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Research Article

Neurological Differences and Pharmaceuticals in Persons with Autism

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Abstract:
Given the rise of persons diagnosed with autism, this paper is to highlight psychopharmacueticals that are often used in the treatment of autism symptomology. I begin with a brief summary of autism followed by a summation of biological differences. A discussion of pharmaceuticals often used to alleviate the symptoms associated with autism is also discussed. Lastly, a brief conclusory statement is provided.

Introduction

According to the APA Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5, 2013) for an individual to be diagnosed with autism, their symptomology must have been present early in their development and the symptoms cause impairments in a variety of areas in current functioning. Since autism is a spectrum disorder, the specific areas of deficits vary with each individual. Specific factors that contribute to a diagnosis of autism include that an individual needs to demonstrate difficulties in social communication and interaction. An individual must also have demonstrated restrictive, repetitive patterns of behavior, interests, or activities (DSM-5, 2013). These impairments can significantly impact an individual's quality of life (Murza, Nye, Schwartz, Ehren, & Hahs-Vaughn, 2014).

Neurological Manifestations

One study by Ha, Sohn, Kim, and Cheon (2015) indicated that patterns of restricted and repetitive behaviors were linked to differences in the striatum, which is part of the basal ganglia in the brain. Differences in the brain were also found in the orbitofrontal cortex and the caudate nucleus. Furthermore, deficits in social language processing and social attention were found to originate from differences in the inferior frontal gyrus, the superior temporal ulcus within the Broca's and Wernicke's area (Ha, Sohn, Kim, & Cheon 2015). Similarly, Azeem, Imran, and Khawaja (2016) found that there were enlarged ventricles and increased cerebral volume in the brains of persons with autism. They found abnormalities in brain biochemistry and in serotonin pathways. Persons with autism also showed decreased metabolism in both the anterior and posterior cingulate gyri. Cellot and Cherubini (2014) found that one common neurological manifestation in persons with autism is that the GABA pathway is disrupted.

Psychopharmacology

When treating for autism, there are varying courses of treatment. For the purposes of this paper, pharmaceuticals will be discussed. Medications are prescribed to treat the various adverse symptomology of autism. However, only two are approved by the U.S. Food and Drug Administration. These are risperidone and aripiprazole, classified as antipsychotics. Due to the limits in the availability of medications specifically prescribed for the treatment of autism, many practitioners often prescribe "off label" medications. Off label refers to pharmaceuticals prescribed for use in the treatment of an ailment that is not approved by the FDA.

Antipsychotics

Antipsychotics are commonly utilized in the treatment of autism; in fact, risperidone was the first medication approved by the FDA for the treatment of autism symptomology. Antipsychotics have been proven effective in treating irritability and aggression in those with autism. However, there are some adverse side effects such as weight gain and increased appetite. Risperidone is a dopamine, serotonin, norepinephrine receptor antagonist (DSN-RAn) that works by blocking dopamine 2 and serotonin 2A receptors (Stahl, 2017). Similarly, aripiprazole is often prescribed for the treatment of irritability and is a dopamine, serotonin receptor partial agonist (DS-RPA).

In a study by Ghanizadeh, Sahraeizadeh, and Berk (2014) researchers compared the effects of risperidone and aripiprazole in persons with autism. Participants consisted of 59 children, who participated in a randomized, double-blind study. Results indicated that those treated with aripiprazole showed a reduction of adverse symptomology, aggression and irritability, earlier than those treated with risperidone, but that the two appeared to have equal effectiveness. In another study consisting of 30 individuals with autism, results showed that risperidone was markedly effective in treating symptomology like irritability, socialization and hyperactivity (Nikvarz, AlaghbandRad, Tehrani-Doost, Alimadadi, & Ghaeli, 2017).

Antidepressants

Antidepressants are often prescribed for those with autism

who also present with comorbidities such as depression, anxiety, and obsessive-compulsive disorder. Cardwell (2017) conducted a meta-analysis of SSRIs in the treatment of autism. The primary focus was on the usefulness of fluoxetine and citalopram. Fluoxetine works by increasing serotonin and by blocking the serotonin reuptake pump. Fluoxetine works as an antagonist at 5HT2C receptors, which is likely to increase norepinephrine and dopamine neurotransmission (Stahl, 2017). Citalopram works by increasing serotonin and by blocking the serotonin reuptake pump (Stahl, 2017). Cardwell concluded that there is not much support for their use in the treatment of autism in children and that more research is needed to examine the usefulness in adults with autism.

Interestingly, the use of SNRIs, such as venlafaxine and atomoxetine may be beneficial in the treatment of the core symptoms of autism (Handen et al., 2015). Venlafaxine increases serotonin, norepinephrine and dopamine. It also blocks the norepinephrine reuptake pump. Atomoxetine increases norepinephrine and blocks norepinephrine reuptake pump (Stahl, 2017).

Psychostimulants

McCracken et al., (2014) sought to ascertain the benefits of methylphenidate in the treatment of hyperactivity in persons with autism and showed the course of treatment to be beneficial. However, it is recommended that patients be followed closely as differences in genetic variants could leave people with autism on methylphenidate more susceptible to adverse side effects (Stahl, 2017). McCraken et al., (2014) noted that dosing varied among patients due to these genetic variants. Methylphenidate works by increasing norepinephrine and blocks the reuptake of dopamine (Stahl, 2017).

A_2-Agonists

As described by Cardwell (2017), guanfacine and clonidine are two medications that are often used in people with autism and comorbidity of ADHD. These medications are often prescribed off-label by clinicians for the treatment of inattention and hyperactivity for those with an autism diagnosis. Both influence the postsynaptic alpha 2A receptors in the prefrontal cortex (Stahl, 2017).

Oxytocin

Some evidence suggests that oxytocin can help improve social limitations often demonstrated by those with autism. Furthermore, oxytocin may be beneficial in those with autism in emotion regulation when compared with placebo (Yatawara, Einfeld, Hickie, Davenport, & Guastella, 2016). Oxytocin may also be useful for treating communication deficits as well as symptoms such as social withdrawal (Parker,2017).

GABA Agents

Recent research suggests that GABA agents may assist in shifting activity in the GABA pathway, thus alleviating symptomology such as social interaction, restrictive and repetitive behaviors, as well as communication limitations (Cellot & Cherubini, 2014). In a study conducted by Erickson et al., (2014), the researchers sought to understand the efficacy of arbaclofen in the treatment of symptomology associated with autism. In a sample size of 32 children, research showed that arbaclofen was helpful in alleviating social withdrawal and irritability. Another GABA agent, N-acetylcysteine, works by targeting the GABA pathway and decreases glutamatergic neurotransmission and has been shown to alleviate symptoms of irritability (Dean et al., 2017; Stahl, 2017).

Concluding Thoughts

According to the literature briefly reviewed, different off-label psychopharmaceuticals may be useful in treating the various symptomology in persons with autism. For the treatment of irritability and aggression, in addition to the use of the FDA approved medications risperidone and aripiprazole, there is evidence that suggests the usefulness of GABA agents such as N-acetylcysteine as well as amantadine. For anxiety and depression, SSRIs are suggested, such as fluoxetine and sertraline. In the treatment of hyperactivity and inattention, atomoxetine and methylphenidate are recommended. Guanfacine and clonidine were shown to be beneficial. Finally, in treating for social deficits, communication concerns, and restrictive interests and behaviors, the SNRI venlafaxine may prove beneficial.

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