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Differences Between Children with Fetal Alcohol Spectrum Disorders and Attention Deficit Hyperactivity Disorders: Rural Social Work Implications for Prevention, Assessment, and Treatment

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Abstract. This literature review examined nine quantitative research studies published between 1992-2013 that compared children with Fetal Alcohol Spectrum Disorders (FASD) and Attention Deficit Hyperactivity Disorder (ADHD) to identify: (a) the differences between these children (e.g., intellectual, behavioral); and (b) the diagnostic tools that may be used to distinguish between them, thereby providing a differential diagnosis. Special focus was placed on rural treatment implications. These studies revealed differences between the intellectual, executive functioning, adaptive behavior, motor, and behavioral skills of children with FASD and ADHD. This review identified neurodevelopmental assessments used in these nine research studies that appear to support learning and behavior differences between children with FASD and ADHD. Implications for prevention, assessment, and mental health treatment in rural social work practice are offered.

Keywords: Fetal Alcohol Syndrome (FAS), Fetal Alcohol Spectrum Disorders (FASD), Attention Deficit Hyperactivity Disorder (ADHD), differential diagnosis, neurodevelopmental disorders, rural social work, rural mental health

This review examined quantitative research comparing Fetal Alcohol Spectrum Disorders (FASD) and Attention Deficit Hyperactivity Disorders (ADHD) to ascertain clinical and diagnostic overlap that often results in FASD being misdiagnosed as ADHD. Implications suggesting differences in prevention and intervention strategies for rural social workers and other mental and public health practitioners providing services to individuals with FASD and ADHD are highlighted.

FASD is the umbrella term used to denote the set of conditions arising from prenatal exposure to the teratogen alcohol that encompass various physical, cognitive, behavioral, emotional, and adaptive functioning deficits (Greenbaum, Stevens, Nash, Koren, & Rovet, 2009; Interagency Coordinating Committee on Fetal Alcohol Spectrum Disorders, 2011; Streissguth, 1997). FASD includes diagnoses such as Fetal Alcohol Syndrome (FAS), partial FAS (pFAS), Alcohol Related Neurodevelopmental Disorders (ARND), and Alcohol-Related Birth Defects (ARBD). Astley and Clarren (2000) established the clinical 4-digit diagnostic code for FAS identifying four primary criteria: (a) growth deficiencies that stunt prenatal and/or postnatal growth; (b) permanent brain damage resulting in neurological abnormalities, delay in development, intellectual impairment, and learning/behavior disabilities; (c) abnormal facial

features, including short eye opening, thin upper lip, and reduced or absent philtrum; and (d) maternal alcohol use during pregnancy.

Regarding all levels of FAS, May et al. (2009) found that the prevalence in younger school children may be as high as 2-5% in the United States and some Western European countries. Sampson et al. (1997) speculated that the combined rate of FAS and ARND, or all FASDs, is estimated to be at least 9.1/1,000 live births.

FASD/ADHD in rural areas

Generalist social work practice, the “best suited model” for rural social workers and other mental health providers, recognizes the unique cultural and diverse aspects of rural settings (Berg-Weger, 2013, p. 259). Rural social workers may be the only resource to deal with challenges such as FASD (Daley & Avant, 2014). Knowledge of the incidence of FASD, the overlap in characteristics between FASD and ADHD, and the subsequent challenge of accurate diagnosis are important for rural social workers and other mental health practitioners.

Relevant to this discussion, the incidence of FASD may be higher in rural, remote, isolated, and geographically dispersed regions of the United States and rural communities of other countries (May et al., 2009). For example, the Aboriginal Mental Health Research Unit in Quebec identified increased rates of alcohol consumption in rural communities as their number one health concern and as a contributing factor to the increase in FASD in rural villages, towns and communities (Tait, 2003). The Centers for Disease Control and Prevention (CDC) (2010) published data on state specific weighted prevalence estimates of alcohol use among women aged 18-44. Results indicate that six of the ten states with the highest rates of alcohol consumption reported by women in this age range are also states with high rural populations. According to the CDC, alcohol use before pregnancy is a significant predictor of alcohol use during pregnancy (Floyd, Decouflé, & Hungerford, 1999; Zammit, Skouteris, Wertheim, Paxton & Milgrom, 2008). As approximately 40% of women realize they are pregnant after four weeks, a portion of women who use alcohol will continue during the early weeks of gestation. These data are of particular relevance for rural social workers because of implications for FASD in rural areas due high alcohol consumption (Heise, 2010).

