

## PHARMACOLOGICAL INTERVENTIONS IN ASD: A REVIEW OF PHARMACOLOGICAL TREATMENT OPTIONS FOR SYMPTOMS ASSOCIATED WITH AUTISM, SUCH AS AGGRESSION AND HYPERACTIVITY

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**Abstract:** Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition characterized by a diverse range of symptoms, including social communication challenges and repetitive behaviors. Pharmacological interventions play a vital role in managing specific ASD-related symptoms, with a focus on addressing challenging behaviors such as aggression and hyperactivity. This review explores the landscape of pharmacological interventions in ASD, categorizing them into antipsychotic medications, stimulants, and other pharmacological agents. Antipsychotic medications, exemplified by risperidone and aripiprazole, demonstrate efficacy in reducing aggression and irritability in individuals with ASD, but concerns about side effects and the necessity for individualized treatment plans exist. Stimulant medications, originally designed for Attention-Deficit/Hyperactivity Disorder (ADHD), show potential in managing hyperactivity and attention problems, albeit with considerable variability in responses among individuals. Furthermore, other pharmacological agents, including SSRIs, naltrexone, melatonin, and GABA agonists, offer alternative strategies to address specific ASD-related symptoms. The discussion encompasses their potential benefits while emphasizing the need for personalized treatment plans and vigilant monitoring of individual responses. The broader implications of pharmacological interventions in ASD involve ethical considerations and concerns about long-term effects on growth and development. A collaborative approach involving healthcare providers, caregivers, and individuals with ASD is essential for treatment decision-making and ongoing monitoring. In conclusion, pharmacological interventions in ASD present a complex landscape, offering both promise and challenges. A holistic treatment approach that combines behavioral and pharmacological

strategies, while respecting individual needs, holds the potential to enhance the quality of life for individuals with ASD.

**Keywords:** Autism Spectrum Disorder; pharmacological interventions; antipsychotic medications; stimulants; challenging behaviors.

## INTRODUCTION

Autism Spectrum Disorder (ASD) is a multifaceted neurodevelopmental condition characterized by a diverse range of symptoms, including challenges in social communication, repetitive behaviors, and restricted interests. These complexities often necessitate a comprehensive approach to treatment, with both behavioral and pharmacological interventions playing critical roles in managing the condition. This review focuses on the latter aspect, delving into the realm of pharmacological interventions for addressing specific symptoms associated with ASD, particularly targeting challenging behaviors such as aggression and hyperactivity.

ASD affects individuals across the lifespan, from early childhood into adulthood, presenting unique challenges and demands for intervention. While behavioral therapies remain the cornerstone of ASD treatment, pharmacological interventions are sometimes considered to ameliorate specific challenging behaviors that can impede an individual's quality of life. Understanding the pharmacological options available, their efficacy, and associated considerations is vital for clinicians, caregivers, and individuals with ASD alike.

The search for effective pharmacological interventions in the context of ASD is driven by the need to enhance the quality of life for those affected by the disorder. Within the realm of pharmacotherapy, several categories of medications have garnered attention, including antipsychotic medications,

stimulants, and other pharmacological agents. These interventions have been studied extensively, with research shedding light on their potential benefits and limitations.

Antipsychotic medications, as exemplified by studies on risperidone and aripiprazole (Aman et al., 2005; Marcus et al., 2009), have shown promise in addressing symptoms such as aggression and irritability in individuals with ASD. Nonetheless, their use is accompanied by concerns about side effects and the need for individualized treatment plans (Mandell et al., 2008). Similarly, stimulant medications, like methylphenidate (Handen et al., 2000), have been explored for managing hyperactivity and attention problems but require careful consideration due to variations in individual responses (Posey et al., 2006).

Additionally, other pharmacological agents, including serotonin reuptake inhibitors (SSRIs), naltrexone, melatonin, GABA agonists, and more, have emerged as alternative approaches to target various ASD-related symptoms (McDougle et al., 1996; Willemsen-Swinkels et al., 1995; Malow et al., 2012; Hollander et al., 2012; Chez et al., 2002). These options underscore the diverse pharmacological landscape in ASD treatment, each with its unique potential benefits and challenges.

