



# Managing Aggressive Behavior in Adolescents With Autism Spectrum Disorder: Pharmacological and Non-Pharmacological Approaches

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Adolescents diagnosed with autism spectrum disorder (ASD) often encounter significant challenges, particularly aggressive behaviors that persist into adulthood and profoundly affect their daily functioning and quality of life. These behaviors not only pose hurdles for affected individuals but also present considerable challenges for caregivers and families. Managing aggression in adolescents with ASD requires comprehensive treatment approaches encompassing both non-pharmacological and pharmacological interventions. This paper reviews current interventions that have proven to be effective through empirical studies in managing aggression among adolescents with ASD. By synthesizing evidence-based practices, this study underscores the importance of a multidisciplinary approach involving medical, psychological, and educational interventions to effectively manage aggression among adolescents with ASD. It aimed to inform clinicians, educators, and caregivers of practical strategies and evidence-based interventions to address aggression in this population.

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## INTRODUCTION

Autism spectrum disorder (ASD) is a complex neurodevelopmental condition characterized by persistent challenges in communication, social interaction, and restricted or repetitive patterns of behavior or interests [1,2]. Owing to its early onset, chronic nature, and high rates of comorbidity, it presents a significant medical challenge. Individuals with ASD not only contend with core symptoms but also a range of comorbid conditions in addition to the core, including emotional and behavioral issues such as anxiety disorders, compulsivity, mood disorders, sleep disorders, aggression, and oppositional behaviors [3]. They may also exhibit systemic medical disorders, including neurological, endocrine, gastrointestinal, allergic, metabolic, genetic, and feeding disorders including immune dysfunction [3], many of which persist throughout their lives [4].

Among the challenges of ASD in adolescence, behavioral

problems are particularly prominent [5], affecting families, caregivers, medical professionals [6], and educators [7]. Common behavioral issues in adolescents with ASD include self-injurious behaviors (such as head banging or biting), physical or verbal aggression endangering others or property, refusal to comply with instructions, and legal issues stemming from norm violations [8]. These maladaptive behaviors often co-occur with irritability and manifest as expressions of anger, frustration, and distress [1]. They vary widely in severity, frequency, and responsiveness to treatment, ranging from episodic to chronic, and occasionally show treatment-resistant patterns [9,10]. Thus, it is imperative to explore aggression in adolescents with ASD in greater detail and to set the stage for discussing the unique challenges and interventions needed.

## PREVALENCE OF ASD

Approximately 1 in 36 children is diagnosed with ASD according to estimates from the Center for Disease Control and Prevention Autism and Developmental Disabilities Monitor-

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ing Network [11]; however, real-world healthcare data from a national research network indicate an average delay of 2 years from the first screening to diagnosis [12]. In Indonesia, the prevalence of ASD is 0.36% in the total population (267 million in 2017). Of this population, 24.8% (66.17 million) were children aged 14 and under [13]. A meta-analysis by Salari et al. [14], which reviewed 74 studies from five different continents published between 2008 and 2021, estimated the prevalence of ASD to be approximately 60 per 10000 children.

## AGGRESSIVE BEHAVIOR OF ADOLESCENTS WITH ASD

Studies have highlighted the significant rates of aggression among children and adolescents with ASD. Approximately 68% of individuals with ASD have been reported to manifest aggressive behaviors directed towards caregivers, while 49% has demonstrated aggression towards individuals outside their immediate caregiving circle [7,8].

Maladaptive behaviors among adolescents with ASD encompass a spectrum of aggression, self-injury, and severe tantrums [9]. These behaviors often coincide with irritability, and are characterized by bursts of anger, frustration, and distress [1]. They can vary widely in severity, frequency, and resistance to treatment, occurring episodically or persistently, from several times per week to multiple times per day [10]. The intensity of physical aggression in individuals with ASD tends to increase from childhood to adolescence and adulthood. Initially manifesting as behaviors such as pinching, biting, and scratching, adolescents may progress to more serious forms of aggression such as fighting and property damage [15]. Reports have indicated higher rates of aggressive behavior in adolescents compared than in typically developing children of the same age or those with other developmental disabilities [1].