Despite the prevalence of FASD, it is under-diagnosed (Vaurio, Riley & Mattson, 2008) and more often misdiagnosed as Attention Deficit Hyperactivity Disorder (ADHD) (Crocker, Vaurio, Riley, & Mattson, 2011). Misdiagnosis or under-diagnosis is a concern for social workers and other professionals in a variety of mental health, school, and community settings. Children with FASD have a greater than average rate of (a) IQs that measure within the intellectual disabilities category, suggesting the need for special education services and learning supports; (b) problems following directions, poor memory and judgment skills; and (c) poor academic performance leading to an increased school dropout rate (Abkarian, 1992; Burgess & Streissguth, 1990; Coggins, Friet, & Morgan, 1998; Kleinfeld & Wescott, 1993; National Research Council, 2001; Timler & Olswang, 2001).

Under- or misdiagnosis of FASD and the subsequent lack of appropriate special education services has been cited as a concern by rural special educators, behavior specialists, and other mental health practitioners (Ryan & Chionnaith, 2006; Ryan & Ferguson, 2006a; Ryan & Ferguson, 2006b). A 5-year study of rural special educators and mental health providers

indicated that rural practitioners were ill-prepared to meet the education and mental health needs of a growing number of children and youth with FASD in their rural classrooms and communities, children who had previously been diagnosed with other disorders including ADHD (Ryan & Ferguson, 2006a, 2006b).

Nash et al. (2006) described the need for effective screening and diagnostic tools that may distinguish between children with FASD and ADHD, particularly for those living in rural and remote areas with limited access to diagnostic and mental health services. Even when such services are available, waitlists are typically lengthy and travel distances considerable (Nash et al., 2006; Ryan & Ferguson, 2006a, 2006b). Therefore the need for accessible, accurate, and differential diagnosis is critical for underserved persons in areas.

Children affected by FASD have also been found to be at increased risk for juvenile justice involvement, and had not been appropriately diagnosed and treated until after they entered the legal system (Fast, Conry, & Looock, 1999). Understanding the legal charges, culpability, and the negative consequences individuals with FASD face may be challenging for practitioners. However, punitive sanctions or traditional behavioral modification approaches may be ineffective as viable treatments for people with FASD (Malbin, 2004). Furthermore, individuals with FASD may experience additional victimization in the justice system; and given comorbid mental health and executive functioning challenges, may be more susceptible to negative peer influences.

Many educational or clinical phenomena seen in children with ADHD also characterize those with FASD (Kooistra, Ramage et al., 2009). For example, characteristics often attributed to children with prenatal exposure to alcohol are poor attention and hyperactivity. Early identification and diagnosis can lead to effective intervention protocols that assist students with FASD-related developmental problems (May et al., 2009), students who might otherwise have been inappropriately treated (Coles et al. 1997).

This article reviews existing quantitative research in which children with FASD were compared to children with ADHD in an effort to identify unique differences. A second purpose is to identify what diagnostic/assessment tools may be used to distinguish between children with FASD and ADHD, thereby facilitating differential diagnostic options for rural professionals including social workers, mental health professionals, and special educators.

Method

Selected articles were published between 1992-2013 from electronic databases and are listed in Table 1. Educational Resources Information Centers (ERIC), Academic Search Premier, PsychInfo, and PubMed search terms included:

- Fetal Alcohol Spectrum Disorder;
- Attention Deficit Hyperactivity Disorder;
- Fetal Alcohol Syndrome;
- Attention Deficit Disorder with Hyperactivity;
- Prenatal Alcohol Exposure;
- Attention Disorders; and
- Teratogenicity.

Reference lists of these articles were analyzed to determine additional articles, and a hand search of the following journals was also conducted:

- *Journal of Attention Disorders*;
- *Exceptional Children*;
- *The Journal of the National Institute on Alcohol Abuse and Alcoholism*;
- *Alcoholism, Clinical and Experimental Research*;
- *Journal of Child and Adolescent Psychopharmacology*;
- *Developmental Medicine and Child Neurology*;
- *Human Movement Science*; and
- *Rural Special Education Quarterly*.