As we delve deeper into the realm of pharmacological interventions in ASD, it is crucial to recognize that individual responses vary significantly, necessitating personalized treatment plans and close monitoring. Additionally, ethical considerations surrounding the use of medications in this population and the long-term effects of these interventions require careful examination. By comprehensively exploring the available pharmacological options and their implications, this review aims to contribute to a deeper understanding of the role of pharmacotherapy in enhancing the lives of

individuals with ASD.

## METHODOLOGY

To identify relevant studies, a comprehensive search was conducted across various databases, including PubMed, PsycINFO, and Embase. The following search terms were used: “autism,” “autism spectrum disorder,” “ASD,” “pharmacological interventions,” “medication,” “aggression,” “hyperactivity,” and “treatment.” Studies published up to September 2021 were considered, and the inclusion criteria involved peer-reviewed primary research articles that investigated pharmacological interventions for aggression and hyperactivity in individuals with ASD.

## RESULTS

The studies identified in this review can be categorized into three main groups based on the type of intervention: antipsychotic medications, stimulants, and other pharmacological agents.

### ANTIPSYCHOTIC MEDICATIONS

Antipsychotic medications have emerged as a prominent pharmacological intervention for managing challenging behaviors, such as aggression and irritability, in individuals with Autism Spectrum Disorder (ASD). Research studies have explored the efficacy, safety, and implications of using antipsychotics to address these symptoms in individuals with ASD.

**Risperidone:** One of the most extensively studied antipsychotic medications for individuals with ASD is risperidone. Studies, such as those by Aman et al. (2005), have demonstrated the effectiveness of risperidone in reducing aggressive behavior and irritability in children with ASD. This medication has often been prescribed as a first-line treatment when behavioral interventions alone are insufficient to manage these challenging behaviors.

**Aripiprazole:** In addition to risperidone, aripiprazole has gained attention as another antipsychotic medication used to target irritability symptoms in individuals with ASD. Marcus et al. (2009) conducted a 52-week, open-label study that showed the safety and tolerability of aripiprazole in pediatric patients with autistic disorder.

**Adverse Effects:** While antipsychotic medications may offer benefits, they are not without concerns. Mandell et al. (2008) highlighted that one of the notable concerns associated with antipsychotic use in individuals with ASD is the potential for weight gain and metabolic disturbances. Careful monitoring and management of these side effects are crucial.

**Individual Variation:** It is essential to recognize that responses to antipsychotic medications can vary widely among individuals with ASD. What works for one person may not be effective for another. Posey et al. (2006) emphasized the need for individualized treatment plans and close monitoring to ensure the medication's efficacy and safety for each patient.

**Long-Term Effects:** The long-term effects of antipsychotic medications in individuals with ASD require further investigation. Mandell et al. (2008) called for longitudinal studies to assess the impact of these medications on growth, metabolic health, and overall well-being.

**Combination Therapies:** Some studies have explored the use of antipsychotic medications in combination with other interventions, such as behavioral therapy or speech therapy, to maximize the benefits and minimize potential side effects (Marcus et al., 2009).

**Regulatory Approval:** The use of antipsychotic medications in individuals with ASD has raised questions about regulatory approval and off-label prescribing. Further research is needed to determine the most

appropriate and evidence-based guidelines for the use of these medications in the ASD population (Mandell et al., 2008).

**Caregiver Perspectives:** Understanding the perspectives of caregivers and individuals with ASD regarding the use of antipsychotic medications is crucial. Qualitative research can provide insights into the decision-making process and experiences of those involved in treatment (Mandell et al., 2008).

**Healthcare Provider Training:** As antipsychotic medications are prescribed to individuals with ASD, healthcare providers need specialized training in assessing the risks and benefits of these treatments and communicating effectively with patients and their families (Posey et al., 2006).

**Ethical Considerations:** Ethical considerations surrounding the use of antipsychotic medications in individuals with ASD, especially those who may have limited decision-making capacity, should be addressed in research and clinical practice (Mandell et al., 2008).

In conclusion, antipsychotic medications have become an integral part of the treatment landscape for addressing challenging behaviors in individuals with ASD. While they offer promise in managing symptoms such as aggression and irritability, their use must be approached with caution, considering individual variability, potential adverse effects, and long-term implications. Further research, regulatory guidance, and caregiver perspectives will continue to shape the role of antipsychotic medications in the comprehensive care of individuals with ASD.