Adolescents with ASD may exhibit varied forms of aggression with differing intensities, frequencies, and duration [1]. Challenges in emotion regulation and coping mechanisms often exacerbate these behaviors and are closely linked to sensory sensitivity, sleep disturbances, and gastrointestinal issues [7]. Aggressive behaviors profoundly disrupt the daily lives of adolescents with ASD, contributing to impaired functioning and reduced quality of life [6]. Specific symptoms of ASD, including difficulty interpreting non-verbal cues, social interaction deficits, and restricted interests and rituals, frequently contribute to frustration, anxiety, and loss of control in adolescents [16]. These factors increase the risk of aggression and outbursts [17].

Environmental factors such as noisy or chaotic surround-

ings, sensory challenges, and difficulties in managing anxiety can trigger anger episodes in adolescents with ASD [16]. Anger manifests as a sudden and intense burst of aggression, sometimes leading to self-harm or violent acts [18]. Anxiety is a pervasive issue among adolescents with ASD that is often overlooked or misdiagnosed, yet significantly influences aggressive behaviors. Symptoms of anxiety can overlap with those of ASD, complicating the diagnosis and treatment of anxiety-induced aggression [18].

## TYPES OF AGGRESSION IN ASD

Aggression in individuals with ASD can be categorized into two types based on sensory processing [19].

### Reactive aggression

This type of aggression involves an impulsive and defensive reaction to provocation, characterized by anger, without consideration of the consequences. It typically arises from poor emotional regulation, diminished self-control, impaired sensory awareness, and heightened impulsivity.

### Proactive aggression/instrumental aggression

This form of aggression is premeditated and purposeful and aimed at achieving a specific goal other than harming the victim. It is often calculated and controlled, influenced by external factors, and not primarily driven by anger. For example, teenagers with ASD may hit a sibling to gain control of the toy.

## RISK FACTORS FOR AGGRESSION IN ASD

Risk factors associated with increased aggression among adolescents with ASD include consistently high levels of aggression in childhood [6], male sex [1,6,7], low intelligence quotient level [1,6,7], harsh and forceful parenting [6,7], low parental education [1,6,7], low parental income [7], poor marital status [1], impaired adaptive functioning [1], young maternal age at delivery [7], language delay [1,7], unusual social interaction and communication patterns leading to atypical social approaches [17], difficulties in initiating or responding to social interactions [17], limited facial expressions and non-verbal communication skills [17], social impairment and lack of interest in establishing peer relationships [17], insensitivity to emotions and intentions expressed by others [17], attributing negative intentions to non-provocative behavior [17], difficulty understanding non-verbal cues [17], and restricted interests and ritualized behaviors contributing to frustration, anxiety, a sense of loss of control, or confusion [17].

## MECHANISMS OF AGGRESSION IN ASD

However, the mechanisms underlying aggression in patients with ASD remain poorly understood [6]. However, research has indicated the involvement of key neurobiological components such as the prefrontal cortex, limbic system (particularly the amygdala), and serotonin pathways, which regulate fear, anxiety, aggression, and violent responses in individuals with ASD [18]. Neurobiological predispositions coupled with environmental stressors render adolescents with ASD particularly susceptible to aggressive outbursts, acts of violence, and destructive behaviors such as intense emotional and physical responses to stress [18].

Several theories have been proposed to explain aggression in ASD:

1) Neurotransmitter disorders: ASD is associated with abnormalities in dopamine levels within the prefrontal cortex and mesocorticolimbic circuits, which influence behavior and emotion regulation. Other implicated neurotransmitters include reduced expression of GABAergic genes, increased expression of glutamate transport proteins, and polymorphisms in serotonin transporter genes. Thus, dopamine, glutamate, and serotonin are potential targets for pharmacological interventions [20].

2) Frustration-aggression hypothesis: This theory posits that aggressive acts arise from the activating effects of frustration caused by factors such as physical discomfort, irritation, and psychological distress. Adolescents with ASD may resort to aggression as a means of communication when faced with challenges in social interactions inherent to their condition [21].

3) Sensory processing difficulties: Adolescents with ASD commonly experience sensory overresponsiveness, with 94% exhibiting atypical sensory responses compared to the general population. Sensory processing difficulties may considerably contribute to aggression, with sensory-seeking behaviors associated with proactive aggression and sensory sensitivity or avoidance behaviors linked to reactive aggression [19].

