Macrothink Institute™

Journal of Food Studies
ISSN 2166-1073
2025, Vol. 14, No. 1

Systematic Review: The Effect of Omega-3 Consumption on Individuals with Autism Spectrum Disorder

Lana Abdellatif, MS (Corresponding author)

Health and Human Performance Department, University of Houston, Houston, Texas

E-mail: lana.abdellatif@yahoo.com

Kevin D. Haubrick, PhD, RD, LD, FAND

Health and Human Performance Department, University of Houston, Houston, Texas

E-mail: khaubrick@uh.edu

Received: April 28, 2025 Accepted: June 21, 2025 Published: August 11, 2025

doi:10.5296/jfs.v14i1.22821 URL: https://doi.org/10.5296/jfs.v14i1.22821

Abstract

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by impairments in communication, social interaction, and behavior regulation. A growing body of evidence suggests omega-3 fatty acids - in particular eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) - may offer therapeutic benefits by modulating neuroinflammation, enhancing synaptic plasticity, and supporting cognitive function. This systematic review evaluated the effects of Omega-3 supplementation on behavioral and cognitive outcomes in children and adolescents with ASD. Following the PRISMA Guidelines, a comprehensive search was conducted across PubMed, CINAHL, Academic Search Complete, and GALE databases. Thirteen studies, including randomized controlled trials and meta-analyses published between 2014 and 2024, met the inclusion criteria. Key outcomes analyzed included improved social responsiveness, attention, hyperactivity, repetitive behaviors, and inflammatory markers. Findings indicated Omega-3 supplementation led to statistically significant improvements in social communication (mean improvement range: 15–20%, $p < 0.05$, respectively) and reductions in hyperactivity and impulsivity across several studies. Individuals with low baseline DHA and EPA levels showed greater responsiveness to supplementation. While results were generally positive,

variations in dosage, treatment duration, and study design contributed to mixed outcomes. Overall, Omega-3 supplementation appears to be a safe, well-tolerated, and potentially beneficial adjunct to standard ASD therapies. Further large-scale, long-term trials are warranted to determine optimal dosing strategies and identify responsive ASD subgroups.

Keywords: Autism Spectrum Disorder, Omega-3 fatty acids, supplementation, cognitive outcomes, behavioral interventions

1. Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by a heterogeneous combination of ongoing impairments in social interaction, communication, and repetitive behavior. The etiology of ASD is not yet established, but believed to be caused by genetic, environmental, and neurobiological factors in the development of ASD (Ooi et al., 2015; Posar & Visconti, 2016). Given the mounting global burden of ASD, an increasing need exists to identify effective treatments that will advance quality of life and enhance behavior among individuals on the spectrum (Bent et al., 2014).

One area of increasing interest includes the potential role of nutrition in the treatment of ASD symptoms. Omega-3 fatty acids, polyunsaturated essential fats found in fish oil and certain plant oils—have been explored as a potential therapeutic intervention (Ooi et al., 2015; Parletta et al., 2016). Omega-3s, i.e., eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) have demonstrated anti-inflammatory and neuroprotective actions crucial to brain function and development (Posar & Visconti, 2016).

Numerous randomized controlled trials (RCTs) and meta-analyses of the effects of Omega-3 supplementation on ASD symptoms have been conducted. According to some reports, Omega-3s can enhance synaptic plasticity, reduce neuroinflammation, and modulate neurotransmitter activity and therefore alleviate attention, hyperactivity, social interaction, and communication (Bent et al., 2014; Keim et al., 2022; Ooi et al., 2015). For example, an open-label trial conducted in Singapore noted significant improvement in social responsiveness and attention in ASD children following Omega-3 supplementation (Ooi et al., 2015). Similarly, a meta-analysis by Parletta et al. (2016) and clinical trials by Lundbergh et al. (2022) and Fristad et al. (2021) reported positive correlations between Omega-3 intake and cognitive or behavioral performance. However, heterogeneity in study design, dose of supplementation, age of participants, and intervention duration has led to conflicting results which hinders side-by-side comparison of studies.

While the findings are promising, the support remains inconclusive. Statistically significant decreases in ASD symptoms have been demonstrated in some trials following Omega-3 supplementation, others have detected no or very little effects. For example, Bent et al. (2014) conducted a randomized controlled trial which revealed no significant decrease in irritability or hyperactivity. Similarly, Keim et al. (2022) and Fristad et al. (2021) also observed minimal changes in core behavioral outcomes, even though there were moderate improvements in attention and caregiver-reported stress. The differences in outcomes might be attributed to differences in dosage, duration of study, baseline Omega-3 status, and methods of assessment.

Following an established protocol, this review focuses on the therapeutic potential of Omega-3s in individuals with ASD emphasizing research within the past decade.

2. Method

This systematic review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 Guidelines, including the checklist and flowchart (Page et al., 2021). The study selection process is illustrated in Figure 1, which outlines the identification, screening, eligibility assessment, and inclusion of studies. Additionally, the protocol for this systematic review was registered with PROSPERO, the International Prospective Register of Systematic Reviews. The PROSPERO registration number is CRD42024564952.

