Effect of an anti-inflammatory diet on the psychomotor profile of children with Autism Spectrum Disorder: a pilot study

Efecto de una dieta anti-inflamatoria en el perfil psicomotor de niños con Trastorno del Espectro Autista: un estudio piloto

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Abstract

Introduction: Autism Spectrum Disorder (ASD) is characterized by multiple difficulties in psychomotor development that affect the performance of daily activities and social participation. Scientific evidence establishes that diet and gut microbiota balance can positively influence the functionality of individuals with ASD.
Objective: This study explores the effect of an anti-inflammatory diet on the psychomotor profiles of children with ASD.
Methodology: A pilot quasi-experimental study was conducted with 18 children diagnosed with ASD: 9 in the experimental group and 9 in the control group, and 12 neurotypical children: 6 in the experimental group and 6 in the control group. Patients were evaluated before and after a 12-week anti-inflammatory nutritional intervention. Sociodemographic and clinical characteristics, nutritional status, muscle tone, balance, laterality, spatiotemporal structuring, body awareness, global praxia, fine praxia, and psychomotor profile were assessed. Results: Significant improvements ($p < 0.05$) were found in muscle tone, fine praxia, and psychomotor profile in children with ASD. The effect size was high in several domains ($d > 0.8$), indicating substantial changes due to the intervention.
Discussion: The study results support nutritional interventions in interdisciplinary therapeutic programs in clinical and educational settings for individuals with ASD; however, more robust studies are needed to confirm this.
Conclusions: Implementing an anti-inflammatory diet can improve the psychomotor profile of children with ASD.

Keywords

Autism spectrum disorder; child; neurodevelopmental disorders; nutritional therapy; psychomotor performance.

Resumen

Introducción: El Trastorno del Espectro Autista (TEA) se caracteriza por múltiples dificultades en el desarrollo psicomotor que afectan el desempeño de las actividades diarias y la participación social. Evidencias científicas determinan que la dieta y el equilibrio de la microbiota intestinal pueden influir positivamente en la funcionalidad de las personas con TEA.
Objetivo: Este estudio explora el efecto de una dieta antiinflamatoria en el perfil psicomotor de niños con TEA.
Metodología: Se realizó un estudio piloto cuasiexperimental con 18 niños diagnosticados con TEA: 9 en el grupo experimental y 9 en el grupo control, y 12 niños neurotípicos: 6 en el grupo experimental y 6 en el grupo control. Se evaluó a los pacientes antes y después de una intervención nutricional antiinflamatoria de 12 semanas. Se evaluaron características sociodemográficas y clínicas, estado nutricional, tono muscular, equilibrio, lateralidad, estructuración espaciotemporal, noción corporal, praxia global, praxia fina y perfil psicomotor. Resultados: Se encontraron mejoras significativas ($p<0,05$) en los factores de tono muscular, praxia fina y perfil psicomotor en niños con TEA. El tamaño del efecto fue alto en varios dominios ($d>0,8$), lo que indica cambios sustanciales por la intervención.
Discusión: Los resultados del estudio respaldan las intervenciones nutricionales en programas terapéuticos interdisciplinarios en contextos clínicos y educativos en personas con TEA, sin embargo, se requieren estudios más sólidos para confirmarlo.
Conclusiones: La implementación de una dieta antiinflamatoria puede mejorar el perfil psicomotor de los niños con TEA.

Palabras clave

Desempeño psicomotor; niño; terapia nutricional; trastorno del espectro autista; trastornos del neurodesarrollo.

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by problems in communication and social interaction and the presence of repetitive patterns of behavior, interests, or activities (American Psychological Association (APA), 2013). Problems associated with ASD include deficiencies in several areas of development (Elbaum et al., 2010; Harris, 2017), including psychomotor performance which can begin in early childhood (Whyatt & Craig, 2013; Bölte et al., 2014). Motor difficulties, which are common in individuals with ASD and correspond to problems in performing age-appropriate skills, have been found to occur in up to 83% of children with this disorder and are related to abnormalities in motor control and learning (Marko et al., 2015; Ohara et al., 2019; Ruggeri et al., 2020).

One study used behavioral techniques to quantify motor learning and structural brain imaging techniques to determine neural bases and found that abnormal motor learning patterns in children with ASD were caused by proprioceptive and visual difficulties associated with cerebellar abnormalities showing that children with ASD have problems with motor planning, coordination, and praxias (Memari et al., 2014). These difficulties arise because of problems with muscle tone, joint instability, primitive reflex activity, tremors, muscle imbalance, proprioceptive, vestibular, and tactile failures, and muscle fatigue (Elbasan et al., 2012), manifesting as impaired motor coordination necessary for locomotor activities, intentional movements, projective activities, and object control, and problems with manual praxias, postural control, and balance (Pan et al., 2017). Likewise, difficulties in fine and gross motor skills (Fournier et al., 2010) have led some authors to determine the comorbidity of developmental coordination disorders (DCD) in children with ASD (Paquet et al., 2019).

DCD is a neurobiological developmental disorder that manifests through its effects on various functions involved in perception, movement, verbal and nonverbal communication, emotion and can significantly impact activities of daily living, academic performance and playing (Salamanca et al., 2016; Paquet et al., 2019). In addition to these difficulties in ASD, there is an eating disorder marked by selectivity and preference in food consumption, which leads to nutrient deficiencies, unbalanced body composition, and consequent gastrointestinal problems (Molina-López et al., 2021; Byrska et al., 2023; Naranjo-Galvis et al., 2025). In this regard, scientific evidence has shown that the gut microbiota is a determinant of neurodevelopment, acting on the gut-brain axis and influencing different dimensions of human functioning (Wang et al., 2023). This dysregulation, called intestinal dysbiosis, is characterized by reduced microbial diversity, increased pro-inflammatory bacteria, and a decreased number of beneficial species and can contribute to alterations in behavior, emotional regulation, and motor skills (Srikantha & Hasan Mohajeri, 2019).

