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Abstract:
Fetal alcohol syndrome disorder (FASD) is a syndrome affecting some children whose mothers consumed alcohol while pregnant. The effects of FASD are based on genetic predisposition, level of maternal alcohol consumption, fetal age during alcohol consumption and the overall health of the mother and fetus. Psychologists have compared FASD with attention-deficit/hyperactivity disorder (ADHD) and found that they differ in two major areas: motor skills and cognitive performance. Without recognizing differences and diagnosing the disorders correctly, doctors may allow symptoms to go untreated. These untreated symptoms may lead to secondary disabilities and result in incorrectly prescribed medications. With more research, doctors may not prescribe ADHD medication for children diagnosed with FASD because they may recognize differences between the disorders and understand how ADHD medication negatively affects them. An accurate diagnosis could lead to better use of ADHD medications as doctors may recognize differences between FASD and ADHD.

DIAGNOSIS OF FASD AND ADHD

A family pediatrician examined a recently adopted four-year-old boy and diagnosed him with attention-deficit/hyperactivity disorder (ADHD). The pediatrician prescribed ADHD medications to help regulate his behavior. After researching the possible negative effects of medications the physician had prescribed, the boy's parents took their son to a pediatric neuropsychologist. After extensive testing and analysis, the psychologist concluded that the boy actually had fetal alcohol syndrome disorder (FASD). She explained that the physical and cognitive results of his testing that were linked to the syndrome and described some of the implications of the new diagnosis. This led to a completely different treatment plan. Real stories, like this one, demonstrate the importance of FASD research.

Psychologists have researched the impacts of FASD on children, including developmental delays and behavioral issues and have sought to educate expectant mothers about the disorder. For example, Ware et al. (2014) concluded that prenatal alcohol exposure is one of the most common preventable causes of mental retardation and developmental disorders. Although this research has demonstrated how to prevent future cases of FASD, but does nothing to educate caregivers and parents as to how best to help children diagnosed with FASD, prevention re-

search cannot reverse the effects of the disorder in those already struggling with it. Researchers have not focused sufficiently on ways to help children who already have FASD. Caretakers should know how to help individuals currently struggling with this disorder because sufficient research on how to prevent FASD has not been done.

By understanding FASD, caretakers may be able to provide proper interventions (Streissguth, Barr, Kogan & Bookstein, 1997). FASD can have an array of effects, based on genetic predisposition, the level of maternal alcohol consumption, and fetal age when consumption occurs, among other variables. Variations in these factors can lead to a range of effects including facial abnormalities, growth delays, and irregularities in the central nervous system. The evaluation of these and other effects are the basis for a medical diagnosis on the FASD spectrum and the subsequent prescription of specific treatments and therapies.

This diagnosis seems straightforward, but too many doctors do not know many of the symptoms of FASD (Benz, Rasmussen, & Andrew, 2009). During a doctor's visit, alcohol consumption during pregnancy is factor that should be discussed more frequently (Rojmahamongkol, Weitzman, Sentur-

ias, & Augustyn, 2014). Instead of asking these personal questions, doctors may resort to diagnosing the child with a more common disorder—ADHD. FASD and ADHD can be similar in their symptomologies as shown by the statistic that about 73% of children diagnosed with FASD may also have ADHD (Lane, Stewart, Fernandes, Russo, Enns, & Burack, 2014; Doig, McLennan & Gibbard, 2008). Even though there is overlap between the two disorders (which may be caused by inaccurate diagnoses of FASD) there are notable behaviors and symptoms that are unique to FASD (Frankel, Paley, Marquardt & O'Connor, 2006). When children are diagnosed with ADHD, doctors are able to prescribe specific treatments and medications to help them. If a child has FASD but is misdiagnosed with ADHD, he or she may not receive the proper treatment needed.

The notable differences between FASD and ADHD make the medications unique for these disorders. While neuropsychological testing can differentiate between FASD and ADHD, doctors may still diagnose individuals with only ADHD and fail to utilize the more accurate neuropsychological tests because the symptomolgies are so similar. The inaccurate diagnosis of FASD may lead doctors to relieve some symptoms, but other symptoms may go untreated. Ultimately, inappropri-

ate treatment may lead to secondary disabilities.