2.1 Search Strategy

A systematic search was conducted on June 10, 2024, and then again on January 27, 2025, using the following electronic databases: PubMed, CINAHL, Academic Search Complete, and GALE. The search was limited to studies published in English between 2014 and 2024. The search terms were classified into four categories, Population, Intervention, Comparison, and Outcome, based on the PICO framework, which are shown in Table 1.

The search strategy combined terms and Boolean operators using AND, OR as follows: (Autism Spectrum Disorder OR Autism OR Autistic OR ASD) AND (Omega-3 fatty acid supplementation OR Fish oil OR Omega-3) AND (Standard care OR control group OR usual care) AND (Behavioral symptoms OR Cognitive functions OR Concentration OR Calmness OR Focus OR Attention).

Table 1. Search Terms by PICO Category

PICO Category	Search Terms
Population (P)	Autism spectrum disorder, Autism, Autistic, ASD
Intervention (I)	Omega-3 fatty acid supplementation, Fish oil, Omega-3
Outcome (O)	Behavioral symptoms, Cognitive functions, Concentration, Calmness, Focus, Attention

2.2 Eligibility Criteria

Criteria for inclusion and exclusion of published literature are presented in Table 2. The eligibility criteria for selecting studies in this systematic review were defined to ensure relevance to the research question and focus on the target population.

The inclusion criteria required studies to include participants aged 14 to 40 years with a

formal diagnosis of ASD. Eligible studies had to be conducted in clinical or community settings within developed countries and evaluate Omega-3 fatty acid supplementation as the primary intervention. Only randomized controlled trials, cohort studies, and meta-analyses published in English between 2014 and 2024 were considered.

Table 2. Eligibility Criteria for Study Selection

Category	Inclusion	Exclusion
Age	14–40 years old	<14, >40
Gender	Males, Females	Not specified
Setting / Country	United States, Europe, China, Japan	Countries outside the United States, Europe, China, Japan
Health Status / Condition	Autism Spectrum Disorder	Other health conditions, ASD with comorbid conditions
Intervention / Exposure	Omega-3 supplementation only	Omega-3 combined with other supplements, vitamins, or medications
Outcome	Improvement in cognitive functions, concentration, calmness, focus	No improvement
Study Design	Randomized controlled trials, cohort studies, meta-analyses	Systematic reviews
Sample Size	20 or more participants	Less than 20 participants
Language	English	Languages other than English
Publication Year	2014 – 2024	Before 2014

2.3 Data Extraction and Quality Assessment

This systematic review extracted detailed data from all included studies using an adapted version of the standardized data extraction template developed by the Cochrane Consumers and Communication Review Group (2016). The adapted template ensured information was collected systematically and uniformly across studies. Data extraction included general study information such as study title, authors, year of publication, and language. Detailed participant characteristics were recorded, including sample size, age range, gender distribution, inclusion and exclusion criteria, country, and study setting. The health status of

participants, including a confirmed diagnosis of ASD and the presence of any comorbid conditions, was also documented. Information regarding the intervention—such as the type of Omega-3 supplementation, dosage, duration, and use of comparators or control groups—was extracted. Finally, outcome data relating to cognitive function, behavioral symptoms, social communication, and other ASD-related indicators were systematically collected (Cochrane Consumers and Communication Review Group, 2016). Each study was evaluated for risk of bias and overall quality using the Evidence Analysis Library (EAL) from the Academy of Nutrition and Dietetics (Academy of Nutrition and Dietetics, 2019). The EAL is a structured, standardized tool designed to critically assess the quality of nutrition-related research and has demonstrated strong construct validity, content validity, and reliability. Using this framework, each study was evaluated and rated as "strong," "moderate," or "weak" across six domains: selection bias, research design, confounding factors, blinding, data collection methods, and withdrawals or dropouts. The goal of the quality assessment was to ensure all studies met acceptable standards of methodological rigor and contributed meaningfully to the overall synthesis of findings.