Inclusion/exclusion criteria

Articles included in the review were (a) published in the United States or Canada, (b) published between 1992-2013, (c) reported quantitative results, and (d) included a research design that compared participants with FASD with those who had ADHD. Participants, study designs, dependent variables, and significant findings are summarized in Table 1.

Analysis of the literature

Nine articles met all search criteria, and were reviewed as follows:

- authors and date;
- purpose and objectives of the study;
- participant demographic information;
- setting (when available);
- research design;
- instruments used/dependent variable;
- results; and
- study limitations.

Inter-rater reliability was determined across the nine articles by summing the total number of agreements, and dividing it by the total number of possible responses. The initial inter-rater reliability was 92%. Where there was disagreement, the authors discussed the article and criterion, and then recalculated reliability after consensus was reached. After discussions, the inter-rater reliability was 100%.

Results

The number of children who participated in the nine quantitative research studies included in this literature review ranged from a low of 54 (Nash et al., 2006) to a high of 149 children (Coles et al., 1997). The children's age ranged from 7-10 years. All studies were conducted in clinical, lab, or hospital settings.

Study designs

The nine studies included in this review utilized quantitative descriptive and/or experimental designs across three and sometimes four distinct groups. Table 1 highlights the specific aspects of each research study including a description of the experimental and control groups.

Table 1

Research Using FASD/ADHD Samples

Authors	Participants	Study Design	Instruments/ Dependent Variables	Significant Findings
Coles et al. (1997)	FAS/FAE (N=25), PAE non-dysmorphic (N=62), ADHD (N=27), Control (N=35)	Compared 4 groups on maternal, child physical & neurocognitive traits, & behavioral indicators controlling for race/SES.	K-ABC; WISC-R; Test of visual/motor integration (VMI); SNAP; CBCL (parent & teacher versions); DISC; CPT; Four Factor Model of Attention (Mirsky et al., 1989).	FAS group had more visual/spatial skills, encoding information, & problem solving challenges; ADHD group had more attention & behavior problems.
Crocker et al. (2009)	ALC (N=22), ADHD(N=23), Control (N=20)	Matched sample control group design; Subjects were previously administered a battery of neuropsychological tests (e.g., measuring intelligence, language, learning)	VABS: Assessing adaptive behavior in communication, daily living skills, & socialization.	ALC group showed more communication & daily living skill impairments than ADHD & control groups Socialization scores decreased as ALC group grew older.
Crocker et al. (2011)	ALC (heavy prenatal exposure and ADHD) (N=22), ADHD (nonexposed) (N=22), Controls (N=22)	Experimental design across 3 groups compared performance of ADHD & FASD groups on the CVLT-C	CVLT-C including measures of verbal learning, recall, retention, & recognition.	ALC group showed impaired recognition of presented verbal material; ADHD group demonstrated impaired retention.
Greenbaum et al. (2009)	ALC (N=33), ADHD (N=30), Control (N=34)	Experimental design across the 3 groups: FASD, ADHD, & Normal Controls.	CBCL; Teacher Report Form (TRF); SSRS; Theory of Mind Task (Saltzman-Benaiah & Lalonde, 2007); Minnesota Test of Affective Processing; Weschsler Abbreviated Scale	FASD group had poorer performance on experimental measures of social cognition. Parents & teachers reported more behavior problems & poorer social skills in FASD & ADHD groups
Kooistra et al. (2011)	ADHD (N=47), FASD (N=28), Controls (N=38)	Experimental group design across the 3 groups	ADHD Checklist; Conners Parent Rating Scale-Revised; & Attentional Network Test (ANT)	FASD group had lower FSIQ. Both ADHD-C & FASD groups had higher conflict scores than control group.
Kooistra, Ramage et al. (2009)	ADHD (N=47), FASD (N=30), Control (N=39)	Experimental group design across 3 groups	Conners Parent Rating Scale-Revised; M-ABC; WISC-III; COMPS.	Both FASD & ADHD groups had problems with complex motor skills. ADHD also had problems with basic motor skills.
Kooistra, Crawford et al. (2009)	ADHD (N= 47), FASD (N=30), Control group (N=39)	Experimental group design across 3 groups.	Slow rate continuous performance task (CPT); Inhibitory control was tested using Go/No-Go task; Conners' Parent Rating Scale-Revised; WISC-III.	FSIQ & SES were lower for FASD group. CPT task performance decreased in ADHD & FASD groups. On the Go/No-Go task, children with ADHD-C and FASD groups performed more slowly and more variably.
Nash et al. (2006)	FASD (N= 54), Control (N= 30), ADHD (N=30)	Experimental design across 3 groups	Child Behavior Checklist (CBCL)	Children with FASD were more likely to <i>lie and steal</i> than children with ADHD.
Vaurio et al. (2008)	ADHD (N=20), ALC (N=20), Control (N=20)	Experimental design across 3 groups: ALC, ADHD, and Control (Non-alcohol/non ADHD group)	WCST; COWAT; TMT; WISC-III.	ALC group displayed overall deficits in letter fluency and impairment in category fluency.