Differences between FASD and ADHD

The differences between FASD and ADHD, especially in terms of behavior, may be so small that physicians cannot differentiate between the two disorders during a routine exam. To determine whether a child has FASD, the medical interview is used to determine whether the mother used alcohol during pregnancy and, if so, when she used it. The child may also be referred for neuropsychological testing. In the absence of a comprehensive testing and a thorough analysis of the results, a child may well be misdiagnosed as having only ADHD. Consequently, the prescribed treatment may be inadequate because ADHD and FASD affect motor skills and cognitive performance differently. The health and development of the child requires a proper diagnoses of ADHD or FASD.

Motor Skills

Children diagnosed with ADHD and FASD display a similar lack of fine motor skills. Researchers have shown that some children diagnosed with ADHD have severely impaired motor and postural skills (Kooistra et al., 2009). Research has also

shown that some children diagnosed with FASD had no more disruption in their learning, including during therapy, than children diagnosed with ADHD (Ware et al., 2015). Thus the results of tests of gross motor skills should be included in the decision making that results in the FASD diagnosis (Lucas et al., 2014). When children are tested for ADHD, doctors should analyze whether the motor results of those being tested are in line with control group results or if they are significantly impaired. They can then also refer children to neuropsychological testing to make sure the children do not have FASD. Using this simple technique, doctors can obtain a more accurate diagnosis than is possible if they just quickly diagnose ADHD.

Cognitive Performance

Another difference between FASD and ADHD is cognitive performance. Children diagnosed with both FASD and ADHD perform worse cognitively than those diagnosed with ADHD only. These children exhibit impaired working-memory processes, verbal abilities, perceptual reasoning skills, processing speeds, and overall adaptive skills (Boseck, Davis, Cassady, Finch, & Gelder, 2015; Glass et al., 2013). Children diagnosed with ADHD who were exposed to alcohol prenatally but are

not diagnosed with FASD nonetheless score poorly on texts of visual recognition and struggle to encode verbal information compared to controls (Crocker, Vaurio, Riley, & Mattson, 2011). Children diagnosed only with ADHD perform better at learning verbal information than those with additional prenatal alcohol exposure. There is a clear difference in cognitive abilities of children diagnosed with ADHD only and those who have been prenatally exposed and ADHD, specifically attentional control and executive functioning. Overall, children with both prenatal alcohol exposure and ADHD have much lower cognitive performance than children who just have ADHD.

Attentional control. Children diagnosed with FASD but who do not have ADHD struggle to switch their attention between alternatives (Lane et al., 2014; Kooistra, Crawford, Gibbard, Ramage, & Kaplan, 2010; Lane et al., 2014). Children diagnosed with both FASD and ADHD become less focused when they are under-stimulated. They also demonstrate little motivation to concentrate their attention on what is most important in a stimulus field. However, children only diagnosed with FASD and who do not have ADHD may have problems concentrating their attention when there are multiple stimuli (Kooistra et al., 2010). For example, children with prenatal al-

cohol exposure are more likely to be hyperactive and daydream more often than those without alcohol-exposure (Graham et al., 2013). These children may daydream because they are trying to avoid over-stimulation—instead of over-stimulation from a school lesson; they distract their minds with daydreams. Because children diagnosed with ADHD show these same signs, doctors misdiagnose children diagnosed with FASD or ADHD. However, the underlying causes of these symptoms come from opposite ends of the stimulation spectrum. Children diagnosed with ADHD daydream because they are under-stimulated and kids with FASD daydream because they are over-stimulated. This is an important defining difference between ADHD and FASD that doctors cannot detect immediately.

Executive functioning. Children who have been diagnosed only with FASD, as well as those diagnosed with both ADHD and FASD show executive function deficits (Kingdon, Cardoso, & McGrath, 2016; Kooistra, Crawford, Gibbard, Kaplan, & Fan, 2011). Alerting, orientating and executive control are three indistinguishable functions of those children compared to those who do not have either disorder (Kooistra et al., 2011). Researchers need more data to see how FASD and ADHD differ from one another in terms of executive func-

tioning. Although not many over-arching conclusions can be drawn about specific defining parts of executive functioning in children from these studies, it is possible that under- and over-stimulation are another significant difference between FASD and ADHD.

By understanding these differences better, doctors may be able to provide more useful treatments and intervention and allow some currently treated symptoms to be treated.