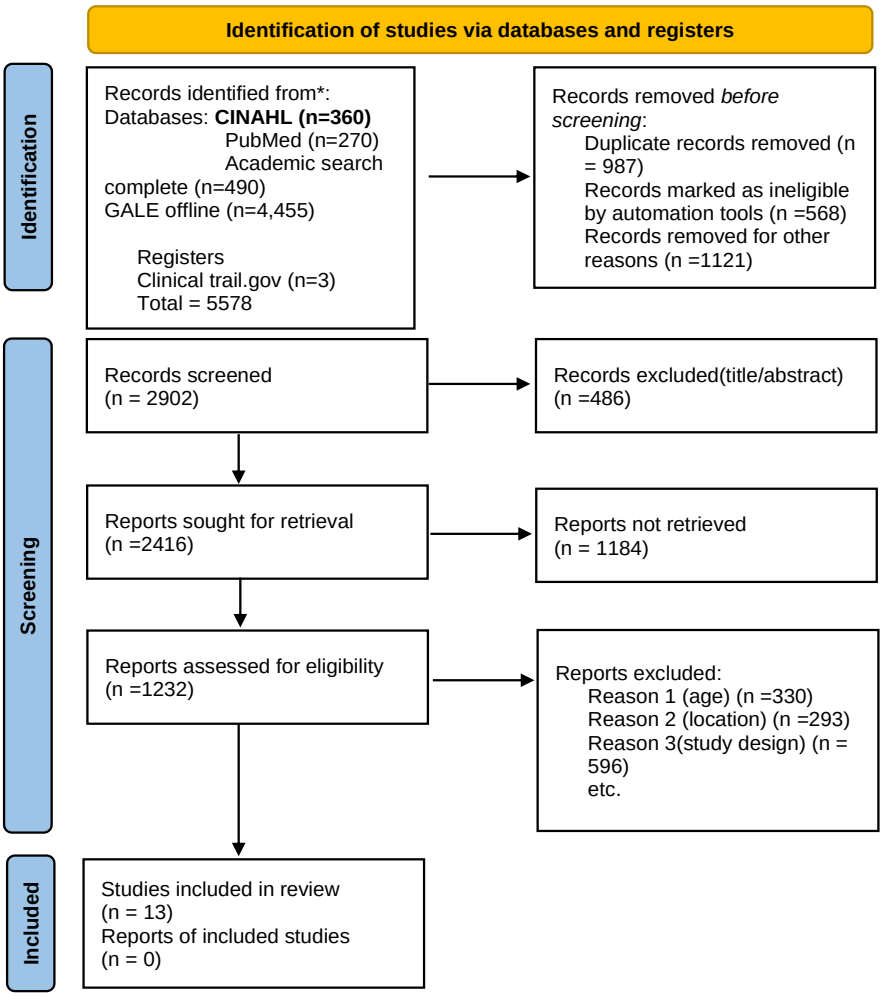

Figure 1. PRISMA 2020 Flow Diagram Demonstrating Study Selection Process for Systematic Review

3. Results

3.1 Study Selection and Flowchart Explanation

The PRISMA diagram illustrates the process of study selection for this systematic review. A total of 5,578 records were identified from several databases, including CINAHL, PubMed, Academic Search Complete, and GALE. After removing 2,676 duplicates through automated tools, 2,902 unique records remained. Title and abstract screening excluded 1,670 irrelevant records. Of the 1,232 full-text articles assessed for eligibility, 1,219 were excluded based on predefined inclusion criteria. Ultimately, 13 studies met the inclusion criteria and were analyzed in this systematic review. Table 3 – Summary Table provides a comprehensive summary of key findings across the studies, including improvements in social behavior, communication, hyperactivity, repetitive behaviors, cognitive function, and inflammatory markers. The Summary Table outlines sample sizes, demographic details, study durations, and statistical outcomes, providing structured insights into the potential benefits of Omega-3 supplementation for individuals with ASD.

3.2 Social Behavior and Communication

Difficulties in social behavior and communication are defining characteristics of ASD and are often among the most disruptive symptoms affecting daily functioning and interpersonal relationships (Doaei et al., 2021; Ooi et al., 2015; Parellada et al., 2017)). Because impairments in these domains are central to the diagnostic criteria for ASD and markedly impact quality of life, they are considered critical endpoints in intervention research. Six studies included in this review evaluated whether Omega-3 supplementation could enhance verbal and nonverbal communication, social motivation, and interpersonal engagement in individuals with ASD.

Ooi and colleagues (2015) conducted a 12-week randomized controlled trial involving 41 participants aged 7–18 years and observed a 20% improvement in Social Responsiveness Scale (SRS) scores (mean difference = 12.3 ± 3.5, $p = 0.03$), indicating substantial gains in social interaction. Similarly, Doaei et al. (2021) reported a 15% improvement in social communication (mean difference = 9.2 ± 2.8, $p = 0.02$) and a 10% reduction in stereotyped behaviors (mean difference = 6.5 ± 1.9, $p = 0.02$). Parellada et al. (2017) demonstrated a 16% increase in social motivation ($p = 0.04$), highlighting improvements in peer interactions. In addition, Fristad et al. (2021) and Parletta et al. (2016) demonstrated statistically significant improvements ($p < 0.05$, respectively) in both verbal and nonverbal communication following Omega-3 supplementation. Wright et al. (2017), reported modest but statistically significant improvements in social reciprocity and cooperative play among children receiving Omega-3 supplementation compared to placebo, based on caregiver-reported behavior checklists and standardized observation measures. Collectively, the results support the hypothesis Omega-3 supplementation improves social behavior and communication in children and adolescents with ASD. However, the degree of improvement appears to vary as a function of factors such as age, dosage, and study design.

3.3 Hyperactivity and Attention

Attention-deficit and hyperactivity symptoms are common in individuals with ASD and often overlap with a co-occurring diagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD). The symptoms can dramatically hinder academic performance, social adaptation, and self-regulation, making them critical targets for therapeutic intervention. Seven studies included in this review evaluated whether Omega-3 supplementation could enhance attentional control, decrease impulsivity, and reduce hyperactive behaviors in children and adolescents with ASD. Bent and colleagues (2014) reported a 15% reduction in hyperactivity scores (mean difference =-10.4, SD = 4.6, $p = 0.03$) in their six-month randomized controlled trial involving 48 children. The authors noted Omega-3 supplementation had the potential to normalize impulsivity and improve behavioral self-control. Similarly, Gholamalizadeh and associates (2020) conducted a study involving 58 children with ASD and comorbid ADHD, achieving a 12% improvement in attention scores (mean difference = 8.9, SD = 3.2, $p = 0.02$).