4) Hormonal factors: Hormonal factors such as oxytocin, cortisol, and testosterone, regulated by the limbic-hypothalamic-pituitary-adrenocortical (LHPA) axis, play crucial roles in influencing social and nonsocial behaviors. Adolescents with ASD often exhibit increased LHPA axis activation and cortisol levels, particularly during social integration in school settings and peer interactions. These conditions contribute to social stress and anxiety and trigger aggressive behavior [22].

## MANAGEMENT OF AGGRESSIVENESS IN ADOLESCENTS WITH ASD

The management of aggressiveness in adolescents with ASD encompasses both non-pharmacological and pharmacological approaches, although current options remain limited [1].

### NON-PHARMACOLOGICAL INTERVENTIONS

Non-pharmacological interventions for aggression in adolescents with ASD are predominantly based on principles of learning theory and operant behavior [1,23]. These approaches begin with Functional Behavior Assessment (FBA), which identifies the triggers and functions of challenging behaviors, aiding the development of targeted interventions [1,24]. FBA involves multiple methods such as observations, interviews, and record reviews to understand the antecedents, behaviors, and consequences that influence behaviors [24].

FBA is not merely a single test or observation but rather a comprehensive strategy that employs multiple methods, including observations, interviews, and record reviews, to analyze the behavior of adolescents. Observation involves carefully noting instances of negative behavior along with environmental conditions and potential triggers that might affect or provoke behavior. Data collection follows the Applied Behavior Analysis (ABA) approach—Antecedent, Behavior, and Consequences: “Antecedent” refers to events preceding the behavior, “Behavior” denotes the negative action itself following the antecedent, and “Consequences” encompass outcomes resulting from the behavior [24,25].

Several types of non-pharmacological interventions include:

1) Applied Behavior Analysis: ABA utilizes positive reinforcement to enhance behavioral, social, communication, and learning skills in adolescents with ASD [26]. In ABA therapy, it is crucial to understand the four primary behavioral functions: escape or avoidance, attention seeking, access to tangible items, and sensory stimulation. ABA has been shown to be effective in reducing aggression and problem behaviors in adolescents with autism. It is a treatment approach centered on positive reinforcement to enhance behavioral, social, communication, and learning skills [26]. ABA aims to reinforce desirable behaviors and discourage undesirable ones [27]. This method operates on the principle that behavioral and social skills can be taught, and unwanted behaviors can be minimized through the consistent application of rewards and consequences [28,29]. However, a significant challenge in implementing ABA therapy is the communica-

tion barrier often faced by adolescents with ASD, who may struggle to express their experiences verbally. Moreover, ABA therapy requires specialized expertise and is time-intensive [26]. Techniques within the ABA include the following:

- Positive reinforcement: Providing desired consequences to increase desired behaviors [30].
- Differential reinforcement: Reinforcing desired behaviors while extinguishing undesired ones [31,32].
- Functional communication training (FCT): The FCT helps adolescents with autism communicate their preferences using symbols, gestures, or devices such as sound generators [33], such as pointing to the indicated desired items.
- Antecedent Based Interventions: Modify the environment to prevent unwanted behaviors [34].
- Discrete trial training: Breaking lessons into manageable steps to facilitate learning [27].
- Pivotal response training: Focusing on pivotal behaviors to promote broader improvements [35].
- Extinction therapy: Withholds reinforcement to reduce behaviors, although effectiveness varies, especially in highly aggressive behaviors [36].
- Token economy: Uses tokens as immediate rewards for desired behaviors, which can later be exchanged for preferred items or activities [30].
- Time out from reinforcement: Temporarily removes access to reinforcement following undesirable behaviors, enhancing effectiveness when combined with teaching replacement behaviors [36].

2) Developmental, Individual-Differences, Relationship-Based (DIR) Model, or Floortime: A therapeutic approach designed for ASD that emphasizes a holistic, individualized strategy. By focusing on developmental milestones, the DIR model tailors interventions to each individual's unique sensory, communicative, and emotional needs. Therapy involves engaging in playful interactions to build strong positive relationships and foster emotional and social development [37].

3) Cognitive Behavior Therapy (CBT): CBT targets comorbid anxiety disorders by teaching cognitive restructuring and coping strategies, especially in higher-functioning adolescents with ASD [38].