Secondary Disabilities

Primary disabilities in children diagnosed with FASD are abnormalities in the central nervous system. Deficits caused by negative interactions between primary disabilities and the environment are called secondary disabilities (Streissguth et al., 1997). They may result from untreated symptoms from differences between ADHD and FASD. Because of the misdiagnoses between the two, children may face primary disability-environment interaction. Secondary disabilities may include complications like social rejection, inappropriate expectations, and misuse of medications.

Social Rejection

The secondary disability of social rejection may lead to a child's poor social judgment, the inability to read social cues

and predict consequences, inappropriate social behaviors, and communication issues, which may prevent the development of positive peer relationships (Frankel et al., 2006; Peadon & Elliott, 2010; Streissguth et al., 1997). For example, some children diagnosed with FASD have receptive-expressive language disorder, which affects social cognition and social communications adversely (Crocker et al., 2011; O'Malley & Nanson, 2002). They struggle to find ways to connect with peers, which may only intensify social rejection. Because of these issues, children diagnosed with FASD can struggle to find positive social interaction (Frankel et al., 2006). These children may have a difficult time fitting in with their peers.

Even without essential socializing skills, most children can quietly copy the actions of their peers to blend. On the other hand, children with prenatal alcohol exposure perform daily living skills significantly worse than those in the ADHD and the normally developing groups (Peadon & Elliott, 2010). Children may not be able to grasp these skills because of the neurocognitive and behavioral effects of FASD (Frankel et al., 2006). Even with repeated practice of these daily living skills, children diagnosed with FASD cannot perform these tasks well enough to fit in with their peers. Even to complete other tasks

that require less repetition, children may not be able to blend in either. For example, learning to put on shoes is a task that does not require much repetition. However, children diagnosed with FASD may take more repetition to learn the skill or may not perform the skill as smoothly as children without FASD. This inability to perform tasks like their peers may also lead to social rejection.

Disrupted School Experience and Inappropriate Expectations

Teachers' erroneous expectations of a student's academic success may result from the latter's secondary disabilities. More than half of the individuals in one study who were prenatally exposed to alcohol either dropped out of school, were suspended, or were expelled (Streissguth et al., 1997). This disrupted school experience is another example of a secondary disability. There are no specific reasons shown in the research explaining why individuals with FASD have disrupted school experiences, it could be from the lack of positive social interaction experienced by them, but it could also be the lack of appropriate expectations from authority figures. For example, teachers of children diagnosed with FASD may be unfamiliar with its symptoms and may have similar expectations of such students

as for their peers. This may increase the frustration experienced by those with FASD, frustration that teachers may also fail to comprehend.

Adding to the lack of understanding, children diagnosed with FASD lack cognitive understanding and may talk at inappropriate times, and exhibit oppositional defiance (O'Malley & Nanson, 2002). Their verbal responses to questions may not make sense, but because of their expressible vocabulary, teachers may believe that these children diagnosed with FASD are capable of completing more than they actually are. Because of a lack of knowledge about FASD, teachers may not understand that children diagnosed with FASD need specific to achieve the expectations set for most children (Peadon & Elliott, 2010). The interventions needed are different from those needed for students with ADHD or other disorders.

ADHD Medications

Treating children diagnosed with FASD using medications for ADHD can have mixed results because they include stimulants such as dexamphetamine and methylphenidate (Peadon & Elliott, 2010). These medications are used to stimulate the central nervous system by inhibiting dopamine, norepinephrine

and serotonin. This may help ADHD individuals to become hyper-aware and focus on what is salient. However, individuals with FASD have a different central nervous system structure which may cause them to react differently to these medications (Peadon & Elliott, 2010). Their unique brain structure and addiction tendencies cause the stimulants to overwhelm the autonomic nervous systems of these individuals with FASD (Kooistra et al., 2010). Consequently, using ADHD medications may hinder their performances.

Unique brain structure. Because individuals with FASD have unique brain structures with unexpected reactions to ADHD medications, they may develop increased impulsiveness and aggressiveness (O'Malley & Nanson, 2002). These issues may lead to more secondary disabilities such as trouble making friends. Prenatal alcohol exposure affects the dopamine and norepinephrine neurotransmitters of the fetus. The negative effects of medication often stem from hypersensitivity of individuals with FASD, especially in the prefrontal and straits brain regions (Peadon & Elliott, 2010; Ware et al., 2015).