Studies have shown that specific nutritional interventions can lead to better clinical conditions in people with ASD, social awareness, social communication, social cognition, stereotyped and repetitive behaviors, hyperactivity and impulsivity (Vargas & Rodríguez, 2022). Hence, it has been identified that the gut-brain axis not only influences physical health but also plays an important role in brain organization and plasticity, and has implications for the psychomotor and overall development of people with ASD (Ranieri et al., 2023; Majhi t al., 2023). A randomized controlled trial found that comprehensive nutritional intervention led to improvements in cognitive motor development in children with ASD, with important functional implications for coordination skills (Adams et al., 2018). Furthermore, a recent review confirmed that specific therapeutic diets can improve the functioning of these individuals (Pérez-Cabral et al., 2024).

Although this overview highlights the effects of an appropriate nutritional diet for people with ASD in improving many of its manifestations, scientific evidence is still emerging, especially in Latin America. Therefore, it is an important field of study for health decision-making. This study aimed to determine the effects of an anti-inflammatory diet on the psychomotor profile of children with ASD in Manizales, Colombia.

Method

A pilot quasi-experimental study was conducted with children diagnosed with Level I ASD (APA, 2013) and neurotypical (NT) children. The pilot study was considered quasi-experimental because the children were volunteers with the consent of their parents or guardians due to the difficulty of obtaining authorization from a large number of parents and limitations in taking a random sample from this population. The study was approved by the Central Research Committee of the Universidad Autónoma de Manizales (approval number 797-124 (act. 124, 2022), and the Bioethics Committee of the same university (act 150, 2023). Written informed consent was obtained from all the participants' guardians, and assent was obtained from the children and adolescents.

Participants

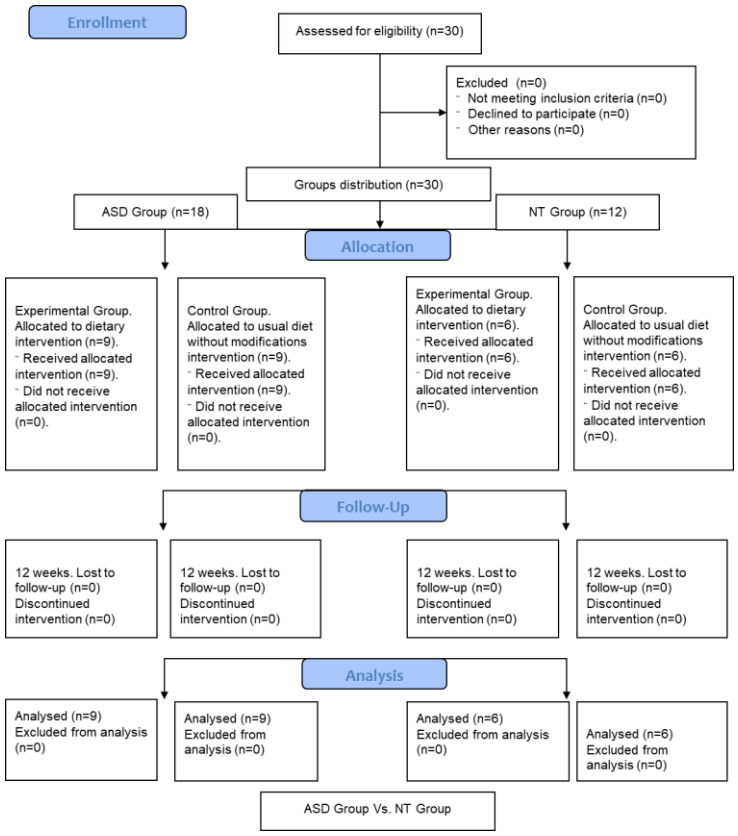
The study included a total sample of 30 children aged 6–17 years, of whom 18 were diagnosed with ASD level I (APA, 2013) and 12 were neurotypical (NT). The diagnosis of ASD was confirmed with the report of the clinical history of the participants in the sample, which corresponded to assessments of neuropediatrics, neuropsychology or psychiatry, and based on DSM V criteria. Participants with ASD were recruited from therapeutic support organizations, centers, and institutes, and NT participants were recruited from public and private educational institutions. In addition, a recruitment campaign was implemented with videos and advertisements to publicize the research in the city and its metropolitan area, with the aim of strengthening recruitment and involving participating families, children, and adolescents.

The inclusion criteria were active affiliation with the Colombian General Social Security System; no consumption of steroids, antifungals, antibiotics, or immunosuppressants in the last 3 months; no food intolerance or history of milk protein allergy; neuromuscular, systemic inflammatory, metabolic, musculoskeletal, or immune disorders; and no nutritional diet at the time of the study. An expert physiotherapist screened all potential participants, and eligible individuals were recruited.

Random assignment was not performed, the group assignment was by convenience, determined by diagnostic condition (ASD vs NT). Participants were recruited, assessed and distributed into two groups: ASD (n =18) and NT (n =12). Each group was allocated to either the experimental intervention (anti-inflammatory dietary program) or the control condition (usual diet). All participants received the allocated intervention, with no loss to follow-up or discontinuation during the 12-week intervention period. The final analysis included nine ASD-experimental, nine ASD-control, six NT-experimental, and six NT-control participants (n = 30).

Participant recruitment, group allocation, intervention, follow-up and inclusion in the final analysis are illustrated in Figure 1.

Figure 1. Flow diagram of participant recruitment, allocation, and analysis.



Source: Authors.

Procedure

Instruments

Questionnaire on sociodemographic and clinical characteristics

This questionnaire asked about the child's characteristics, such as sex, age, health and disease history, gastrointestinal symptoms confirmed by a pediatrician, socioeconomic status, and educational institutions.