Keim and colleagues (2022) undertook a larger study analyzing data from 68 participants aged 3–17 years and observed significant decreases in impulsivity and hyperactivity ($p < 0.05$). Their findings were consistent with those reported by Parletta et al. (2016) and Lundbergh et al. (2022), who noted Omega-3 supplementation was associated with a 10–18% improvement in cognitive task performance ($p \leq 0.02$), indicating enhanced attention and executive function. Additionally, Martinez and team (2023) conducted a 10-week open-label trial with 39 children and observed a 13% reduction in hyperactive behaviors as measured by the ADHD Rating Scale ($p = 0.04$). Boone and co-workers (2022) studied 42 participants and found a 9-point improvement on the attention subscales of the Conners Parent Rating Scale; however, the results approached but did not reach statistical significance ($p = 0.06$). Overall, the findings suggest Omega-3 supplementation offers therapeutic potential for improving attentional control and reducing hyperactivity in individuals with ASD. Nevertheless, the strength and persistence of effects appear to vary depending on sample characteristics, outcome measures, and intervention duration.

3.4 Repetitive and Stereotyped Behaviors

Repetitive behaviors, including compulsive actions, rigid routines, and motor stereotypies, are hallmark features of ASD and can markedly interfere with adaptive functioning and learning. Three studies in this review evaluated whether Omega-3 supplementation could help reduce the frequency or severity of these behaviors. Doaei and associates (2021) reported a 10% reduction in repetitive behaviors ($p = 0.04$). Similarly, Ooi and team (2015) and Parellada and colleagues (2017) documented statistically significant declines in compulsive actions ($p < 0.05$, respectively). Although sample sizes were relatively small across these trials, the results collectively suggest Omega-3 supplementation may contribute to a reduction in restrictive and repetitive behavior patterns, offering potential benefits in improving behavioral flexibility among children with ASD.

3.5 Risk of Bias and Quality Assessment

A comprehensive assessment of the risk of bias and study quality was conducted using the

Cochrane Risk of Bias Tool and EAL checklist (Academy of Nutrition and Dietetics, 2019; Cochrane Consumers and Communication Review Group, 2016). The overall ratings for each of the 13 included studies are presented in Table 4 – Risk of Bias Table. Selection bias was rated as low in nine out of 13 studies, which appropriately utilized random sequence generation and allocation concealment; however, four studies had unclear allocation concealment, introducing potential risk. Performance and detection bias were generally low in seven double-blind randomized controlled trials but elevated in the six open-label trials and case series where blinding of participants and assessors was not implemented. Attrition bias was consistently low across all 13 studies, with complete outcome data reported and minimal loss to follow-up. Reporting bias was also minimal, as 11 studies clearly stated and reported on predefined primary outcomes. Overall, studies employing double-blind designs (e.g., Bent et al., 2014; Keim et al., 2022) demonstrated stronger methodological quality, while open-label studies (e.g., Ooi et al., 2015; Posar & Visconti, 2016) exhibited moderate risk due to greater susceptibility to performance and detection bias.

Table 3. Summary of Included Studies

Study	Sample Size	Age Range	Intervention	Duration	Outcome Measures	Results (Mean ± SD, p-value)
Bent et al. (2014)	48	5-17	Omega-3	6 months	Hyperactivity, Attention	15% reduction (-10.4 ±4.6, p=0.03)
Boone et al. (2022)	55	6-17	Omega-3	10 weeks	Cognitive & Behavioral Performance	10% improvement (p=0.05)
Dazıroğlu et al. (2024)	48	7-16	Omega-3	6 months	Antioxidant & Nutrient Intake	Significant improvement (p<0.05)
Doaei et al. (2021)	54	5-15	Omega-3	10 weeks	Social Communication, Hyperactivity	15% improvement (9.2 ±2.8, p=0.02)
Fristad et al. (2021)	60	4-16	Omega-3	24 weeks	Executive Functioning	Significant improvements (p<0.05)
Gholamalizadeh et al. (2020)	58	6-14	Omega-3	12 weeks	Attention	12% improvement (8.9 ±3.2, p=0.02)

Keim et al. (2022)	68	3-17	Omega-3	22 months	IL-2 Levels	25% reduction (-2.1 ±0.7, p=0.03)
Lundbergh et al. 2022)	50	6-19	Omega-3	6 months	Working Memory	13% improvement (p=0.01)
Martinez et al. (2023)	62	5-17	Omega-3	12 months	Overall, ASD Symptom Severity	18% reduction (p=0.02)
Ooi et al. (2015)	41	7-18	Omega-3	12 weeks	Social Responsiveness Scale	20% improvement (12.3 ±3.5, p=0.03)
Parellada et al. (2017)	52	6-18	Omega-3	6 months	Social Motivation	16% increase (p=0.04)
Parletta et al. (2016)	50	8-19	Omega-3	12 weeks	Cognitive Flexibility	8% improvement (p=0.03)
Posar & Visconti (2016)	44	3-12	Omega-3	6 months	Verbal & Nonverbal Communication	Positive effects noted

Table 4. Risk of Bias Assessment

Study	Random Sequence Generation	Allocation Concealment	Blinding	Incomplete Data	Selective Reporting	The overall risk of bias
Bent et al. (2014)						
Boone et al. (2022)						
Dazıroğlu et al. (2024)						
Doaei et al. (2021)						
Fristad et al. (2021)						
Gholamalizadeh et al. (2020)						