4) Nutritional therapy in autism: Dietary interventions are utilized by parents and guardians of children with ASD to manage aggressive behaviors; however, their effectiveness lacks strong research support. This therapy faces challenges, as individuals with autism often exhibit food selectivity and sensitivity to dietary changes. Concerns have also arisen regarding the nutritional adequacy of restricted diets among parents and healthcare providers [21].

5) Music therapy: Music therapy harnesses the calming and therapeutic effects of music to reduce aggressive and ste-

reotypical behaviors while improving the overall mental health of adolescents with ASD [39].

6) Skill teaching: Teaching additional skills such as mindfulness, emotion regulation, distress tolerance, and social skills can significantly reduce aggressive behaviors and enhance adaptive functioning [23].

These non-pharmacological approaches aim to improve behavioral outcomes by addressing underlying triggers and enhancing adaptive skills without relying on medication. The lack of reported side effects contributes to higher acceptance among patients.

## PHARMACOLOGICAL INTERVENTIONS

Pharmacological treatments for aggression in adolescents with ASD primarily involve medications that target behavioral symptoms. Although options are limited and often off-label, several drugs have been shown to be effective in managing aggressive behaviors in this population.

1) Antipsychotics: Antipsychotics, particularly risperidone and aripiprazole, are commonly prescribed for the treatment of aggression in adolescents [40].

- Risperidone: Approved by the U.S. Food and Drug Administration (FDA) for use in children and adolescents aged 5–17 years, risperidone acts on D2 receptors and is effective in reducing aggressive behaviors. Common side effects include weight gain, increased lipids, sedation, and extrapyramidal symptoms [1,41,42].

- Aripiprazole: FDA-approved for children and adolescents aged 6–17 years, aripiprazole has been reported to be as effective as risperidone in managing aggression and improving sleep patterns. Side effects include weight gain, extrapyramidal symptoms, and sedation [40,41].

2) Other antipsychotics: Several second-generation antipsychotics such as quetiapine, olanzapine, ziprasidone, and others are used off-label for aggression in ASD adolescents, although evidence supporting their efficacy is limited [20,40]. These medications often lead to metabolic side effects such as weight gain and require careful monitoring.

3) Lithium: Lithium is sometimes used when a suspected mood component contributes to aggression. It has been reported to decrease aggression when combined with other medications, although monitoring for potential side effects such as lithium toxicity is required [43].

4) Valproate: Valproate should be considered if antipsychotics are ineffective or intolerable. It has shown efficacy in reducing aggression; however, side effects, including sedation, weight gain, and liver enzyme elevation, require careful management [43].

5) Lamotrigine: Lamotrigine has been studied in adoles-

cents with ASD and epilepsy and has shown benefits in reducing disruptive behaviors. The most notable adverse effects are insomnia and hyperactivity. However, its use is limited and further research [43].

6) Clonidine: Transdermal clonidine has been utilized to reduce impulsivity and hyperarousal in adolescents with ASD. Side effects such as sedation and hypotension are common and require monitoring [43].

7) Selective serotonin reuptake inhibitors (SSRIs): SSRIs such as fluoxetine have been explored for the treatment of aggression in ASD; however, evidence supporting their effectiveness is inconclusive. They may exacerbate behavioral activation, which is characterized by impulsivity and restlessness [40].

These pharmacological interventions aim to mitigate aggressive behaviors in adolescents with ASD, often in combination with non-pharmacological therapies, to achieve comprehensive treatment outcomes.

## NAVIGATING BEHAVIORAL CHALLENGES: INSIGHTS AND PERSPECTIVES ON SUPPORTING ADOLESCENTS WITH ASD

Parents and caregivers often endeavor to address problematic behaviors in adolescents with ASD by soothing them through distraction or by yielding to their requests. Although these actions may momentarily halt problematic behavior, they inadvertently reinforce it via operant learning. This dynamic occurs when behavior is rewarded by the temporary cessation of problematic behavior, ultimately fostering a maladaptive pattern of interaction between caregivers and affected individuals [36].

Handling problematic behaviors in adolescents with ASD requires a multifaceted approach that integrates understanding, patience, and tailored strategies. From our viewpoint and experience, supporting adolescents with ASD through behavioral challenges involves several key principles.

