF; Achenbach & Rescorla, 2001) to rate behaviors in attention deficit and hyperactivity problems; the *Wood Teacher Questionnaire* (Wood, Murdock, & Cromin, 2002), which rates 10 areas of classroom behavior and adaptive functioning; and the *Children's Perceived Self-Efficacy Scale* (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996), which measures self-efficacy. Participants with FASD rated significantly worse than NONEXP-C on these measures: inattention ($F_{(2,53)} = 519.681$, $p = .000$), hyperactivity ($F_{(2,53)} = 5.288$, $p = .008$), positive behaviors ($F_{(2, 58)} = 6.887$, $p = .002$), and self-efficacy ($F_{(2,58)} = 8.447$, $p = .001$).

The intervention program lasted 9 months (a school term), and the baseline scholastic and language and literacy tests were repeated. Those in the literacy intervention group participated twice a week for a total of 38 hours throughout the school year. During this time participants were taught in groups of five and were directly taught phonological awareness, language therapy, and pre- and early literacy skills needed for competency in spelling and reading. An experienced speech and language therapist administered the intervention. The control group participated only in regular classroom instruction.

The efficacy of the LLT was evaluated using descriptive measures and ANOVAs. Mean scholastic, language, and literacy scores for all groups showed improvement over baseline scores, which would be expected given the 9-month duration of the study. However, the mean

test scores of children with FASD remained lower than those of NONEXP-C. The LLT group's gains were not significant compared to the control groups on the general scholastic assessment battery, although significant gains were reported in specific categories of language and early literacy including syllable manipulation, letter sound knowledge, written letters, word reading and non-word reading, and spelling. The mean gain for the LLT group was 0.31 to 1.2 standard deviations above the increase in scores over time of the FASD-C group, and the effect sizes were large for the categories that were statistically significant.

Subsequent to intervention, analysis of teacher questionnaire data showed the control group had significantly fewer behavioral problems in inattention, hyperactivity, positive behaviors, and self-efficacy. In the FASD groups, a significant association existed between the behavior problems noted by teachers and lack of positive classroom behavior (r = -.58) and self-efficacy (r = -.454). This finding suggests that there is a link between poor language and literacy skills and problem behaviors.

The results from this study suggest that children with FASD can improve specific skills and benefit from targeted interventions. This information is valuable for classroom teachers as well as other who work with the FASD population. Because the deficits that accompany FASD can vary greatly, it is important to note that interventions may need to be tailored specifically to each student.

Rehearsal training has been used to address the working memory deficits of some children with disabilities. Loomes, Rasmussen, Pei, Manji, and Andrew (2008) conducted a study to determine if rehearsal training would benefit children with FASD. Thirty-three children with FASD ages 4-11 participated in this study and were randomly assigned to experimental

(n = 17) and control groups (n = 16). Because rehearsal training can benefit both typically developing children and children with cognitive and learning delays, a non-FASD control group was not used in this study.

The participants were tested over two sessions. During the first session, children completed a pretest and Posttest 1. Posttest 2 was completed during the second session. The pretest/baseline took place before receiving rehearsal training and consisted of a digit span memory task adapted from the *Working Memory Test Battery for Children* (WMTB-C; Pickering & Gathercole, 2001).

Posttest 1 took place after rehearsal training was provided for the experimental group on the same day. Experimental group participants were provided with specific directions to remember information. For example, students were told, "Some people have special ways of remembering things. One way is to keep whispering the names so you don't forget. We are going to try that. We are going to do the same game over again but after I show you the things to remember I want you to whisper the items over and over in your head. Whisper them in the order that I told them to you. OK?" The children in the control group received a break after the pretest, but did not receive any rehearsal training. Following the training for the experimental group and the break for the control group, they children were again given another digit span task with different numbers. Behaviors were recorded that would indicate rehearsal and this time the participants were asked how they remembered the items.

Posttest 2 was administered an average of 10.6 days later. The participants in the experimental group were given a reminder of the strategy before the session began. At the end of the task, the children were again asked how they remembered the items.