Assessment of nutritional status

All children in the sample, both in the experimental and control groups, were assessed by an expert, a nutritionist. All participants were weighed and measured, and their body mass index (BMI) was calculated. The interpretation of the anthropometric data was based on the nutritional classification according to Resolution 2465 of June 14, 2016, of the Colombian Ministry of Health, "Adopting anthropometric indicators, reference standards, and cut-off points for the anthropometric classification of the nutritional status of girls, boys, and adolescents under 18 years of age" (Ministerio de Salud y Protección Social, 2016). This assessment determined the diet prescribed for each child in the ASD and NT experimental groups.

Da Fonseca Psychomotor Battery (Da Fonseca, 1998)

It consists of seven factors: tonicity, balance, body awareness, spatial-temporal structuring, laterality, global praxia, and fine praxia, and their respective subfactors, each with specific tests that allow the child's psychomotor profile to be determined. The tests in the battery allow the degree of psychomotor maturation to be identified and signs of deviation from the average to be detected, which helps determine problems in the psychomotor performance of children. The battery has a scoring scale based on the child's performance in each test.

The final result was expressed according to the child's performance on each of the tests, for which the performance average was calculated for each factor (Table 1). These were added together to give a final result that determines the psychomotor profile with the following classification: scores of 7–8 = apraxia profile, 9–13 = dyspraxia profile, 14–21 = normal profile, 22–26 = good profile, and 27–28 = superior profile.

This instrument was administered at baseline before the interventions and at the end of the 12-week intervention period in the experimental and control groups.

Table 1. Interpretation of the psychomotor profiles of the BPM

Levels	Psychomotor profile	Description
1	Apraxia	Absence of response, imperfect, incomplete, inadequate, and uncoordinated performance (very weak and weak; evident and obvious dysfunctions, indicating significant learning difficulties)
2	Dyspraxia	Weak performance with difficulty in control and deviating signals (weak, unsatisfactory; mild dysfunctions, indicating learning difficulties)
3	Eupraxia	Complete, adequate, and controlled performance (good, no discernible dysfunctions, no objective learning difficulties)
4	Hyperpraxia	Perfect and precise performance with ease of control (excellent, optimal; objective evidence of learning difficulties)

Source: Manual de observación psicomotriz (Da Fonseca, 1998)

Description of intervention

The design included four groups: two experimental groups (EG) and two control groups (CG), as follows: EG1 – ASD: 9 children with ASD who received a diet designed according to the principles of inflammatory restriction; EG2 – NT: 6 NT control children who also received an anti-inflammatory diet; CG1 – ASD: 9 children with ASD who received their usual diet without modifications; CG2 – NT: 6 NT control children with their usual diet without modifications.

This study defined a null hypothesis and an alternative hypothesis. Null hypothesis (Ho): Consumption of an anti-inflammatory diet in children with ASD and NT children does not produce significant changes in psychomotor factors and psychomotor profiles compared to children who do not consume the diet. Alternative hypothesis (H1): Consumption of the diet produces significant changes in psychomotor factors and psychomotor profiles compared with those in children who do not consume the diet.

Experimental groups intervention

The experimental groups of children with ASD and NT received individualized and monitored nutritional interventions that considered both the benefits and possible adverse effects.

This diet was designed to reduce low-grade systemic inflammatory processes common in ASD, promote gut microbiota balance, minimize exposure to pro-inflammatory compounds, and meet macro- and micronutrient requirements by age. Five phases were developed to implement an anti-inflammatory diet: identification, analysis, implementation, monitoring, and adherence. The identification phase involved the initial collection of dietary information and eating habits through structured interviews that allowed for the breakdown of usual intake by meal times (breakfast, lunch, snacks, etc.) and food frequency questionnaires, with the aim of identifying consumption patterns, food preferences, and possible nutritional deficiencies or excesses in the diet.

The analysis phase allowed for a quantitative and qualitative assessment of the child's current diet by comparing the proportion of intake with ideal nutritional standards. Based on Resolution 3803 of 2016 of the Colombian Ministry of Health, which "establishes the Energy and Nutrient Intake Recommendations (RIEN) for the Colombian population and dictates other provisions" (Ministerio de Salud y Protección Social, 2016) and on the food composition table of the Colombian Institute of Family Welfare (ICBF) of 2018 (Instituto Colombiano de Bienestar Familiar, 2018), a nutritional analysis of each participating child's diet was performed to establish their nutritional imbalances.

In this phase, the first psychomotor evaluation (pre-test) was conducted as a baseline. To minimize expectation bias, expert physiotherapists assessed the psychomotor profile using identification codes without knowing the dietary group to which each participant belonged to.

Subsequently, in the implementation phase, the diet was designed according to nutritional balance criteria and scientific evidence with an anti-inflammatory approach, to prioritize the inclusion of foods with antioxidant and prebiotic properties, reduce the consumption of pro-inflammatory compounds such as gluten, added sugars, FODMAPs (oligosaccharides, disaccharides, monosaccharides, and fermentable polyols), and ultra-processed foods, and provide those that provide insoluble fiber in adequate amounts as required, as well as micronutrients such as vitamins and minerals, that is, zinc, and B riboflavin, A, and C vitamins. The intervention was personalized according to the needs of each child and adjusted to the cultural and family contexts.

During the meeting with each family in the first week, the meal plan was explained, and any questions were answered. To facilitate adherence to the diet, nutritional education was provided to families on anti-inflammatory diets so that they could understand the fundamentals of the diet and how to implement it at home. To this end, a manual for parents and an individual nutritional plan format according to age group were provided to the participants. Balanced information was provided on the type of diet. The foods included in the designed diet were delivered to each family every 15 days during the 12-week intervention period by independent personnel and packaged in accordance with all biosafety standards.