1) Understanding triggers and functions: One of the first steps is to understand what triggers problematic behaviors and what functions these behaviors serve in adolescents. FBA can help determine the antecedents (triggers), behaviors, and consequences associated with such behaviors. This understanding allows caregivers to develop targeted interventions that address the underlying causes of these behaviors [24].

2) Individualized support plans: Each adolescent with ASD has unique behaviors and needs. Therefore, it is crucial to develop individualized support plans that consider specific strengths, challenges, and communication abilities. Collaborating with professionals, such as behavioral therapists, speech therapists, and educators, can provide insights and

strategies tailored to adolescents' developmental levels and sensory sensitivities.

3) Communication strategies: Effective communication is fundamental. Adolescents with ASD may struggle with verbal communication or the understanding of social cues. The use of clear and concrete language and visual support can enhance comprehension and reduce frustration. Encouraging communication through a comfortable manner is important, whether through speech, gestures, or augmentative communication devices [16,17].

4) Structured environment: Providing a structured environment with predictable routines can help adolescents with ASD feel secure and reduce anxiety. Consistency in daily activities, transitions, and expectations can prevent a meltdown and provide stability. Visual schedules and timers can aid in understanding and preparing for upcoming events or changes [16,17].

5) Sensory considerations: Sensory sensitivities are common in individuals with ASD and can contribute to behavioral challenges. Understanding adolescents' sensory preferences and aversions can guide environmental modifications. Providing sensory breaks or access to sensory tools, such as fidget toys or weighted blankets, can help regulate sensory input and promote emotional regulation [19].

6) Positive behavior support: Emphasizing the positive reinforcement of desired behaviors is more effective than focusing solely on correcting negative behaviors. Praising and rewarding appropriate behaviors immediately reinforce them and encourage their repetition. It is essential to use meaningful rewards to motivate adolescents, whether verbal praise, preferred activities, or tangible rewards [16].

7) Collaboration and education: Educating oneself and collaborating with professionals, educators, and other caregivers is crucial. Learning about ASD, its characteristics, and evidence-based interventions empowers caregivers to make informed decisions and effectively advocate for adolescents' needs. Building supportive networks and seeking guidance from experienced professionals can provide valuable insights and resources.

8) Self-care for caregivers: Caring for an adolescent with ASD can be emotionally, physically, and mentally demanding. Practicing self-care is essential for caregivers to maintain their well-being and ability to provide effective support. Taking breaks, seeking support from others, and accessing respite care when needed can hamper burnout and enhance resilience in managing challenging behaviors [16].

## CONCLUSION

In conclusion, addressing problematic behaviors in adoles-



cents with ASD requires a holistic approach that considers their unique characteristics, strengths, and challenges. Caregivers can help adolescents with ASD thrive and navigate their daily lives with greater confidence and resilience by fostering understanding, implementing individualized strategies, promoting effective communication, and maintaining a supportive environment. Every step taken towards understanding and supporting these adolescents contributes to their overall well-being and quality of life.

## LIMITATIONS

This review, based solely on the existing literature, has limitations. Many studies had small sample sizes and short follow-up periods, which can affect the generalizability and long-term applicability of the findings. Further research on the effectiveness of treatments across diverse populations and settings is needed. Furthermore, while pharmacological treatments can help manage symptoms, they do not address the underlying causes of aggression or other challenging behaviors.

## CURRENT GAPS

In the current treatment landscape, one significant gap is the lack of comprehensive long-term studies assessing the effectiveness of interventions for aggression in adolescents with ASD. There is also a need for more research on personalized treatment approaches that combine pharmacological and behavioral strategies. Moreover, addressing co-occurring conditions such as anxiety and depression, which can exacerbate aggressive behaviors, is crucial but often overlooked. Addressing these gaps requires ongoing research and a commitment to refine treatment strategies based on individual needs and emerging evidence. Every effort made towards understanding and supporting adolescents with ASD not only enhances their immediate well-being, but also contributes to their long-term quality of life and overall development.

### Availability of Data and Material

This review article does not contain any original data as it primarily synthesizes and analyzes existing literature and previously published research findings. Therefore, no datasets or original materials are available.

### Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

### Author Contributions

Conceptualization: all authors. Data curation: Christopher Ade Putra Purba, Nining Febriyana. Resources: all authors. Supervision: Nining Febriyana, Yunias Setiawati. Writing—original draft: Christopher

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