Stimulants are used to inhibit dopamine and norepinephrine so those neurotransmitters cannot leave the brain. Altering these neurotransmitters may influence attention,

impulsivity and behavior inhibition (Peadon & Elliott, 2010). Although these effects may seem to improve behavioral issues of FASD, they do not help as well as other medications might. For example, neuroleptic medication is shown to be helpful in improving behavior more than other medicines. Neuroleptic medicines depress nerve functions, and therefore give better outcomes for children diagnosed with FASD than stimulants (Frankel et al., 2006). In one experiment, parents and teachers reported greater improvement of behavior with neuroleptics while stimulant medications had no significant difference or resulted in worse behaviors (Frankel et al., 2006).

Another study shows contrasting research that impulsivity, inattentiveness, and hyperactivity improved in 63% of individuals with FASD when a stimulant was prescribed (Doig et al., 2008). This contradicts the other research, which was inconclusive. One avenue of study may be to explore the optimal dosages of neuroleptics and how they affect unique brain structures (Frankel et al., 2006). Even though the research is not yet completely conclusive (reorder words), researchers, caregivers and physicians can help affected children improve their secondary disabilities. Finding how medications affect the unique brain structures of children diagnosed with FASD may decrease

the impact of secondary disabilities.

Addiction tendencies. Children diagnosed with FASD often have addiction tendencies, a symptom that ADHD medications do not treat well. Children with prenatal alcohol exposure are more likely to become addicted to substances because of the structural brain changes that exposure to alcohol may cause (Uban, Comeau, Ellis, Galea, & Weinberg 2013). Because children with prenatal alcohol exposure may be more addiction-prone, exposing them to ADHD medications may increase their chances of becoming drug addicts since ADHD treatments increase dopamine levels (Peadon & Elliott, 2010). In a study by Streissguth (1997), a pioneering FASD researcher, 30% of the patients with FASD (12 years old and over) had alcohol/drug problems.

Most factors influencing FASD are uncontrollable after prenatal alcohol consumption occurs. However, secondary disabilities are one of the few pieces of FASD that can be manipulated once the child is born. Secondary disabilities may increase with negative experiences, specifically social rejection, inappropriate expectations and misuse of medications—these are all factors that parents, teachers and physicians can monitor and change. Doctors may recognize primary disabilities of

children diagnosed with FASD (deleted "the") and then suggest appropriate interventions before the secondary disabilities begin affecting the child's life.

Conclusion

Physicians may misdiagnose children who have FASD as having ADHD instead and may therefore prescribe ADHD medications. As a result, such children suffer additionally from secondary disabilities, such as social rejection. Prescribing appropriate treatment can help these secondary disabilities. However, appropriate treatment cannot be given unless the doctor diagnoses the individual's disorder correctly. For this reason, I have argued that it is essential that physicians reliably and validly differentiate between the symptoms of ADHD and those of FASD.

There are limitations in research in this field of study; the specific results of FASD have not been thoroughly researched. Because diagnoses of FASD are so rare, it is difficult to find large groups of subjects. Also, researchers cannot control numerous, life-defining variables of a child with FASD, such as the amount of alcohol a pregnant mother consumes. There are other parts of the environment that are in the past and cannot be changed like peers' interactions, teachers' expectations and

medicine prescribed to individuals. Although these factors cannot be individually controlled, analyzing combinations of them can help psychologists draw useful conclusions.

Some research regarding the effects of FASD and certain factors within the environment has already been done. This literature review combines information from these limited sources of research to demonstrate the importance of correct diagnosis of FASD. The differences between ADHD and FASD may lead to more secondary disabilities, and these secondary disabilities are hindered even more by social rejection, frustrating expectations and ADHD medications. The factors discussed are in the environment, and can be monitored, controlled, and improved. Without improvement, individuals may suffer their entire lives trying to fix their symptoms using incorrect methods like ADHD medications. Further research may identify productive steps for parents, and other caregivers, physicians, teachers, and psychologists to take separately and collectively to provide better treatment, through better diagnosis, for children diagnosed with FASD, or both FASD and ADHD.

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