During the follow-up phase, periodic food consumption surveys and 24-hour recall questionnaires were conducted to validate adherence and detect deviations in dietary compliance; therefore, adherence was not a variable but an inclusion criterion. These data allowed informed decisions to be made to maintain or adjust the intervention. These methodological control measures helped reduce the measurement and expectation biases inherent to the non-blind nature of dietary interventions.

Finally, the adherence phase aimed to promote the sustainability of dietary change through nutritional education processes targeted at both parents and children, adapted to their level of understanding, positive reinforcement, and individualized adjustments to improve acceptance and continuity. The process is dynamic and cyclical, allowing constant feedback on monitoring, adherence, and implementation.

Control groups

The children in the ASD and NT control groups continued their usual diets and benefited from nutritional education.

At the end of the 12-week intervention, the final psychomotor assessment (post-test) was conducted by expert physical therapists who were unaware of the pre-test results and the distribution of children in the experimental and control groups.

Data Analysis

Initially, sociodemographic variables were analyzed to determine if there were initial differences between the groups in variables such as age or sex that could influence the response variables related to praxic development. For age, a one-way ANOVA was used to compare the mean ages between the groups. For sex distribution, chi2 independence tests (or Fisher's exact test if any expected frequency was < 5) were used. In the descriptive analysis, means and standard deviations were calculated for the psychomotor factor scores and psychomotor profile scores, pre- and post-tests in each group, as well as frequency distributions for the qualitative variables.

Regarding the verification of assumptions, given the small sample size in each group, it was crucial to check the normality of the distributions before applying parametric tests. The Shapiro-Wilk test was used to assess the normality of the scores and the pre- and post-differences in each group. This test was chosen because it is the most appropriate for sample sizes of less than 50 people. To compare groups, the homogeneity of variances was checked using Levene's test before performing ANOVAs, with $p>0.05$ as the criterion for assuming equal variances. Pre- and post-test intragroup comparisons were performed in the four groups to evaluate a statistically significant change in the psychomotor profile at 12 weeks after the intervention. In cases where the distributions of the posttest and pretest differences did not deviate significantly from normality, a paired Student's t-test (dependent) was applied. In groups in which the normality of the differences was rejected (or in the presence of outliers that could distort the mean), the non-parametric Wilcoxon test for paired data was used. A statistical confidence level of 95% was used for the statistical analysis.

The magnitude of the intervention effect was determined using Cohen's effect size measure (d), which identified the importance of the results beyond the p-values. Cohen's effect values were considered as follows: small <0.5, medium 0.5-0.8, and large >0.8, based on the intervals proposed by Ferguson in clinical psychology practices. It should be noted that Cohen's effect is a robust measure in non-normal scenarios; therefore, it is equally interpretable when this assumption is met. All analyses were performed using Python with the Pandas, Numpy, and SciPy libraries. stats and statsmodels packages, among others, for the statistical calculations.

Results

Sociodemographic and clinical characteristics

The average age of all participants in the sample was 11±2.3 years, with no significant differences between the groups (ANOVA, p=0.45). Age in years in a diet: children with ASD on a diet: 10.6±2.1; children on a diet: 10.9±2.6; NT children on a diet: 12.5±2.2; NT children not on a diet: 11.0±2.3. With regard to sex, males predominated in both groups, with a distribution of 83% males in the ASD group and 67% in the NT group. The groups did not differ significantly in sex ratio when comparing children with ASD and NT children (chi2=0.38, p=0.54). These results indicate that the groups were comparable in terms of basic characteristics; therefore, it is unlikely that the results were due to sample biases in age or sex.

In addition, both the ASD and NT groups were born at term (more than 98%). Likewise, 67% and 33% of the participants in both groups were enrolled in public educational institutions, respectively (Table 2). Regarding school grade, 50% of the children in the sample were in primary school, and the other 50% were in secondary school, with a similar distribution of primary and secondary grades in each group. In relation to the frequency of physical activity (Table 2), 61% of the children with ASD did not engage in any type of activity during the week, and 22% engaged in some activity two to six times a week. Among NT children, 50% did not engage in any activity, and the other 50% engaged in an activity more than twice a week.

Most children with ASD reported a history of gastrointestinal problems, and both children with ASD and NT children were predominantly of adequate height and weight for their ages (Table 2). Eighty-three percent of children with ASD currently receive some form of health intervention, predominantly medical and psychological consultations.

Of the gastrointestinal conditions confirmed by pediatric evaluation, functional constipation was found to predominate in 8 children with ASD, functional dyspepsia in 5 children, and aerophagia in 5 children, with 5 children having more than one diagnosis. The children were diagnosed with functional constipation and functional dyspepsia (Table 2).

Table 2. Sociodemographic and clinical characteristics

Variable		Children with ASD n=18 n (%)	NT children n=12 n (%)
Sex	Male	15 (83%)	8 (67%)
	Female	3 (17%)	4 (33%)
Birth	Preterm	0 (0%)	2 (17%)
	Full term	15 (83%)	10 (83%)
	Post-term	3 (17%)	0 (0%)
Educational institution	Public	12 (67%)	7 (58%)
	Private	6 (33%)	5 (42%)
Physical activity	Does not participate	11 (61%)	6 (50%)
	Yes	7 (39%)	6 (50%)
History of gastrointestinal disease or symptoms	Yes	14 (78%)	5 (42%)
	No	4 (22%)	7 (58%)
Height for age	Appropriate	14 (78%)	11 (92%)
	Risk of delay	3 (17%)	1 (8%)
	Low for age	1 (5)	0 (0%)
Anthropometric classification of nutritional status (BMI/Age)	Adequate	9 (50%)	5 (41%)
	Overweight	0 (0%)	2 (17%)
	Obesity	1 (6%)	2 (17%)
	Thinness	2 (11%)	2 (17%)
	Risk of thinness	6 (33%)	1 (8%)

BMI: Body Mas Index.