We maintained the researchers' language to describe experimental groups. For example, many referred to students on the FASD spectrum as the *alcohol group* with the abbreviation *ALC*. When only the term *prenatal exposure to alcohol* was used, we used the Institute of Medicine (IOM) term Fetal Alcohol Spectrum Disorder (FASD) (IOM, 1996).

Dependent variables/instruments used to compare groups

Confirmation of FASD and diagnosis of ADHD. Substantiation of prenatal exposure to alcohol was determined using a variety of diagnostic methods. The FAS diagnosis, or documentation of prenatal exposure to alcohol (including FASD), was determined using the FAS 4-digit diagnostic code (Astley & Clarren, 2000) in three studies (Kooistra, Crawford et al., 2009; Kooistra, Ramage, et al., 2009; Kooistra et al., 2011). Coles et al. (1997) used an empirically based dysmorphia checklist to confirm the FAS diagnosis. An FAS diagnosis and documentation of FASD was confirmed through several mechanisms including confirmed maternal consumption of alcohol and verification of FAS by a dysmorphologist with expertise in alcohol teratogenesis in three studies (Crocker, Vaurio, Riley, & Mattson, 2009; Crocker et al., 2011; Vaurio et al., 2008). A unique profile of deficits and assets tool (Greenbaum, Nulman, Rovet, & Koren, 2002) was used in two studies to identify children with FASD (Greenbaum et al., 2009; Nash et al., 2006).

Researchers confirmed the ADHD diagnosis for children in the respective group by using a variety of instruments. The ADHD Checklist (Kaplan, Humphreys, Crawford, & Fisher, 1997) was used to confirm the diagnosis of ADHD and the Diagnostic Interview for Children and Adolescents-IV (Reich, Welner, & Herjanic, 1997) was used to re-confirm the diagnosis and assign ADHD subtype in three studies (Kooistra et al., 2011; Kooistra, Crawford et al., 2009; Kooistra, Ramage et al., 2009). Psychiatrists or behavioral pediatricians used the DSM-III (American Psychiatric Association, 1987) or DSM-IV ADHD diagnostic criteria (American Psychiatric Association, 1994, 2000) in seven studies (Coles, et al., 1997; Crocker et al., 2009, 2011; Greenbaum et al., 2009; Kooistra, Ramage et al., 2009; Nash et al., 2006; Vaurio et al., 2008). Vario et al. (2008) determined the ADHD diagnoses through the use of parent interviews including the National Institutes of Mental Health (NIMH) Diagnostic Interview Schedule for Children (DISC) (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000) or the Schedule for Affective Disorders and Schizophrenia School Aged Children: Lifetime Version Interview (Kaufman et al., 1997).

General Intelligence Quotients. Of the nine studies only three included general intelligence as a dependent variable as measured by the Weschler Intelligence Scale for Children (WISC) (Weschler, 1991) or subtests including *coding* and *vocabulary* and *developmental test of visual/motor integration* (VMI) (Coles et al., 1997; Greenbaum et al., 2009; Vaurio et al., 2008).