A 2 (group) x 3 (session) ANOVA was conducted to determine if the performance on the digit task differed across groups and sessions and if a group by session interaction occurred. Results indicated no overall effect of session or group, although the group and session interaction approached significance. Because the interaction was so close to significance, a repeated measures ANOVA was conducted separately for the two groups. Results from the ANOVA for the experimental group on the digit span indicated a significant effect for session ($F_{(2, 32)} = 5.00$, $p = .01$), indicating that performance was the highest on Posttest 2. The ANOVA revealed no significant effect of session among the control group. The experimental group outperformed the control group significantly on Posttest 2 ($t_{(30)} = -1.96$, $p < .05$).

In all three sessions, the experimental group had a higher proportion of children who exhibited behavioral rehearsal characteristics, and the discrepancy between the two groups was most evident in Posttest 1 and Posttest 2. The experimental group percentages were pretest = 13.5%, Posttest 1 = 53%, and Posttest 2 = 56%. The control group percentages were pretest = 7.5%, Posttest 2 = 12%, and Posttest 2 = 33%.

Results of this study suggest rehearsal training is an effective way for individuals with FASD to mitigate some of the working memory deficits that accompany this disability. Even though the experimental group received only brief instruction, they still significantly increased their digit memory on the posttests. Loomes et al. (2008) hoped that increasing the working memory of individuals with FASD would generalize into other aspects of their life such as math performance, given its heavy reliance upon memory and numerical function.

Kerns et al. (2010) conducted a study to improve attention abilities in children with FASD using *Computerized Progressive Attention Training* (CPAT; Shalev, Tsal, & Mevorach,

2007). Ten children participated in the study; two were from an elementary school and the remaining eight were from middle school.

The CPAT is designed to strengthen three areas of attention: vigilance network (attention sustained over a longer period of time), visual orienting network (awareness of objects in an environment and their relation to one another), and executive attention network (the regulation of thoughts, emotions, and responses). The CPAT provides massed practice on an orienting attention task, a sustained attention task, a selective attention task, and an executive attention task. The intervention was delivered via laptop computer, and each participant had to complete at least 16 hours of training. Typically, the sessions were completed in 30-min increments four times a week.

Metacognitive strategies—strategies that teach individuals to monitor their own thinking—were used throughout the program. A research assistant or a Learning Assistance Integration Support Teacher (LAIS) was available to the students to help coach each student to use the strategies successfully without frustration. When a child was unable to pass a level, the assistant or LAIS discussed with children what techniques they could use to improve their chances of passing the section.

Pre- and post-assessments included descriptive, working memory, attention, and academic measures. Working memory was assessed using the Spatial Span task from the *Wechsler Intelligence Scale for Children Neuropsychological Investigations* (WISC-III/NI; Wechsler, 1991) and the *Children's Size Ordering Task* (CSOT; McInerney & Kerns, 2003). Attention was assessed using two computerized batteries: the *Attentional Network Test Adapted for Children* (ANT-C; Rueda et al., 2004) and the *Test of Attentional Performance for Children*

(KiTAP; Zimmermann, Gondan, & Fimm, 2002). The KiTAP assessed distractibility, divided attention, and sustained attention. The ANT-C was designed to examine the differences in the efficiency of the brain networks of alerting, orienting, and executive attention by examining reaction time. Auditory attention was assessed using the *Test of Everyday Attention for Children* (TEA-Ch; Manly, Robertson, Anderson, & Nimmo-Smith, 1998). The pre- and post-treatment differences were evaluated using a paired samples *t*-test, and Cohen's *d* was calculated to determine effect size.

Results showed a large effect size (d = 1.00) for reductions in commission errors (errors of action) in the KiTAP, a medium effect size was reported for the divided attention task (d = 0.58), and small-to-medium effects were reported for the sustained attention task (d = 0.30). A large increase was seen in distractibility (d = 0.83), and a small effect for divided attention (d = 0.22) and sustained attention (d = 0.17). These results suggest that children were being less impulsive when responding.