Psychomotor factors and psychomotor profile: Intra-group comparison – pre and posttest results

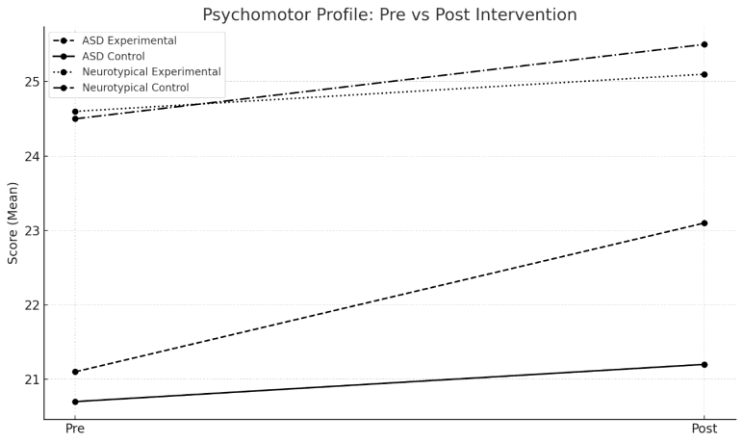
Regarding the psychomotor profile of the children at the beginning of the study, it was found that before the intervention in both groups, most children were classified as having a "good" and "normal" psychomotor profile, one case in the group of children with ASD was "dyspraxic" (very low performance), and one NT was "superior" (above typical). This reinforces the fact that many children with ASD were initially below their NT peers (Table 3).

Table 3. Psychomotor factors and psychomotor profile before intervention

Factor and psychomotor profile		Experimental group ASD (n=9)	Control group with ASD (n=9)	Experimental group NT (n=6)	Control Group NT (n=6)
Tonicity	Hyperpraxia	4	4	6	5
	Eupraxia	5	5	0	1
	Dyspraxia	0	0	0	0
	Apraxia	0	0	0	0
Balance	Hyperpraxia	9	2	6	5
	Eupraxia	0	5	0	1
	Dyspraxia	0	2	0	0
	Apraxia	0	0	0	0
Body awareness	Hyperpraxia	2	5	5	6
	Eupraxia	6	3	1	0
	Dyspraxia	1	1	0	0
	Apraxia	0	0	0	0
Spatial-temporal structuring	Hyperpraxia	1	2	2	3
	Eupraxia	6	5	4	3
	Dyspraxia	2	1	0	0
	Apraxia	0	1	0	0
Laterality	Hyperpraxia	8	7	6	5
	Eupraxia	1	2	0	1
	Dyspraxia	0	0	0	0
	Apraxia	0	0	0	0
Global praxia	Hyperpraxia	2	0	1	2
	Eupraxia	6	6	5	4
	Dyspraxia	1	2	0	0
	Apraxia	0	1	0	0
Fine praxia	Hyperpraxia	0	1	2	1
	Eupraxia	4	3	3	5
	Dyspraxia	4	3	1	0
	Apraxia	1	2	0	0
Psychomotor profile	Superior	0	0	0	1
	Good	4	4	6	5
	Normal	5	4	0	0
	Dyspraxic	0	1	0	0

Likewise, NT children had a higher average psychomotor profile than ASD children. The mean pre-test psychomotor profile score was 22.9 in NT children and 20.9 in children with ASD. This initial difference was statistically significant (independent t-test ASD vs. NT =-2.03, p = 0.050), which was expected, given that children with ASD tend to have compromised psychomotor areas compared to their typically developing peers. In contrast, there were no pretest differences due to diet; among children with ASD, the diet vs. no-diet groups had very similar initial scores (21.1 vs. 20.6), similar to NT (24.55 vs. 24.53) (Figure 2). A 2 × 2 ANOVA on the pretest confirmed a significant effect of diagnosis (ASD vs. NT, p=0.04), but not of diet (p=0.80) or interaction, showing that diet assignment was random with respect to the initial level.

Figure 2. Psychomotor profile scores in the pre- and post-tests by group.



Source: Authors.

Before comparing the differences after the dietary intervention, the distribution of the scores was examined to justify the use of parametric or non-parametric tests. The Shapiro-Wilk test did not detect significant deviations from normality in most cases ($p>0.05$). In this regard, Table 3 reports the use of the paired t-test when the Shapiro test assumes normality and the non-parametric Wilcoxon test when this assumption is not satisfied. The effect of the intervention, with or without diet, was evaluated within each group separately by comparing the scores of the seven psychomotor factors and the psychomotor profile before and after the intervention. No losses or exclusions were observed in any group after distribution. The results were as follows.

EG1-ASD: There was a significant improvement after the dietary intervention, with an increase in the scores for the psychomotor factors of tonicity and fine praxia, with a statistically significant p-value and $d > 1$ (Table 4). Likewise, the psychomotor profile score increased from 21.1 °to 23.1°; the median difference was +1.6 points, and the Wilcoxon signed-rank test confirmed that this increase was statistically significant, as was the magnitude of the effect (Table 5). Based on the above, it was determined that most children with ASD on their diet had better scores after the intervention. In fact, eight of the children improved, and in two of them the improvement was sufficient to move them up a qualitative category, from "normal" to "good."

CG1-ASD: In this group, there was only one statistically significant change with a large effect size ($d=1.21$) in the psychomotor factor of fine praxia (Table 4); regarding the psychomotor profile, the mean score improved from 20.7 to 21.2; however, this change did not reach statistical significance (paired Student's t-test: $t = 1.60$, $p = 0.14$) (Table 5). The improvement, although present in several children (seven had some increase), was more modest and inconsistent; for example, one child with ASD in the control group improved by more than three points, from a "dyspraxic" profile of 13.1 to "normal" profile of 16.4.