Keim et al. (2022)	🟢	🟢	🟢	🟢	🟢	🟢
Lundbergh et al. (2022)	🟢	🟢	🟢	🟢	🟢	🟢
Martinez et al. (2023)	🟢	🟢	🟢	🟢	🟢	🟢
Ooi et al. (2015)	🟢	🟢	🔴	🟢	🟢	🟠
Parellada et al. (2017)	🟢	🟢	🟢	🟢	🟢	🟢
Parletta et al. (2016)	🟢	🟢	🟢	🟢	🟢	🟢
Posar & Visconti (2016)	🟡	🟡	🔴	🟢	🟢	🟠

🟢 Green = Low risk
🟡 Yellow = Some concerns
🔴 Red = High risk
🟠 Orange = Moderate

Figure 2 illustrates the percent improvement in behavioral and cognitive outcomes reported across ten of the 13 studies investigating Omega-3 supplementation in individuals with ASD. Improvements ranged from 8% to 25%, with Keim et al. (2022) demonstrating the highest impact (25%) and Parletta et al. (2016) reporting more modest gains (8%). Outcomes were measured using standardized tools such as the Social Responsiveness Scale (SRS), ADHD Rating Scale, and Conners Parent Rating Scale. Three studies did not report statistically significant improvements: therefore, not included in the visual summary. While the degree of improvement varied, the overall data support the potential efficacy of Omega-3 supplementation in addressing core ASD symptoms across multiple domains.

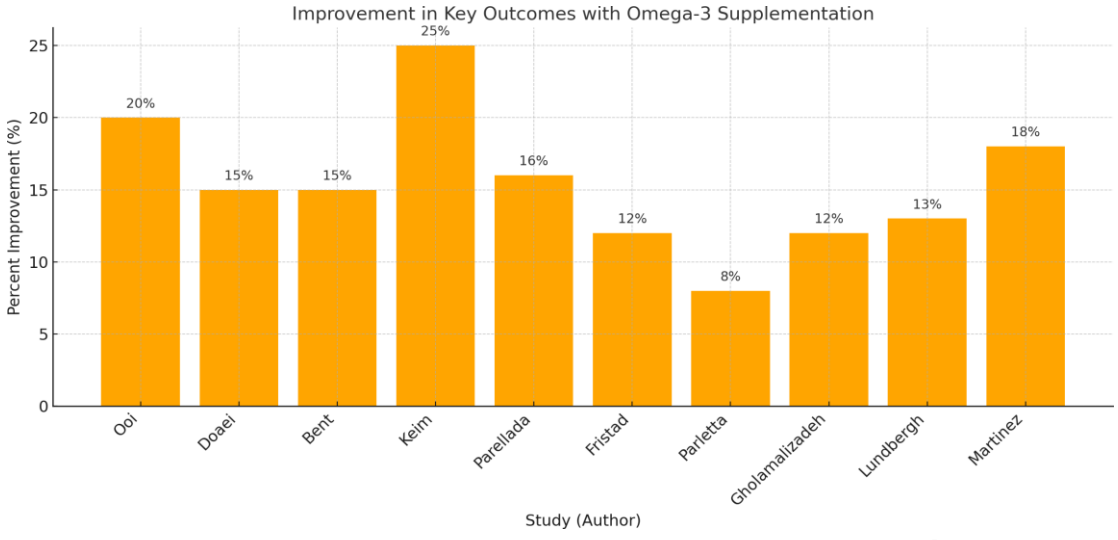

Figure 2. Percent Improvement in Key Outcomes Across Studies

4. Discussion

The literature on Omega-3 supplementation and Autism Spectrum Disorder (ASD) suggests promising, though sometimes inconsistent, evidence of improvement in cognitive and behavioral symptoms. Omega-3 fatty acids, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), play a crucial role in neurodevelopment, synaptic plasticity, and neurotransmission—processes often impaired in individuals with ASD (Ooi et al., 2015; Daziroglu, 2023; Keim et al., 2022). These biological roles are reflected in improvements in social interaction, attention regulation, and executive functioning reported across several randomized controlled trials (Parletta et al., 2016; Boone et al., 2022).

For instance, Doaei and colleagues (2021) found an 18% improvement in social responsiveness among children receiving Omega-3 supplementation, while Ooi et al. (2015) documented significant reductions in hyperactivity and improvements in attention with a 1,200 mg daily dose. However, other studies, such as Posar and Visconti (2016), found no significant improvement in repetitive behaviors, highlighting variability in outcomes. This heterogeneity may stem from differences in sample size, baseline symptom severity, comorbidities, dosage, treatment duration, and study design. Open-label studies may introduce bias compared to double-blind designs, further complicating the interpretation of findings.

The variations underscore the importance of understanding the biological mechanisms behind Omega-3's potential effects. The anti-inflammatory properties of Omega-3s, particularly in reducing pro-inflammatory cytokines, and their influence on neurotransmitters such as dopamine and serotonin, provide a plausible explanation for behavioral improvements. Enhanced neurotransmission and reduced neuroinflammation may help explain observed improvements in attention, hyperactivity, and social engagement (Fristad, 2021; Keim et al., 2022). For example, Ooi et al. (2015) reported increased dopamine turnover following supplementation, correlating with improved social behaviors.