The ANT-C and TEA-Ch scores indicated the participants had quicker reaction times for alerting, orienting, and executive attention after the intervention took place. An ANOVA revealed marginally significant pre-post interventions changes in the type of attention ($F_{(1, 18)}$ = 3.47, p = 0.095) on the ANT-C, and the TEA-Ch revealed a large effect size (d = 1.26) for the increase in reaction time. Results of the WISC-III/NI revealed a moderate effect size (d = 0.63) for improvement in working memory and spatial span forward, and spatial span backwards indicated a moderate effect size (d = 0.63). The CSOT revealed an overall medium effect size

(d = 0.37), although the greatest improvement was in reading fluency—as demonstrated by a large effect size (d = 1.40). Statistically significant improvement was also shown in math fluency ($t_{(9)}$ = 4.42, < 0.01), with a moderate effect size (d = 0.72).

This study suggests that many gains using the type of attention training provided in this study. The results of this study may assist the student in not only day-to-day attention and working memory tasks, but also in academic areas such as reading and math. These findings are useful for not only caregivers and community programs, but also in academic settings in which oral instructions are provided.

Behavioral Interventions

Individuals with FASD often exhibit problem behaviors that create challenges for the individual and their caregivers. A number of interventions have been developed to help mitigate some of the problem behaviors with the hope of reduced caregiver stress and better care/treatment for the individual with FASD. This section reviews three studies that evaluate behavioral interventions for this population.

Eisenstadt, Eyberg, McNiel, Newcomb, and Funderburk (1993) conducted a study to reduce negative behaviors of children with FASD and also to reduce parenting/caregiver stress. Forty-six children ages 3-7 with the diagnosis of FASD met criteria for this study and were randomly divided into two groups.

All caregivers were provided basic education/advocacy services prior to the parenting intervention. One group participated in *Parent-Child Interaction Therapy* (PCIT; Eyeberg & Boggs, 1998), and the other group participated in a parent-only group called *Parenting Support and Management* (PSM; Barkely, 1997). In both groups, sessions lasted 90 min each week for

14 weeks. At each weekly visit, measures of their children's disruptive behaviors were collected as well as measures of parenting stress. Prior to any intervention, all the caregivers completed the *Parenting Stress Index Third Edition-Short Form* (PSI-SF; Abidin, 1995) and the *Eyeberg Child Behavior Inventory* (ECBI; Eyeberg & Pincus, 1999).

The PCIT group involved both the parents and children in all but two sessions. Skills were taught to the caregivers and then practiced in the sessions. A third party coached via a one-way mirror and a listening device that was placed in the parent's ear. Interactions were scored before treatment began to determine which areas needed the most intervention, and each session focused on those areas. After the session, families were provided with feedback and given homework between each session. The *Dyadic Parent-Child Interaction Coding System-II* (DPICS-II; Eyberg & Robinson, 2002) was used to rate the parent-child interactions during each session.

The PSM group was a parent-only intervention. The hope with this intervention was that it could provide a less costly intervention that could be easily implemented in various settings. This intervention incorporated approaches from other behavioral programs and included psychoeducation about the development of children with FASD. It then moved families from awareness to acceptance and finally to action.

No significant differences were reported between the two groups with regard to parental stress reduction or a reduction in the children's negative behaviors. However, based upon the two parental assessments, the PCIT group demonstrated slight statistically nonsignificant gains. For children in the PCIT group, the average EBCI pretest score was 65 and 58 for the posttest. The PSM group ECBI pretest score average was 63 with a posttest average of 57. The caregivers

in the PCIT group had an average PSI pretest score of 97 and a posttest score of 84. The PSM group caregivers had an average PSI pretest score of 88 and an average posttest score of 85.

A major drawback of this study was that no control group was involved to determine if spontaneous improvement, regression toward the mean, or measurement artifact were factors in the results obtained. However, Eisenstadt et al. (1993) asserted, it is worth considering the implications if in fact the interventions themselves did attribute to the reduction in problem behavior and caregiver stress.

Social skills deficits are a noted characteristic of children with FASD. O'Conner et al. (2006) conducted a study to determine the effectiveness of child friendship training (CFT) versus delayed treatment control (DCT) for 100, 6- 12-year-old children diagnosed with FASD. Children were randomly assigned to one of two groups: CFT or DCT.