EG2-NT: NT children on the diet showed a slight increase from 24.6 to 25.10 points in the psychomotor profile score (+0.55) (Table 5). However, this improvement was not statistically significant (paired t-test: $t=2.17$, $p = 0.076$). Four of the six children showed small increases (≤1.4 points), and two did not change or changed little. Only one child had a notable improvement of +1.4, which took him from a “good” profile to a “superior” profile. Overall, given that the NT children already had high baseline values, whose theoretical maximum would be approximately 28 points, the margin for improvement was small. The results suggest that diet did not produce notable changes in children without previous difficulties.

CG2-NT: A statistically significant difference and a high effect size were found in the fine motor skills factor (Table 4). The mean improvement in the psychomotor profile score from 24.5 to 25.5 (+0.98) was not statistically significant (paired t: $t=2.26$, $p = 0.07$) (Table 5).

These intragroup results indicated that only the group of children with ASD who received the diet achieved significant improvements in their psychomotor profile (Figure 2). The other groups showed trends toward improvement but with insufficient statistical evidence (p= 0.07-0.14).

Table 4. Intragroup comparison pre – posttest - psychomotor factors

Psychomotor factor	ASD Experimental Group		p	Cohen's d	ASD Control Group		p	Cohen's d	NT Experimental Group		p	d de Cohen	NT Control Group		p	Cohen's d
	Pre	Post			Pre	Post			Pre	Post			Pre	Post		
Tonicity	3.3±0.34	3.7±0.34	0.00[a]	1.67	3.2±0.45	3.5±0.50	0.08[a]	0.67	3.8±0.10	3.9±0.09	0.5[b]	0.62	3.7±0.24	3.8±0.10	0.75[b]	0.39
Balance	3.0±0.40	3.3±0.27	0.07[a]	0.69	2.8±0.69	3.0±0.78	0.31[a]	0.37	3.5±0.29	3.6±0.22	0.06[a]	0.97	3.6±0.33	3.7±0.21	0.3[a]	0.47
Body awareness	3.0±0.55	3.3±0.30	0.56[a]	0.53	3.2±0.71	3.0±0.69	0.7[b]	-0.42	3.7±0.16	3.6±0.26	0.5[b]	-0.59	3.7±0.10	3.6±0.15	0.25[b]	-0.91
Spatial-temporal structuring	2.7±0.51	2.9±0.45	0.21[a]	0	2.8±0.71	2.9±0.87	0.77[a]	0	3.2±0.25	3.4±0.26	0.25[b]	0.74	3.5±0.45	3.7±0.40	0.25[b]	0.81
Laterality	3.9±0.33	4.0±0.00	1[b]	0.33	3.8±0.44	3.9±0.33	1[b]	0.19	4.0±0.00	4.0 ±0.00	1[a]		3.8±0.40	3.8±0.40	1[a]	
Global praxia	2.9±0.51	3.1±0.64	0.34[a]	0	2.6±0.75	2.8±0.86	0.39[a]	0.29	3.3±0.23	3.5 ±0.35	0.06[a]	0.99	3.2±0.44	3.3±0.37	0.54[a]	0.26
Fine praxia	2.2±0.79	2.8±0.64	0.004[b]	1.27	2.3±0.82	2.8±0.48	0.007[a]	1.21	3.2±0.56	3.2 ±0.68	0.86[a]	-0.07	2.9±0.41	3.5±0.29	0.02[a]	1.26

[a] paired t
[b] Wilcoxon

Table 5. Intragroup comparison pre – posttest - psychomotor profile

Psychomotor profile	ASD Experimental Group		p	Cohen's d	ASD Control Group		p	Cohen's d	NT Experimental Group		p	Cohen's d	NT Control Group		p	Cohen's d
	Pre	Post			Pre	Post			Pre	Post			Pre	Post		
	21.1±2.12	23.1±1.93	0.004[b]	2.33	20.7±3.68	21.2±3.78	0.14[a]	0.55	24.6±0.99	25.1±1.23	0.08[a]	0.91	24.5±1.73	25.5±1.26	0.07[a]	0.93

[a] paired t
[b] Wilcoxon

Discussion

Children with neurodevelopmental disorders such as intellectual disability and ASD generally have problems and underachievement in the development of locomotor, coordination, and gross motor skills (Romero et al., 2025; Mohd Nordin et al., 2021). This study identified the psychomotor profile of children with ASD and determined whether an anti-inflammatory diet can improve these manifestations, which have consequences for daily functioning in various activities. Motor incoordination, problems with walking, postural control, balance, and disorders in the performance of intentional movements for the development of gross and fine praxia are common in children with ASD, as found in this study, which showed that fine praxia, global praxia, and balance factors resulted in lower performance in almost all cases (Paquet et al., 2016; da Silva et al., 2025)

Although there is growing evidence demonstrating the common motor difficulties associated with ASD and that these are related to problems with the planning and control processes of the sensorimotor system, one of the main failures occurs in praxias. One study aimed to determine the sensorimotor control of arm movements and postural adjustments during ball reception in children with and without ASD, and the results showed that, compared to the control group of typically developing children, children with ASD had greater difficulty catching balls, used visual information less frequently to plan the catching movement, demonstrated fewer and more delayed anticipatory postural adjustments, and exhibited greater corrective control (Chen et al., 2019). These results were similar to those found in the present study, in which praxic difficulties associated with this type of activity were predominant. Another similar study showed that gross motor difficulties in people with ASD were greater than those in NT

controls. This deficit was more pronounced in object control skills, such as ball handling and upper limb or whole-body movements (Wang et al., 2022).