Executive functioning and cognition. Several instruments were used to assess the dependent variables of executive functioning and cognition. Cognitive abilities including executive functioning skills, sequential functioning, reading and decoding were analyzed using several measures:

- Coles et al. (1997) used the Kaufman-Assessment Battery for Children (K-ABC) (Kaufman & Kaufman, 1983);
- Greenbaum et al. (2009) used the Minnesota Test of Affective Processing (Lai, Hughes, & Shapiro, 1991);

- Croker et al. (2011), used the California Verbal Learning Test, Children's Version (CVLT-C) (Delis, Kramer, Kaplan, & Ober, 1994);
- Vaurio et al. (2008) used the Wisconsin Card Sorting Test (WCST) (Heaton, Chelune, Talley, Kay, & Curtis, 1993); and
- Vaurio et al. (2008) used the Controlled Oral Word Association Test (COWAT) (Lezak, 1995); and the Trail Making Test (TMT) (Reitan, 1958).

Adaptive behavior. Only one of the nine studies included the dependent variable adaptive behavior. General adaptive behavior skills were assessed using the Vineland Adaptive Behavior Scales (VABS) (Sparrow, Balla, & Cicchetti, 1984) in the Crocker et al. (2009) study.

Attention and focus skills. The dependent variable attention and focus skills was used in two studies. Impairment in attention pathways and focus skills were assessed using the:

- Four Factor Model of Attention (Mirsky, Anthony, Duncan, Ahern, & Kellam, 1991) in the Coles et al. (1997);
- Slow Rate Continuous Performance Task (CPT) (Rosvold, Mirsky, Sarason, Bransome, & Beck, 1956) in the Coles et al. (1997) and Kooistra, Crawford et al. (2009) studies; and
- Go/No-Go task, developed by the authors, was used by Kooistra, Crawford et al. (2009).

Behavioral skills. Behavior skills were a dependent variable in several sample studies. Behavioral skills including aggressive behavior, as well as anxiety/depression, attention problems, delinquent rule-breaking behavior, social problems, somatic complaints, thought problems, withdrawn behavior, externalizing, and internalizing were assessed as follows:

- Achenbach Child Behavior Checklist (CBCL) (parent and teacher versions) (Achenbach, 1991) in three studies (Coles et al., 1997; Greenbaum et al., 2009; Nash et al., 2006);
- Social Skills Rating Scale (SSRS) (Gresham & Elliott, 1990) in the Greenbaum et al. (2009) study; and
- SNAP (Swanson, Nolan, & Pelham, 1982) in the Coles et al. (1997) study. Parent and teacher rating of children's behavior was measured using the Conners Parent Rating Scale (Revised) (Conners, 1997) in two studies (Kooistra, Crawford et al., 2009; Kooistra et al., 2011)

Motor and movement skills. Skills involving motor and movement were measured using various instruments including the Movement Assessment Battery for Children (M-ABC) (Henderson & Sugden, 1992) and Clinical Observation of Motor and Postural Skills (COMPS) (Wilson, Pollock, Kaplan, & Law, 2000) in the Kooistra, Ramage et al. (2009) study.

Study findings

Each study reviewed sought to compare children from a control group and those with FASD and ADHD. Findings from the studies reported differences between children with FASD and children with ADHD across five specific domains: (a) general intellectual functioning; (b) executive functioning; (c) adaptive behavior skills; (d) social and behavioral skills; and (e) motor skills.

Tests and Measurements Distinguishing FASD and ADHD. This literature review demonstrated that social workers, mental health providers, and school special educators routinely administered at least eight neurodevelopmental tests and measurements that may reveal

differences between FASD and ADHD; however clinical cut points were not provided. The eight neurodevelopmental measurements are:

- Triangles, Matrix Analogies, and the Arithmetic subscales of the Kaufman-Assessment Battery for Children (Kaufman & Kaufman, 1983);
- Wisconsin Card Sorting Task (Heaton et al., 1993);
- Go/No-Go Task tests (Kooistra, Crawford et al., 2009);
- Trail Making Test (Reitan, 1958);
- Daily Living and Social domains of the Vineland Adaptive Behavior Scales-Interview Edition (Sparrow et al., 1984);
- Social Skills Rating Scale (Gresham & Elliot, 1990);
- Child Behavior Checklist (Achenbach, 1991); and the
- Movement Assessment Battery for Children (Henderson & Sugden, 1992).