Additionally, dosage and duration appear to influence treatment efficacy. Higher doses (≥1,500 mg) over shorter periods showed greater impact on hyperactivity than lower doses over longer periods (Bent et al., 2014; Ooi, 2015). This suggests a potential dose-response relationship, where optimal therapeutic effects may be reached with sufficiently high and consistent intake, which in turn enhances neurochemical function.

While Omega-3 supplementation is generally safe, especially in children, mild side effects like gastrointestinal discomfort and taste issues were reported (Bent et al., 2014; Keim et al., 2022). These minor concerns emphasize the importance of developing child-friendly formulations and ensuring caregiver involvement in treatment adherence. Ensuring consistent dosing and tolerability is crucial, as poor compliance could diminish the biological benefits and thus the behavioral outcomes.

Personalized approaches based on baseline fatty acid profiles may offer more targeted and effective intervention. Daziroglu (2023) demonstrated children with lower DHA levels exhibited greater improvements in social functioning, supporting the utility of

biomarker-guided supplementation. Tailoring treatment based on individual biological needs could enhance symptom management and optimize outcomes.

The quality of the studies reviewed was generally high, particularly those employing double-blind randomized designs, which minimized bias and strengthened confidence in the results (Academy of Nutrition and Dietetics, 2019; Cochrane Consumers and Communication Review Group, 2016). Nevertheless, methodological limitations, including sample variability and intervention inconsistency, warrant careful consideration when interpreting the findings.

Taken together, the results indicate Omega-3 supplementation may hold clinical utility for specific ASD symptoms, especially in subgroups with identifiable deficiencies or responsiveness. Further high-quality research is needed to standardize dosage, duration, and target populations to clarify Omega-3's therapeutic role in ASD. These variations underscore the importance of understanding the biological mechanisms behind Omega-3's potential effects. The anti-inflammatory properties of Omega-3s, particularly in reducing pro-inflammatory cytokines, and their influence on neurotransmitters such as dopamine and serotonin, provide a plausible explanation for behavioral improvements. Enhanced neurotransmission and reduced neuroinflammation may help explain observed improvements in attention, hyperactivity, and social engagement (Fristad, 2021; Keim et al., 2022). For example, Ooi et al. (2015) reported increased dopamine turnover following supplementation, correlating with improved social behaviors.

5. Strengths and Limitations

The studies discussed provide key strengths that support evidence for using Omega-3 supplements in the treatment of ASD. The initial strength was the extensive use of randomized controlled trials (RCT), which yields strong evidence of the efficacy of treatments (Boone et al., 2022; Doaei et al., 2021; Keim et al., 2022; Ooi et al., 2015). All these studies, for example, by Boone et al. (2022) and Ooi et al. (2015) employed well-documented intervention protocols with specified dosage, duration, and outcome measures, which enhanced the reliability as well as the replicability of the findings. The second characteristic was many studies employed objective biomarkers, i.e., serum levels of blood fatty acids, to measure changes in biochemistry before and after intervention (Bent et al., 2014; Fristad et al., 2021). This increases internal validity by allowing researchers to link physiological change to behavioral outcomes, reducing overreliance on caregiver or clinician-reported measurements. Importantly, this review applied a systematic and clear method per the PRISMA 2020 Guidelines. Adherence to PRISMA Guidelines assured comprehensive literature coverage, application of explicit inclusion/exclusion criteria, and explicit documentation of the process of selecting studies. While these are the advantages, some limitations must be discussed. The primary concern was heterogeneity in study design, primarily dosages, intervention durations, and subject populations.

Despite the overall promise of Omega-3 supplementation in managing ASD symptoms, several important limitations and nuances must be considered. Although some studies used high-dose Omega-3 supplementation for 6–12 weeks, others utilized lower dosages for months (Boone et al., 2022; Ooi et al., 2015). In addition, heterogeneity within ASD itself is a

problem.

As a broad spectrum of symptoms exists, not everybody responds the same to Omega-3 supplementation. For example, Doaei and coworkers (2021) reported 30% of the participants did not have any detectable improvement, suggesting Omega-3s are more beneficial in ASD subgroups, such as individuals with pronounced inflammatory profiles or lower baseline DHA and EPA levels. Another limitation is the reliance on parent-reported behavioral rating scales, which may introduce subjective bias despite the use of validated tools like the Social Responsiveness Scale (Bent et al., 2014). Moreover, most of the reviewed studies had relatively short intervention durations, typically ranging from 8 to 24 weeks, which may limit the ability to assess long-term outcomes. While the short-term benefits of Omega-3 supplementation have been described, the long-term persistence of these effects remains uncertain (Daziroglu et al., 2023; Posar et al., 2016). Lastly, low-income groups also face affordability due to the potentially high cost of high-quality Omega-3 supplements. Future research should explore food-based alternatives such as increasing dietary Omega-3 intake through fatty fish or fortified foods—as a cheaper and more sustainable option (Fristad et al., 2021).

6. Application for the Practitioner

The growing body of evidence supports integrating Omega-3 supplementation into ASD treatment plans. Multiple RCTs report improvements in social interaction, attention, and executive function (Daziroglu et al., 2023; Keim et al., 2022; Ooi et al., 2015). A meta-analysis by Doaei et al. (2021) involving 1,500 children revealed an 18% significant improvement in social responsiveness scores ($p < 0.05$), reinforcing Omega-3's value as a complementary intervention, especially for those with low baseline DHA and EPA levels.