Psychomotor problems in ASD are not a challenge in themselves; however, it is important to highlight their implications for social participation and inclusion. In this regard, this study identified that most children with ASD did not perform any type of physical activity during the week. One study aimed to identify if motor performance could explain the frequency and percentage of activities, involvement, and desire for change in the participation of children with ASD at home, school, and in the community, and if contextual factors would modify the association between motor skills and participation outcomes. To this end, the participation and motor performance of 30 children with ASD were evaluated, and the results showed that motor skills related to locomotion, object control, position change, and balance explained their participation outcomes (Oliveira et al., 2023). In relation to the above, and by focusing attention on the motor problems of the disorder, it is also relevant to strengthen inclusive pedagogical strategies in physical education classes in educational processes, which also favor active participation, social interaction and adaptation of students (Montiel et al., 2025), fundamental aspects for the processes of adaptation and inclusion in different contexts in childhood.

Gastrointestinal problems common in ASD, also found in the sample of children in this study, are of significant importance when considering nutritional interventions for managing the different implications of this disorder, in this case, motor developmental difficulties. Diet plays a key role in this process, and a special diet can contribute to gastrointestinal and immune health, positively affecting the brain and multidimensional development of children with this diagnosis. The aim of the diet in this study was to reduce systemic inflammation and balance the microbiota, which could mitigate the manifestations of ASD (Tye et al., 2019; Tomova et al., 2020).

The findings of this study provide preliminary information on the potential effects of dietary interventions on manifestations in children with autism compared to NT children. These results suggest that an anti-inflammatory diet improves psychomotor performance in children with ASD. In the experimental group of children with ASD, the results showed statistically significant and high-magnitude effects on tonicity (d =1.67) and fine praxia (d =1.27), suggesting that an anti-inflammatory diet may reduce inflammation by reducing the consumption of gluten, casein, refined sugars, and ultra-processed foods. This may support the modulation of neuroplasticity, facilitate synaptic integration, and therefore favor fundamental processes for postural control and motor execution. This is consistent with recent studies that have reported improvements in the functioning of children with ASD (Al-Beltagi, 2024; Elshamy et al., 2025).

Another study reported that combining a gluten/casein-free diet significantly improved gross motor skills in children with ASD compared with physical therapy alone (Alsayegh et al., 2025). Similarly, a recent meta-analysis found that dietary interventions could reduce the core symptoms of ASD, suggesting overall benefits that may include the psychomotor domain (Yu et al. 2022). In contrast, the effects were more heterogeneous in NT children than in TD children. Although fine praxia also improved in the control group ($p=0.02$ and $d = 1.20$), this may be due to natural neurodevelopmental changes. Furthermore, the other factors did not show relevant changes, indicating that an anti-inflammatory diet has a greater effect on individuals with a baseline inflammatory condition, as is the case in the ASD population. Therefore, the diet did not appear to have an impact on NT children, which was largely expected, as these children already had a good or superior psychomotor profile; thus, a special diet would be unlikely to improve them much further. In fact, some NT children who received the diet experienced smaller improvements than the controls, although this was probably due to chance. It is noteworthy that only in the group of children with ASD on the diet was the pre-post improvement statistically significant, with a strong effect size. This indicates an effect within the group, which is consistent with the hypothesis that certain nutritional adjustments benefit the motor, praxic, and overall development of children with ASD. However, the literature on this topic is still in its infancy, with most studies on diets in ASD focusing on behavioral or cognitive symptoms and little direct research on motor indicators.

This study contributes to this gap by demonstrating a positive trend in psychomotor variables. Notably, no adverse effects of the diet were observed, suggesting that the diet was safe, at least in the short term. This is consistent with reports that excluded diets, such as gluten/casein-free diets, which do not usually cause significant clinical harm, apart from their difficulty in following (Matthews & Adams, 2023). The

findings of this study, of achieving a psychomotor benefit, fit into this narrative of "small added improvement." There is a need for more robust, better-designed, larger, multicenter studies, especially to translate the findings of pilot studies into general clinical recommendations. The support of a specific anti-inflammatory diet facilitates optimal psychomotor development, promoting physical health, better motor skill performance, and better levels of participation, social inclusion, and quality of life.

The results of this study are of interdisciplinary relevance as they are of interest not only in health and rehabilitation but also in the school context and physical education. It is also necessary to strengthen contextual factors and structured, differentiated, evidence-based activities to promote motor development in school settings (Reyes et al., 2025). In this context, regarding the environmental factors that favor the development of children with ASD, it is recognized that the support of a specific anti-inflammatory diet facilitates more optimal psychomotor development, promoting physical health, improved performance in motor skills, and better levels of participation, social inclusion, and quality of life.

The main limitation of this study was its small sample size, which limited its generalizability and statistical power. In addition, it is possible that a longer period would show clearer effects or that some effects would take longer to manifest. Despite these limitations, the preliminary results suggest that incorporating an anti-inflammatory dietary intervention could enhance psychomotor intervention programs for ASD (Matthews & Adams, 2023). The results support the study's alternative hypothesis and lay the groundwork for future studies. An ideal design for isolating the dietary effects would be a randomized controlled trial (RCT). Although this study did not achieve this level of control, its results suggest that an RCT can detect a significant effect of diet on ASD. The most recent meta-analyses concluded that elimination diets produce small overall improvements in ASD, although with moderate-quality evidence (Nova et al., 2022).

Conclusions

This study provided a detailed analysis of the psychomotor profile before and after dietary intervention in children with ASD and found that children with ASD who followed an anti-inflammatory diet showed significant improvement in their psychomotor profile, whereas those without the diet did not show a statistically significant change. In NT children, diet did not produce relevant changes in the psychomotor profile, which was expected, given their high initial performance.

This is consistent with the recent literature highlighting the role of nutritional factors in ASD and supporting comprehensive interventions. An anti-inflammatory diet may be a promising adjunct to the psychomotor performance of children with ASD; however, further research is needed to conclusively determine its efficacy.