The Coles et al. study (1997) indicated that the Triangles, Matrix Analogies, and Arithmetic subscales of the K-ABC (Kaufman & Kaufman, 1983) were sensitive enough to reveal that children with FASD performed less well than children with ADHD in the areas of visual/spatial reasoning and encoding dimensions. The Vaurio et al. (2008) study indicated that the WCST (Heaton et al., 1993) highlighted that children with FASD, not children with ADHD, performed less well in the areas of encoding dimension, retrieval of information, shift variables, and the number of categories completed (Coles et al., 1997, p. 154). The Kooistra, Crawford et al. study (2009) indicated that the Go/No-Go Task tests found that children with FAS had difficulties with encoding and shifting attention, while children with ADHD had problems with focusing and sustaining attention. The Vaurio et al. (2008) study suggests that the TMT instrument (Reitan, 1958) revealed a difference between the ALC and the ADHD groups, in that only the ALC group displayed overall deficits on letter fluency and relative weakness indicative of left frontal damage and temporal lobe abnormality. The Crocker et al. (2009) study indicated that the subscales of the VABS (Sparrow et al., 1984), specifically the *Daily Living Skills* and the *Socialization Domains*, revealed that children with FASD were significantly more impaired in the areas of daily living and social skills than children with ADHD. Both Greenbaum et al. (2009) using the SSRS (Gresham & Elliot, 1990), and Coles (1997), Greenbaum et al. (2009) using the CBCL (Achenbach, 1991), identified particular behavioral characteristic differences between children with FASD and children with ADHD. Children with FASD were found to have more significant behaviors in the area of no guilt, lying and cheating, cannot concentrate, restless, impulsive, disobedient, and acts young. Finally, Kooistra, Ramage et al. (2009) discovered that the M-ABC (Henderson & Sugden, 1992) revealed that children with ADHD had more problems with both basic and complex motor skills, while children with FASD were more affected in their complex motor skills.

Discussion

Neurodevelopmental tests and measurements with potential to distinguish between FASD and ADHD

Columns 4 and 5 of Table 1 highlight the neurodevelopmental tests and measurements that appear to reveal differences between children with FASD and ADHD in the areas of executive functioning, adaptive behavior, behavior and motor. A closer look at a child's performance on these measures may assist professionals in distinguishing between children who

have ADHD, children who are misdiagnosed with ADHD, and children who may have FASD. Further testing or referral to an FASD specialist may be warranted.

Implications and suggestions for rural social workers and practitioners

Review findings have implications for rural social workers and other practitioners providing services and supports to children and youth who have FASD and their families. In addition to the suggestions highlighted in this section, we provide resources for social workers and mental health care providers (see Table 2).

Table 2

FASD Resources for Social Workers and Mental Health Care Providers

Resource	Description	URL
Substance Abuse and Mental Health Services Administration	U.S. Department of Health and Human Services agency	http://www.samhsa.gov
National Institute of Alcohol Abuse and Alcoholism	Part of National Institute of Health that conducts and supports research on alcohol's impact	http://www.niaaa.nih.gov
National Organization on Fetal Alcohol Syndrome	Provides information and resources nationally	http://www.nofas.org
Public Health Agency of Canada Awareness Campaign	PDF of the results of Canadian awareness campaigns about prenatal alcohol exposure	http://www.phac-aspc.gc.ca/publicat/fasd-ac-etcaf-cs/pdf/fasd-ac-etcaf-cs_e.pdf
Centers for Disease Control and Prevention	Overview of facts, research, statistics, and trainings to provide information on prevention and intervention	<p><i>General:</i> http://www.cdc.gov/ncbddd/fasd</p> <p><i>Intervention:</i> http://www.cdc.gov/ncbddd/fasd/research-intervention.html</p> <p><i>Competency-Based Curriculum Guide:</i> http://www.cdc.gov/ncbddd/fasd/research-intervention.html</p>