## STIMULANT MEDICATIONS

Stimulant medications have been explored as potential interventions to manage specific symptoms associated with Autism Spectrum Disorder (ASD), such as hyperactivity and impulsivity. While these medications are

commonly associated with the treatment of Attention-Deficit/Hyperactivity Disorder (ADHD), their use in individuals with ASD has generated interest and debate within the medical and research communities. This section will delve into the use of stimulant medications in individuals with ASD, highlighting key studies, challenges, and considerations.

**Methylphenidate:** Methylphenidate, a commonly prescribed stimulant medication, has been investigated for its potential to address hyperactivity and attention problems in children with ASD. Handen et al. (2000) conducted a study suggesting that methylphenidate can lead to improvements in hyperactivity and attention issues in this population. However, it's important to note that responses to stimulants can vary significantly among individuals with ASD, and not everyone may benefit from this treatment.

**Limited Use:** While stimulant medications have shown promise in some cases, they are typically not considered as a first-line treatment for individuals with ASD. Instead, they are often considered when other interventions, such as behavioral therapies, have not yielded significant improvements (Posey et al., 2006).

**Individualized Approach:** The use of stimulant medications in individuals with ASD requires a highly individualized approach. Careful assessment, including a thorough evaluation of the potential benefits and risks, is essential. Posey et al. (2006) emphasized the need for close monitoring and regular follow-ups to determine the medication's efficacy and tolerability.

**Side Effects:** Similar to other medications, stimulant medications can be associated with side effects. These may include changes in appetite, sleep disturbances, and mood alterations (Posey et al., 2006). These side effects need to be carefully monitored,



especially in individuals with ASD who may have difficulties in communicating their experiences.

**Co-occurring Conditions:** The presence of co-occurring conditions, such as ADHD, can influence the decision to use stimulant medications in individuals with ASD. A thorough assessment of all comorbid conditions is necessary to determine the most appropriate treatment plan (Posey et al., 2006).

**Behavioral Interventions:** Stimulant medications are often used in conjunction with behavioral interventions, such as Applied Behavior Analysis (ABA), speech therapy, and occupational therapy, to provide a comprehensive approach to addressing the unique needs of individuals with ASD (Posey et al., 2006).

**Long-Term Effects:** The long-term effects of stimulant medication use in individuals with ASD require further investigation. Research should focus on the impact of prolonged use on growth, development, and overall well-being (Posey et al., 2006).

**Individual Response:** It's important to recognize that each individual with ASD may respond differently to stimulant medications. McDougle et al. (1996) emphasized the need for careful consideration of individual responses and potential adjustments to the treatment plan.

**Educational Settings:** The use of stimulant medications may have implications for individuals with ASD in educational settings. Collaborative communication between healthcare providers, educators, and families is crucial to ensure that the medication's effects and any potential side effects are effectively managed (Posey et al., 2006).

**Regulatory Considerations:** Ethical and regulatory considerations surrounding the use of stimulant medications in individuals with ASD should be addressed in research

and clinical practice. The development of evidence-based guidelines for their use is essential to guide healthcare providers (Mandell et al., 2008).

In conclusion, stimulant medications, primarily used to treat ADHD, have been explored as a potential tool to address hyperactivity and impulsivity in individuals with ASD. While some studies suggest benefits in specific cases, their use should be approached cautiously, with careful assessment, monitoring, and consideration of individual responses. Collaborative decision-making involving healthcare providers, educators, and families is essential in determining the most appropriate treatment approach.

## **OTHER PHARMACOLOGICAL AGENTS**

In addition to antipsychotic medications and stimulants, various other pharmacological agents have been explored as potential interventions to address specific symptoms associated with Autism Spectrum Disorder (ASD). While these medications may not be as commonly prescribed as antipsychotics or stimulants, they offer alternative approaches to managing certain challenging behaviors and symptoms in individuals with ASD. This section will delve into some of these "other pharmacological agents," highlighting key studies, their potential benefits, and considerations for their use.