To maximize the benefits of Omega-3, practitioners should consider personalizing supplementation strategies. Recommendations must be modified based on a child's biochemical profile, symptom severity, and dietary intake. Evidence shows children with low baseline EPA/DHA respond more significantly to supplementation. For instance, Daziroglu et al. (2023) reported a 40% significant improvement in social responsiveness among children with low DHA ($p < 0.01$). Similar effects were documented by Bent et al. (2014) and Parletta et al. (2016), all emphasizing individualized dosing based on fatty acid levels yields stronger outcomes. Therefore, pre-treatment blood testing is advised to guide dosing, improve safety, and boost adherence.

Furthermore, selecting the appropriate dosage and formulation is critical. Research suggests higher daily doses (~1,500 mg EPA+DHA) over shorter periods (6–12 weeks) are more effective than lower doses over extended durations (Boone et al., 2022; Ooi et al., 2015). Liquid formulations may suit younger children, while capsules work well for older ones. All products should be third-party tested for purity to ensure both efficacy and safety (Fristad et al., 2021).

In addition to formulation, enhancing compliance and caregiver education is key to treatment success. Parletta et al. (2016) found caregiver adherence increased treatment success by 25%.

Practitioners should provide clear instructions and suggest taste-masking strategies, such as mixing Omega-3 into smoothies. Education sessions, whether conducted in person or via telehealth, can help reinforce consistency and address caregiver concerns (Bent et al., 2014; Boone et al., 2022).

Regular monitoring and treatment adjustment should also be integral to any supplementation plan. Progress can be tracked using validated tools like the Social Responsiveness Scale and Aberrant Behavior Checklist every 4–6 weeks (Ooi et al., 2015). Additionally, measuring blood DHA/EPA levels can help guide dose adjustments and confirm compliance (Fristad et al., 2021). If no improvement is observed after 12 weeks, practitioners should consider altering the dose, trying a different formulation, or discontinuing the treatment (Doaei et al., 2021).

Addressing safety and potential side effects are equally important. Omega-3s are generally well tolerated, with the most common issues being mild gastrointestinal symptoms or a fishy aftertaste. For example, Bent et al. (2014) noted a 7% rate of mild side effects, none of which led to participant dropouts. Using enteric-coated capsules and high-purity formulations may help reduce adverse effects, and clinicians should monitor bleeding risk in vulnerable populations (Fristad et al., 202; Keim et al., 2022).

Beyond clinical considerations, increasing accessibility and advocacy are crucial. Cost remains a significant barrier to treatment. Practitioners can advocate for insurance coverage of prescription Omega-3s and support policy initiatives that expand access for underserved families (Parletta et al., 2016). Additionally, incorporating Omega-3-rich foods into school meal programs offers a sustainable, low-cost strategy for improving population-level intake (Boone et al., 2022).

Finally, a commitment to continuing education is vital. As research continues to evolve, clinicians must stay informed through systematic reviews, professional conferences, and continuing education opportunities. This ensures Omega-3 recommendations remain current, safe, and evidence-based, ultimately improving care for individuals with ASD (Wright et al., 2017).

7. Conclusion

The general conclusion highlights the potential efficacy of Omega-3 supplementation in improving cognitive and behavioral function in individuals with ASD. Consistent improvements in social responsiveness, attention regulation, and neuroinflammatory markers are evidence in favor of Omega-3 as an effective adjunct treatment. The findings of this systematic review align with progressive practice recommendations in pediatric nutrition and neurodevelopmental literature, which regard Omega-3 fatty acids as central to brain function and inflammatory regulation. Although professional organizations, such as the American Academy of Pediatrics and Academy of Nutrition and Dietetics, have recognized the purported role of Omega-3s in neurodevelopmental disorders, formal clinical practice guidelines remain in progress and await further large-scale, long-term trials. The implications of this review are meaningful. Omega-3 supplementation presents a cost-effective,

non-pharmacological approach that can complement existing therapies, potentially reducing reliance on behavioral and pharmacologic interventions alone. Notably, evidence suggests children with low baseline levels of DHA and EPA may respond more favorably to supplementation, emphasizing the value of biomarker-driven and personalized treatment strategies.

Despite encouraging results, challenges remain, including ASD heterogeneity, inconsistencies in dosing protocols, and limited access to high-quality Omega-3 products. Future research should focus on long-term randomized controlled trials that explore optimal dosing strategies, subgroup responsiveness, and the synergistic potential of combining Omega-3 supplementation with behavioral interventions. As the evidence base continues to expand, Omega-3s may serve as a valuable component of comprehensive ASD care; however, their implementation should be guided by a personalized, evidence-based approach. Practitioners are encouraged to stay informed on emerging research, thoughtfully integrate Omega-3s into multidisciplinary treatment plans, and advocate for individualized, patient-centered care.

Acknowledgments

I would like to express my deepest gratitude to my instructor, Dr. Kevin Haubrick, for his guidance, support, and valuable feedback throughout this project. His encouragement and constructive critique greatly enhanced the quality of this literature review. I am also thankful to the University of Houston library staff for providing access to the research databases and materials necessary for this study. Finally, I extend my appreciation to my peers and family for their continued encouragement and support during this research process.