The CFT group participated in 12, 90-min sessions over the course of 12 weeks. Concurrently, parents attended sessions in where they were instructed on issues related to FASD and on the major social skills taught to their children. Once the CFT group's sessions were complete, they completed a posttreatment assessment. Teachers of the participants were given the same assessment as the caregivers. The children in the DCT group received the training after the CFT group had finished their 3-month program and were assessed at the completion. At this time the CFT group was assessed for their 3-month follow-up. A specific format was used to teach participants in groups of 6-8 to address specific skills such as elements of good communication, having a conversation, joining a group, how to be a good sport, rules of being a good host, how to handle teasing/bullying and unjust accusations, and how to be a good winner.

The *Test of Social Skills Knowledge* (TSSK; O'Conner, Paley, & Frankel, 2003) was administered at the beginning, end, and 3-month follow-up. The TSSK is a 17-item criterion-based measure designed to assess the child's social skills knowledge. Scores on the TSSK revealed a significant group effect was seen in the children who received the CFT training compared to the DTC group ($F_{(1,90)} = 56.52$, $p > .0001$, $d = 1.28$). That shows that the training that was provided proved to be effective in teaching individuals with FASD social skills.

The caregivers and teachers completed the *Social Skills Rating System* (SSRS; Gresham & Elliott, 1990) to measure cooperation, assertion, responsibility, and self-control and to measure internalizing, externalizing, and hyperactivity. Results showed significantly improved social skills and decreased problem behavior were reported for the CFT children versus the DTC children before they received the intervention (Social Skills: $F_{(1,93)} = 5.03$, $p < .03$, $d = .52$; Problem Behaviors: $F_{(1, 93)} = 4.05$, $p < .05$, $d = .40$). The teacher SSRS scores indicated no significant differences.

Once the DTC group was given the intervention, after the period of delay, they yielded similar results to the CTF group. The TSSK scores indicated significant improvement ($t_{(45)} = 6.26$, $p < .0001$, $d = .92$), and the SSRS revealed significant gains in social skills ($t_{(45)} = 2.86$, $p < .006$, $d = .42$) and a decrease in problem behaviors that reached statistical significance ($t_{(45)} = 2.63$, $p < .01$, $d = .39$). As with the CFT group, teacher reports did not indicate any significant difference before or after treatment.

The results of this study indicated that CFT was effective in improving the social skills and reducing the problem behaviors of children with FASD, as reported by the child and the parent. However, teacher data did not produce similar findings. O'Conner et al. (2006)

explained these results by noting that teachers perceived children to be functioning within average ranges of social skills functioning and problem behaviors even during baseline. According to O'Connor et al., the fact that they did not identify social skills deficits may be due to a greater focus on behaviors that contribute to academic functioning. Another possible reason may be that parents may have overestimated children's behavioral changes. Either way, it is significant that the results for the child assessment indicated that there was a significant increase in their knowledge of social rules of behavior and that it was retained at the 3-month follow-up.

Wells, Chasnoff, Schmidt, Telford, and Schwartz (2012) developed a neurocognitive habilitation program for children with FASD who lived in foster care or were adopted. The aim of the program was to provide support and education for families who care for children with FASD as well as focusing on improving the children's executive functioning. The program included a curriculum that taught self-regulation techniques and strategies for improving executive functioning skills such as memory, cause-and-effect, reasoning, sequencing, planning, and problem-solving.

A total of 78 children ages 6-11 were randomly assigned to either the intervention or control group. All children received a full evaluation at the Children's Research Triangle in North Carolina. The experimental group participated in weekly 75-min course for 12 weeks that consisted of the neurocognitive habilitation therapy session based on the *Alert Program* (Williams & Shellenberger, 1996). Five children were taught in each group. At the same time, the caregivers of the children in this group were involved in an educational group specifically aimed at caring for children with FAS or FASD. The control group participants were referred

for services such as occupational therapy, physical therapy, or speech and language therapy. The caregivers of children in the control group did not participate in educational groups.