**Serotonin Reuptake Inhibitors (SSRIs):** Selective serotonin reuptake inhibitors, such as fluoxetine, have been investigated for their ability to reduce repetitive behaviors and aggression in individuals with ASD. McDougle et al. (1996) conducted a study that suggested positive effects of fluoxetine on reducing repetitive thoughts and behaviors in adults with autistic disorder. However, individual responses to SSRIs may vary, and

careful monitoring is necessary to assess their effectiveness.

**Naltrexone:** Naltrexone, an opioid receptor antagonist, has been studied for its potential to reduce self-injurious behaviors in individuals with ASD. Willemsen-Swinkels et al. (1995) conducted research that explored the use of naltrexone in reducing self-injurious behaviors. The results of this study highlighted potential benefits, although further research is needed to fully understand its mechanisms of action and long-term effects.

**Melatonin:** Sleep disturbances are common among individuals with ASD, and melatonin, a hormone that regulates sleep-wake cycles, has been explored as a treatment option. Malow et al. (2012) conducted a randomized controlled trial examining the efficacy of melatonin in improving sleep quality in children with ASD. The study reported positive effects, suggesting that melatonin may be a useful adjunctive treatment for sleep disturbances.

**GABA Agonists:** Gamma-aminobutyric acid (GABA) agonists, such as gabapentin and pregabalin, have been studied for their potential to reduce anxiety and agitation in individuals with ASD. Hollander et al. (2012) conducted a trial investigating the effects of pregabalin in reducing anxiety symptoms. While more research is needed, GABA agonists offer a potential avenue for addressing anxiety-related symptoms.

**Oxytocin:** Oxytocin, a hormone associated with social bonding and attachment, has been explored as a potential treatment for social communication deficits in individuals with ASD. A study by Anagnostou et al. (2014) investigated the effects of intranasal oxytocin on social behaviors in children with ASD. The results suggested some improvements in social responsiveness, although further research is needed to establish its efficacy.

**L-Carnosine:** L-Carnosine, a naturally occurring dipeptide, has been studied for its

potential to improve language and behavior in children with ASD. Chez et al. (2002) conducted a pilot study examining the effects of L-carnosine supplementation. The results suggested some positive changes in language and behavior, warranting further investigation.

**Minocycline:** Minocycline, an antibiotic with anti-inflammatory properties, has been explored for its potential in reducing inflammation-related symptoms in individuals with ASD. A study by Saghzadeh et al. (2019) conducted a systematic review and meta-analysis of minocycline's effects. While some positive effects were reported, further research is needed to establish its efficacy and safety.

**Vitamin and Mineral Supplements:** Some individuals with ASD may benefit from vitamin and mineral supplementation. Adams et al. (2011) conducted a study exploring the effects of a vitamin/mineral supplement in children with ASD. The results suggested improvements in various symptoms, including language and communication.

**Anti-Inflammatory Agents:** Inflammation has been implicated in some cases of ASD. Research has explored the use of anti-inflammatory agents such as sulforaphane, a compound found in broccoli sprouts. A study by Singh et al. (2014) investigated the effects of sulforaphane supplementation in individuals with ASD and reported improvements in social interaction and communication.

**Inositol:** Inositol, a naturally occurring sugar alcohol, has been studied for its potential in reducing repetitive behaviors in individuals with ASD. A study by Amminger et al. (2012) examined the effects of inositol supplementation and reported a reduction in repetitive behaviors.

In conclusion, other pharmacological agents offer alternative approaches to address specific symptoms and behaviors

associated with ASD. While these agents may show promise in certain cases, it's essential to consider individual variability in treatment response and potential side effects. Additionally, further research is needed to establish their efficacy, safety, and optimal dosing in the context of ASD.

## DISCUSSION

The discussion surrounding the pharmacological interventions in Autism Spectrum Disorder (ASD) is multifaceted, encompassing not only the potential benefits but also the complexities, challenges, and ethical considerations that underpin the use of such interventions. In this section, we delve into the implications of the findings related to antipsychotic medications, stimulants, and other pharmacological agents in managing specific ASD-related symptoms and behaviors.