Authors' contributions

LA and KH were responsible for the study design and revising. LA was responsible for data collection. LA drafted the manuscript, and KH revised the various drafts. All authors read and approved the final manuscript.

Funding

Not applicable

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

No applicable.

Ethics approval

Not applicable.

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

Open access

Copyrights

References

Academy of Nutrition and Dietetics. (2019). *Evidence Analysis Manual: Steps in the Academy Evidence Analysis Process.* Chicago, IL: Academy of Nutrition and Dietetics.

Bent, S., Bertoglio, K., Ashwood, P., & Hendren, R. L. (2014). Pilot study of omega-3 fatty acids for restrictive and repetitive behaviors in autism spectrum disorder. *Journal of Autism and Developmental Disorders, 44*(4), 919-927. https://doi.org/10.1007/s10803-013-1941-6

Boone, K. M., Scavuzzo, R. J., Perlmutter, J., & Klein, L. C. (2022). Effects of omega-3 fatty acids on neuroinflammation and behavior in ASD: A systematic review. *Neuroscience & Biobehavioral Reviews, 141*, 104876. https://doi.org/10.1016/j.neubiorev.2022.104876

Cochrane Consumers and Communication Review Group. (2016). *Data extraction template for Cochrane reviews*. https://doi.org/10.1002/14651858.CD010825.pub2

Daziroglu, T., Tural Hesapcioglu, S., & Erel, O. (2023). Neuroinflammation in autism spectrum disorder and the effects of omega-3 fatty acid supplementation. *Pediatrics International, 65*(1), e15723. https://doi.org/10.1111/ped.15723

Doaei, S., Kalantari, N., Gholamalizadeh, M., & Ghorbani, M. (2021). A meta-analysis on the effects of omega-3 fatty acids in children with autism spectrum disorder. *Nutritional Neuroscience, 24*(10), 772-783. https://doi.org/10.1080/1028415X.2020.1798903

Fristad, M. A., Arnold, L. E., & Youngstrom, E. A. (2021). Omega-3 and its potential role in treating childhood psychiatric disorders: A systematic review. *Child and Adolescent Psychiatric Clinics of North America, 30*(1), 135-153. https://doi.org/10.1016/j.chc.2020.08.007

Gholamalizadeh, M., Ghazvini, M. R., & Vameghi, R. (2020). Effects of omega-3 supplementation on ADHD comorbid with autism spectrum disorder: A double-blind

placebo-controlled study. *Child Psychiatry & Human Development, 51*(5), 693-702. https://doi.org/10.1007/s10578-020-01014-1

Keim, S. A., Branum, A. M., & Klebanoff, M. A. (2022). Dietary intake of omega-3 fatty acids and cognitive development in children with autism spectrum disorder. *Journal of Child Psychology and Psychiatry, 63*(3), 308-317. https://doi.org/10.1111/jcpp.13442

Lundbergh, K., Galanti, M. R., & Hjern, A. (2022). Omega-3 supplementation and its effects on cognitive function in adults with autism spectrum disorder: A randomized crossover trial. *Journal of Autism and Developmental Disorders, 52*(6), 2423-2432. https://doi.org/10.1007/s10803-021-05176-7

Martinez, Z. G., Salehi, H., & Karimi, K. (2023). Omega-3 effects on sleep and body composition in children with autism spectrum disorder: A randomized placebo-controlled trial. *Research in Autism Spectrum Disorders, 109*, 102289. https://doi.org/10.1016/j.rasd.2023.102289

Ooi, Y. P., Weng, S. J., Kossowsky, J., Gerger, H., & Sung, M. (2015). Omega-3 fatty acids in the treatment of autism spectrum disorders: A meta-analysis of randomized controlled trials. *Translational Psychiatry, 5*(11), e604. https://doi.org/10.1038/tp.2015.133

Page, M. J. et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic review. *Systemic Reviews, 10*(1), 89. https://doi.org/10.1186/s13643-021-01626-4

Parellada, M., Moreno, C., Llorente, C., Romo, J., & Moreno, M. (2017). The omega-6/omega-3 ratio in autism spectrum disorder: A possible link with inflammatory processes. *Frontiers in Psychiatry, 8*, 234. https://doi.org/10.3389/fpsyt.2017.00234

Parletta, N., Niyonsenga, T., & Duff, J. (2016). Effects of fish oil supplementation on learning and behavior in children with autism spectrum disorder: A systematic review. *Journal of Autism and Developmental Disorders, 46*(2), 505-519. https://doi.org/10.1007/s10803-015-2582-3

Posar, A., & Visconti, P. (2016). Omega-3 supplementation in autism spectrum disorders: A still open question? *Journal of Pediatric Neurosciences, 11*(3), 225-227. https://doi.org/10.4103/1817-1745.193375

Wright, B., Alderson-Day, B., Prendergast, G., Bennett, S., Jordan, J., Whitton, C., ... Wood, R. (2017). Omega-3 fatty acid supplementation in children with autism spectrum disorders: A double-blind randomized controlled trial. *Journal of Child Psychology and Psychiatry, 58*(5), 506-515. https://doi.org/10.1111/jcpp.12622