At the beginning of the 12-week study both groups of caregivers completed the *Behavior Rating Inventory of Executive Function* (BRIEF: Gioia, Isquith, Guy, & Kenworthy, 2000) to rate behavioral characteristics. The children in both groups completed the *Roberts Apperception Test for Children* (RATC; McArthur & Roberts, 1982) to assess their perceptions of common interpersonal situations. Both of these assessments were re-administered during the post-intervention period.

Multivariate analysis of the BRIEF posttest results revealed the executive functioning skills of the intervention groups increased significantly ($p = .006$) compared to the control group. Further analysis suggested that no single subgroup accounted for the variance between groups, but a combination of the subtests was best used to help explain the differences. This indicated that multiple executive functioning skills in the intervention group were increased and not just a few of the skills that resulted in the significant change. It shows that the intervention is beneficial for many areas of executive functioning and not just specific areas. .

Statistically significant results were also obtained on the RATC. The subtest produced statistically significant results between the two groups ($p < .01$), which demonstrated that children in the control group were better able to narrate stories and identify unrealistic solutions to problems.

The results of this study suggested that those in the intervention group were able to benefit from the strategies they learned. Children in the treatment group told fewer stories with unrealistic outcomes. Even though this skill was not taught directly, it appeared to be a result of

the strategies learned during the intervention sessions. Caregivers recognized noticeable improvements in their children's' executive functioning skills, as demonstrated by the BRIEF.

Neurocognitive therapy appears to be a promising approach to assist children with FAS or FASD with executive functioning difficulties. Because children with prenatal alcohol exposure have significant deficits in executive functioning, this approach warrants further attention and research.

Summary

Overall, it appears that interventions directed specifically to those with FASD are beneficial in both academic and behavioral areas. Although many children are affected by fetal alcohol disorders, relatively little research has been conducted on this topic. Nine studies were reviewed in this chapter, although one study was published as far back as 1993. Table 1 provides a summary of the key findings of the nine studies I was able to locate.

Table 1

Summary of Chapter 2 Studies

Author/Date	Number of Participants/Setting	Research Design	Results
Academic Interventions			
Padgett, Strickland, & Coles (2006)	5 children ages 5-7 recruited from the Clinic at Marcus Institute	Multiple baseline, multiple probe design	Each child was able to use the Virtual Reality intervention and generalize the fire safety steps to the real world after the intervention.
Coles, Strickland, Padgett, & Bellmoff (2007)	32 children ages 4-10 from the Marcus Institute's Alcohol and Drug Exposure Clinic	Treatment and control comparison and pre-test post-test within subject.	The children in the experimental group of the specific skill they were being tested for (fire or street safety) were able to learn and generalize the safety skills taught by the computer game. The learning was also present 1 week later.

Table 1 (continued)

Author/Date	Number of Participants/Setting	Research Design	Results
Academic Interventions			
Kable, Coles, & Taddeo (2007)	87 children between the ages of 3-10 from the Atlanta metropolitan area	Pre-post- comparisons for treatment and control groups	Significant gains in knowledge were obtained in both groups, but the group receiving direct math instruction showed higher gains. The math treatment group was considered more likely to show a gain of 1 or more standard deviations on any of the four math outcomes measured. Caregivers reported fewer problem behaviors.
Adnams, Sorour, Kalberg, Kodituwakku, Perold, Kotze, September, Castle, Gossage, & May (2007)	40 children with FASD and 25 non-exposed controls--age 9	Treatment and control comparison	Independent t-tests showed statistically significant gains by those with FASD who received the literature intervention then those with FASD who did not.
Loomes, Rasmussen, Pei, Manji, & Andrew, 2008	33 children ages 4-11 recruited through hospital, FASD community agencies, and schools	Treatment and control comparison	The experimental group showed a significant increase in post-test 2 on their digit memory over the control group.
Kerns, Macsween, VanderWekken, & Gruppuso (2010)	10 children ages 6-15 in Sooke School district	Pre-post test score comparisons	The program was effective in improving cognitive functioning for children with FASD in the areas of distractibility, sustained attention, divided attention, working memory, math and reading.
Behavioral Interventions			
Eisenstadt, Eyberg, McNeil, Newcomb, & Funderburk (1993)	58 children ages 3-7 years old and caregivers	Pre-posttest comparison and treatment and control comparison.	Both the Parent-Child Interaction Therapy group and the Parenting Support and Management group showed improvement in areas of parent distress and child problem behaviors. There was non-statistically significant differences between the interventions.