(1) Conduct FAS/FASD prevention campaigns. FASD prevalence rates in rural areas suggest the need for primary prevention campaigns that target communities at higher risk for FAS or FASD. Although prenatal exposure to alcohol is certainly not limited to rural areas or native populations, evidence suggests that the rate of FASD may be a cause for particular concern in rural states (Bohjanen, Humphrey, & Ryan, 2009). In fact, the prevalence is as high as 10 to 20 percent in some First Nation communities (Sampson et al., 1997; Sokol, Delaney-Black, & Nordstrom, 2003). The CDC data reported through the Behavioral Risk Factor Surveillance System (BRFSS) Annual Survey (CDC, 2010) warrant serious attention by rural interdisciplinary practitioners including mental and public health providers, school personnel including educators, parent associations, policy makers, and interagency councils. Rural states should invest in prevention campaigns and education programs directed at women between ages 18-44. Prevention campaigns initiated by rural grass roots organizations and policy makers are shown effective and are roles typical of the generalist social worker working in rural communities (Berg-Weger, 2013). Rural communities in Alaska have undertaken such campaigns in an effort to prevent prenatal exposure to alcohol (University of Alaska Anchorage, 2012).

(2) Diagnose FASD early and accurately. Recently the National Institute of Health, specifically the National Institute on Alcohol Abuse and Alcoholism (NIAAA), through their Interagency Coordinating Committee on Fetal Alcohol Spectrum Disorders (ICCFASD), published a consensus statement making the following recommendation: “investigations of other complex developmental disorders (including ADHD) should include inquiry about prenatal alcohol exposure to identify the contribution of prenatal exposure to alcohol to phenotypes of other developmental disabilities” (ICCFASD, 2011, p. 5).

Identifying, understanding, and addressing complex needs of children with executive functioning deficits, and emotional and behavioral disorders resulting from FASD are challenging for social workers and all mental health practitioners, particularly in rural and remote communities. Despite the challenges of obtaining an accurate diagnosis, children with FASD deserve an early and accurate diagnosis followed by appropriate treatment because children with FASD are at particular risk of academic failure and juvenile justice involvement (Ryan & Ferguson, 2006a; Streissguth, 1997).

Rural and remote practitioners including social workers, mental and public health professionals, physicians, and educators may find it helpful to create a FASD task force and FASD diagnostic clinic. The task force can assemble an interdisciplinary team of practitioners to advocate for training, public awareness, and FASD programming. A diagnostic clinic in a rural community could conduct preliminary FASD screenings and make referrals to qualified urban physicians. Making such referrals often require additional resources such as transportation, assistance with making a referral, or help with payment arrangements. Rural social workers or other mental health professionals could facilitate the acquisition of these supports, which are actions rural generalist social workers often take as part of their practice.

Before the creation of diagnostic clinics in rural Alaska, children were referred to the FASD clinic in Washington. Today, there are 14 rural FASD clinics throughout Alaska, staffed by rural mental and public health professionals with expertise in screening, diagnosis and treatment of children with FASD. These rural diagnostic teams received training from national specialists and are now able to conduct diagnosis and treatment. Funding for this training came from a variety of sources including grants, state agency support, and local native corporations.

(3) Pay particular attention to results of CBCL. The Child Behavioral Checklist (CBCL) can provide valuable diagnostic information to help distinguish children with FASD from children with ADHD. The CBCL is routinely used by social workers in a variety of mental health agencies in both rural and urban settings that serve children and families. Assessing skills on competence items measured by the CBCL, like the scores on *activities*, *social*, *school*, and *total competence* scales, as well as *externalizing* and *internalizing* scale scores may help determine whether or not a child has FASD. As cited in this review, Greenbaum et al. (2009) found that children with FASD exhibited clinically significant problems on CBCL items dealing with externalizing behaviors. Nash et al. (2006) found that *impulsivity*, *issues of guilt* and *remorse* and other factors distinguished children with FAS from their counterparts (see Table 1). If the CBCL administered by rural social workers or other mental health practitioners reveals deficits in the aforementioned areas, referral to an FASD specialist is suggested. If the rural community does not have an FASD specialist, a referral to a regional specialist may be warranted.