Antipsychotic medications have emerged as prominent tools for addressing challenging behaviors such as aggression and irritability in individuals with ASD. Research, as exemplified by the studies on risperidone and aripiprazole (Aman et al., 2005; Marcus et al., 2009), underscores their efficacy in symptom reduction. However, the discussion must extend beyond their therapeutic effects. It is crucial to acknowledge that these medications are not without concerns. Adverse effects, including weight gain and metabolic disturbances, have been reported (Mandell et al., 2008). This necessitates an ongoing dialogue between healthcare providers and caregivers to monitor and manage these side effects effectively.

Stimulant medications, primarily used in Attention-Deficit/Hyperactivity Disorder (ADHD) treatment, have been explored as potential interventions to address hyperactivity and attention problems in individuals with ASD. While studies such as the one on methylphenidate (Handen et al.,

2000) have shown promise in some cases, the discussion must emphasize the need for a highly individualized approach. Responses to stimulants vary widely among individuals with ASD (Posey et al., 2006), necessitating careful assessment and monitoring to determine their appropriateness and effectiveness on a case-by-case basis.

Moreover, other pharmacological agents, including SSRIs, naltrexone, melatonin, and GABA agonists, offer alternative approaches to address specific ASD-related symptoms. The discussion here should revolve around the potential benefits of these agents while acknowledging that their use requires thorough assessment and consideration of individual responses. The study by Amminger et al. (2007) on L-carnosine, for instance, suggests potential improvements in language and behavior, yet more research is warranted to solidify these findings.

Furthermore, the discussion should extend to the broader implications of pharmacological interventions in ASD. Ethical considerations surrounding the use of medications, especially in a population that may have limited decision-making capacity, deserve careful examination (Mandell et al., 2008). Additionally, the long-term effects of these interventions, including their impact on growth, development, and overall well-being, must be a focal point of discussion within the research and clinical communities (Mandell et al., 2008; Malow et al., 2012).

In conclusion, the discussion of pharmacological interventions in ASD is complex and multifaceted. While these interventions hold promise in alleviating challenging behaviors and symptoms, their use must be approached cautiously. The discussion should underscore the importance of individualized treatment plans, vigilant monitoring of side effects, and a collaborative decision-making process involving healthcare



providers, caregivers, and individuals with ASD. Ethical considerations and long-term effects should remain at the forefront of discussions, guiding future research and clinical practice to enhance the well-being and quality of life for those affected by ASD.

## CONCLUSION

In conclusion, the realm of pharmacological interventions in Autism Spectrum Disorder (ASD) represents a multifaceted landscape, offering both promise and complexity in the management of challenging behaviors and symptoms. This comprehensive review has explored the various categories of pharmacological agents, including antipsychotic medications, stimulants, and other pharmacological agents, in their efforts to address specific aspects of ASD.

Antipsychotic medications, as evidenced by studies on risperidone and aripiprazole, have demonstrated their potential to alleviate symptoms such as aggression and irritability. However, their use is accompanied by concerns about side effects and the need for individualized treatment plans. Stimulant medications, while primarily associated with ADHD treatment, have shown promise in addressing hyperactivity and attention problems in individuals with ASD, but their effectiveness varies significantly among individuals, necessitating careful assessment and monitoring.

Moreover, other pharmacological agents, such as SSRIs, naltrexone, melatonin, and GABA agonists, offer alternative approaches to

target various ASD-related symptoms. While some studies have reported potential benefits, it is essential to recognize that responses can be highly individualized, requiring personalized treatment plans and vigilant monitoring.

The broader implications of pharmacological interventions in ASD cannot be overstated. Ethical considerations surrounding medication use, especially in a population that may have limited decision-making capacity, warrant ongoing discussion and ethical guidelines. Additionally, the long-term effects of these interventions on growth, development, and overall well-being should remain at the forefront of research and clinical practice.

In light of these complexities, a collaborative and individualized approach to treatment planning is crucial. Healthcare providers, caregivers, and individuals with ASD must work together to assess the potential benefits, risks, and side effects of pharmacological interventions. This comprehensive assessment should guide treatment decisions, with regular monitoring and adjustments as needed.

In summary, while pharmacological interventions offer valuable tools for managing specific challenging behaviors and symptoms in ASD, their use requires careful consideration, ethical reflection, and ongoing research. By maintaining a holistic view of treatment that combines both behavioral and pharmacological approaches, we can strive to enhance the well-being and quality of life for individuals with ASD while respecting their individuality and unique needs.

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