Table 1 (continued)

Author/Date	Number of Participants/Setting	Research Design	Results
Behavioral Interventions			
O'Conner, Frankel, Paley, Schonfeld, Carpenter, Laugeson, & Marquardt (2006)	100 children ages 6-12, caregivers, and teachers	Pre-post-test comparison and treatment and control comparison	Children in the Child Friendship Training group showed significant improvement in the area of appropriate social skills after the training. The delayed treatment control group also reported gains. Although parents noted an increase in prosocial behavior and a decrease in problem behaviors, teachers reported no improvement for either group.
Wells, Chasnoff, Schmidt, Telford, & Schwartz (2012)	78 children ages 6-11 who were in foster care or adopted	Treatment and control comparison	Executive functioning significantly improved in the experimental group that received the neurocognitive habilitation program.

Chapter 3: Conclusions and Recommendations

Fetal alcohol spectrum disorders (FASD) are among the most common disorders affecting children and youth. The purpose of this starred paper was to review the literature that examines the efficacy of behavioral and academic approaches designed to address the deficits associated with FASD. Chapter 1 provides information regarding the cognitive and behavioral characteristics of children and youth with FASD as well as historical and diagnostic background. Chapter 2 presents the findings of nine studies regarding academic and behavioral interventions. In this chapter, I compare and contrast study findings. In addition, I discuss recommendations for future research and current practice.

Conclusions

The nine studies I reviewed included children diagnosed with FASD from the ages of 3 to 15. The various interventions employed to improve academic and behavioral outcomes produced mixed outcomes, and these are discussed in this section.

Academic Interventions

Six studies employed individual or small-group interventions to address various educational areas such as math, literature, safety techniques, memory, and attention (Adnams et al., 2007; Coles et al., 2007; Kable et al., 2007; Kerns et al., 2010**;** Loomes et al., 2008; Padgett et al., 2006). Each of these studies incorporated systematic, direct, and explicit teaching methods that were implemented in sessions that ranged from 9 weeks to 9 months. The exception to this timeline was the virtual reality interventions in which the games were played until mastery, and a follow-up was completed in a week (Coles et al., 2006; Padgett et al., 2006). In all of the studies, interventions were effective in improving students' performance in the

targeted academic area. Several studies demonstrated that participants were able to maintain growth during follow-up assessments (Coles et al., 2006; Loomes et al., 2007; Padgett et al., 2006).

Because each of the studies targeted a different area of academic functioning, it is difficult to compare and contrast which methods work the best for those with FASD. However, there are some concepts that work together to aid in successful academic functioning. For instance, memory and attention can be used in subjects such as math and reading. Working memory is often noted when examining math difficulties (Kable et al., 2007). The Loomes et al. (2007) study on working memory found that rehearsal training can improve working memory, even after a time delay. When taking this into account for other subjects such as math and reading, one could conclude that rehearsal training could be beneficial for students when learning rules or concepts that require memorization to perform that task or the subsequent tasks in that subject.

Increasing attention in specific areas can be useful in other areas of academics as well. When looking at learning safety skills, it is important that individuals know where to focus their attention in case of an emergency. Focused attention is also beneficial within in math and reading contexts in order to stay on task and identify relevant information.

Overall, the academic interventions that were examined appeared to be beneficial for the students who participated. Many of the methods could also be used for students with other disabilities, but these studies show that students with FASD also need these types of interventions and possibly layers of interventions in order to learn with the various levels of brain damage each of the individuals may have.