(4) Carefully monitor and support children with FASD in Foster Care or juvenile justice settings. Victor, Wozniak, and Chang (2008) explored associations between foster care placement and cognitive and behavioral functioning, and found that children with FASD who experienced single or multiple placements, struggled with impulse control, internalizing disorders, and assessment of verbal and mathematical achievement more than children who were never removed from their biological home. These findings suggest that greater consideration of environmental factors, such as family and educational stability, disorganized attachments and verbal interaction between caregivers and their children, is affecting verbal IQ, learning, and internalizing symptoms among children with FASD. One recommendation would be for rural social workers and other practitioners to work with community grass root organizations (e.g., Boys and Girls Clubs, religious groups, or Big Brothers/Big Sisters) to develop informal infrastructures within grass roots organizations that may develop and sustain support groups/friendship circles or other informal natural support systems for children with FASD who are in foster care or a juvenile justice system.

Children affected by FASD have also been found to be at increased risk for juvenile justice involvement and many had not been appropriately diagnosed and treated until after they entered the legal system (Fast et al., 1999). Rural Social workers and other mental health providers can educate juvenile and criminal justice staff about FASD, which may promote alternatives to incarceration. If, however, individuals with FASD become involved in juvenile justice or the criminal justice system, rural attorneys or judges might consider alternatives to treatment and incarceration. For example, the Superior Court of Barrow Alaska has pioneered the concept of mitigating conditions to be used in the sentencing of individuals with FASD (Alaska State Legislature, 2011; Jeffery, 2010).

(5) Include rural community elders and indigenous support systems in the treatment plans of children and youth with FASD. Given the importance of prevention, there are initiatives prioritizing prevention of alcohol-related disabilities. These include screenings for women and interventions that address the needs of high-risk women living in rural settings (Kotrla & Martin, 2009). For example, in the case of Alaska's Comprehensive Fetal Alcohol Syndrome Project, substance abuse prevention practitioners collaborated with tribal organizations and village elders to target rural villages and communities when providing

behavioral health intervention. Working with community leaders including First Nation elders has also been an effective strategy used by the Canadian FASD projects (Pacey, 2010)

(6) Establish evidence based intervention unique to, and effective for, children with FASD. Lastly, evidence-based research and intervention is limited in the area of FASD, and researchers and practitioners call for the development of evidence-based practices for FASD. The assumption that children with FASD should receive intervention found effective on children with Autism Spectrum Disorders (ASD) or ADHD is not appropriate (Ryan & Ferguson, 2006a; Streissguth, 1997).

Limitations of the Study

The results of this review should be interpreted carefully. First, relatively little work has been done on this topic since an extensive literature search located only nine research articles fitting search criteria. A second limitation was researchers' use of multiple measures to substantiate a diagnosis of FASD or ADHD. Although this is an acceptable practice in the field, it makes any comparisons across the 9 studies regarding use of diagnostic tools suspect. Third, the studies reviewed did not use similar dependent or independent variables. The use of multiple and varied instruments/variables confounds the ability to make complete conclusions across the studies. Only studies using experimental group designs were included; and other research methods, such as qualitative or single subject research designs, were not included in this review, yet they might offer significant information related to the similarities and differences between children with FASD and ADHD. Fourth, although the studies resulted in identification of performance differences on particular subtests between children with FASD and ADHD, no study provided clinical cut points that might help practitioners identify FASD specifically. Further research must establish clinical cut points to identify FASD. Additionally, none of the articles specifically defined differences between rural and urban populations. While it is possible that the clinics where study data were collected included rural participants, that information is missing from the articles reviewed. However, this also speaks to the lack of empirical data currently available specifically linking rural issues associated with effectively treating FASD, which is a goal of this paper.

Summary and Conclusions

This article reviewed quantitative research that highlight similarities and differences in children with the disorders of FASD or ADHD, and sought to make relevant connections between research and rural practice. Another purpose of this review was to identify tests and measurements that distinguish between FASD and ADHD, thereby providing a differential diagnosis. This review highlighted at least eight neurodevelopmental tests and measurements, frequently administered by physicians, psychologists and rural social workers and mental health providers with the ability to assist practitioners in accurately diagnosis of FASD. Depending on the performance of the child on these specific neurodevelopmental assessments, social workers and other mental health providers might consider follow-up for FAS diagnostic testing thereby avoiding misdiagnosis. The expectation is that all practitioners seeking to properly diagnose and treat FASD, and understand differences between FASD and ADHD, will benefit from this review. Practitioners in rural areas will find this review especially helpful, as they continue to struggle to effectively address challenges associated with FASD.

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