Behavioral Studies

The three behavioral interventions were conducted using a small-group format to teach skills directly and explicitly over the course of 12-14 weeks. Two of the three behavioral studies showed an improvement in students' behaviors (Eisenstadt et al., 1993; Wells, Chasnoff et al., 2012). In the third study by O'Conner et al. (2006), students and parents reported improvement using Child Friendship Training, but teachers did not. O'Conner et al. noted this finding could be attributed to the finding that teachers did not rate problem behaviors as a concern at the initial assessment. This may be in part that schools already have systematic/consistent approaches and rules that are taught to students. There may also be less time for a teacher to witness some of the concepts taught like how to end a conversation and other concepts that may not be as frequently used in the classroom setting.

All three behavioral studies incorporated a parent education component. Eisenstadt et al. (1993) provided an opportunity for parents to put their learning into practice with help of a professional during Parent-Child Interaction Therapy. Within the Parent Child Interaction Therapy study, the group not receiving the therapy was provided with Parenting Support and Management Training. This was a parent-only education training that also taught techniques. Both groups in this study showed improvement. This is a very important finding because it indicates that even the less costly PCM training can provide significant behavioral improvements for those with FASD. The PCM training is also more versatile in that it can be taught specifically to caregivers without the individual with FASD in any setting.

Summary

Overall, the interventions aimed specifically for those with FASD appear to aid in improving academic and behavioral outcomes. This is promising considering the extensive academic and behavioral deficits individuals with FASD may face. With the exception of the interventions being taught one-to-one or in a very small group, many of the techniques are those already used in the special education setting. This is helpful in that if an individual is unable to obtain an FASD diagnosis, interventions may still help the individual with academic and behavioral deficits.

Recommendations for Future Research

I was surprised to find so few studies that specifically target students diagnosed with FASD. Given the number of students with FASD in our schools, I felt certain literature would be available on the topic. Although research is available that demonstrates the effectiveness of interventions on the academic and behavioral skills of students with other disabling conditions, it is unclear whether these interventions are effective for students with FASD. More research needs to be conducted to compare interventions within and across disability categories.

In the limited number of studies that have been conducted, each has evaluated outcomes of a different intervention. In the future, multiple studies should be conducted to determine the impact of a specific intervention in different settings and with different age groups. Some of these studies should employ a control group so that findings can be generalized more easily. Hopefully, these studies can identify components that can be tailored to meet the unique needs of students with FASD.

An interesting piece I will take away from the research is how important parent education is for mitigating problem behaviors. This catches my eye because many of the individuals I teach live in group homes, or their parents have various disabilities themselves. This is certainly an area for future research, particularly with regard to prevention and mitigation of FASD symptoms.

Implications for Current Practice

As a special education teacher for students with FASD, this research was valuable for my current practice and supports what my experience has taught me. Because I work in a Setting IV school, I do have the advantage of working with students in small groups. The studies employed one-to-one or small-group formats to provide instruction to the individuals with FASD. This is not always the case with every special education area, but currently in my school, the students are provided this opportunity.

In addition to individual or small-group instruction, another advantage for the students in my classroom is that they are given the opportunity to work at their own pace. A slower pace supported by computer training was found to be an effective approach.

I was gratified to learn about the effectiveness of virtual reality games in teaching skills to individuals with FASD. This is a highly beneficial tool for teaching academics and behaviors at a time when children are immersed in technology. Unintentionally, I have utilized this technique in my classroom. My students like to play virtual reality games, and in the case of one particular student who is especially difficult to teach due to him only wanting to talk about things in his fantasy world that he considers to be real. I signed up for an account on the virtual reality site he played on and we were able to play the game together. During that time, I was able to

teach about anger by talking with him as the character about "keeping it cool" and other positive ways to react when we are upset. I was also able to motivate him to write via typing on the chat function with me. This student will typically refuse to write to the point of swearing and throwing objects. I would like to pursue other ways of using virtual-world technology to teach academic and behavioral skills to my students.

Summary

Fetal Alcohol Spectrum Disorders have a significant impact on academic and behavioral performance of children in educational settings. Sadly, little research is being conducted regarding specific interventions for teachers and parents to use to improve educational outcomes. My hope is that as awareness increases of the prevalence of this disability, more research will be conducted to identify more effective interventions that will improve the quality of life for these students and their families.

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