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References

Adams, J. B., Audhya, T., Geis, E., Gehn, E., Fimbres, V., Pollard, E. L., Mitchell, J., Ingram, J., Hellmers, R., Laake, D., Matthews, J. S., Li, K., Naviaux, J. C., Naviaux, R. K., Adams, R. L., Coleman, D. M., & Quig, D. W. (2018). Comprehensive nutritional and dietary intervention for autism spectrum disorder: A randomized, controlled 12-month trial. *Nutrients, 10*(3), 369. https://doi.org/10.3390/nu10030369

Al-Beltagi, M. (2024). Nutritional management and autism spectrum disorder: A systematic review. *World Journal of Clinical Pediatrics, 13*(4), 99649. https://doi.org/10.5409/wjcp.v13.i4.99649

Alsayegh, A. A., Al Areefy, A. A., & Ahmed, M. M. (2025). Effect of therapeutic diet along with special physiotherapy program on gross motor development and cognitive function in autistic children: A randomized controlled trial. *Journal of Disability Research, 4*(1), 20240109. https://doi.org/10.57197/jdr-2024-0109

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5.ª ed.). American Psychiatric Publishing. https://doi.org/10.1176/appi.books.9780890425596

Bölte, S., De Schipper, E., Robison, J. E., Wong, V. C. N., Selb, M., Singhal, N., De Vries, P. J., & Zwaigenbaum, L. (2014). Classification of functioning and impairment: The development of ICF core sets for autism spectrum disorder. *Autism Research, 7*(1), 167–172. https://doi.org/10.1002/aur.1335

Byrska, A., Błażejczyk, I., Faruga, A., Potaczek, M., Wilczyński, K. M., & Janas-Kozik, M. (2023). Patterns of food selectivity among children with autism spectrum disorder. *Journal of Clinical Medicine, 12*(17), 5469. https://doi.org/10.3390/jcm12175469

Chen, L. C., Su, W. C., Ho, T. L., Lu, L., Tsai, W. C., Chiu, Y. N., & Jeng, S. F. (2019). Postural control and interceptive skills in children with autism spectrum disorder. *Physical Therapy, 99*(9), 1231–1241. https://doi.org/10.1093/ptj/pzz084

Da Fonseca, V. (1998). *Manual de observación psicomotriz*. Editorial Trillas.

Da Silva, S. H., Felippin, M. R., De Oliveira Medeiros, L., Hedin-Pereira, C., & Nogueira-Campos, A. A. (2025). A scoping review of motor impairments in autism spectrum disorder. *Neuroscience & Biobehavioral Reviews, 169*, 106002. https://doi.org/10.1016/j.neubiorev.2025.106002

Díaz, D., & Leonario, M. (2022). Effectiveness of nutritional interventions on behavioral symptomatology of autism spectrum disorder: A systematic review. *Nutrición Hospitalaria, 39*(6), 1378–1388. https://doi.org/10.20960/nh.04155

Elbasan, B., Kayihan, H., & Duzgun, I. (2012). Sensory integration and activities of daily living in children with developmental coordination disorder. *Italian Journal of Pediatrics, 38*(14). https://doi.org/10.1186/1824-7288-38-14

Elbaum, B., Gattamorta, K. A., & Penfield, R. D. (2010). Evaluation of the Battelle Developmental Inventory, 2nd edition, screening test for use in states' child outcomes measurement systems. *Journal of Early Intervention, 32*(4), 255–273. https://doi.org/10.1177/1053815110384723

Elshamy, R., Tarboush, H., Alghfeli, B., Alameeri, Z. M., AlAli, A. K. S., & Fityan, M. (2025). Dietary interventions in children with autism spectrum disorder: Contemporary overview. *Discover Medicine, 2*(1), 1–22. https://doi.org/10.1007/s44337-025-00400-y

Fournier, K. A., Hass, C. J., Naik, S. K., Lodha, N., & Cauraugh, J. H. (2010). Motor coordination in autism spectrum disorders: A synthesis and meta-analysis. *Journal of Autism and Developmental Disorders, 40*(10), 1227–1240. https://doi.org/10.1007/s10803-010-0981-3

Harris, S. R. (2017). Early motor delays as diagnostic clues in autism spectrum disorder. *European Journal of Pediatrics, 176*(9), 1259–1262. https://doi.org/10.1007/s00431-017-2951-7

Instituto Colombiano de Bienestar Familiar. (2018). *Tabla de composición de alimentos*. www.icbf.gov.co/nutricion/tabla-de-composicion-de-alimentos-colombianos

Majhi, S., Kumar, S., & Singh, L. (2023). A review on autism spectrum disorder: Pathogenesis, biomarkers, pharmacological and non-pharmacological interventions. *CNS & Neurological Disorders – Drug Targets, 22*(5), 659–677. https://doi.org/10.2174/1871527321666220428134802

Marko, M. K., Crocetti, D., Hulst, T., Donchin, O., Shadmehr, R., & Mostofsky, S. H. (2015). Behavioural and neural basis of anomalous motor learning in children with autism. *Brain, 138*(3), 784–797. https://doi.org/10.1093/brain/awu394

Matthews, J. S., & Adams, J. B. (2023). Ratings of the effectiveness of 13 therapeutic diets for autism spectrum disorder: Results of a national survey. *Journal of Personalized Medicine, 13*(10), 1448. https://doi.org/10.3390/jpm13101448

Memari, A. H., Ghanouni, P., Shayestehfar, M., & Ghaheri, B. (2014). Postural control impairments in individuals with autism spectrum disorder: A critical review. *Asian Journal of Sports Medicine, 5*(3), e22963. https://doi.org/10.5812/asjsm.22963

Ministerio de Salud y Protección Social. (2016). *Resolución 2465 de 2016*. https://www.minsalud.gov.co/Normatividad_Nuevo/Forms/DispForm.aspx?ID=4909

Ministerio de Salud y Protección Social. (2016, 22 de agosto). *Resolución 3803 de 2016*. Diario Oficial No. 49 976. https://www.minsalud.gov.co/Normatividad_Nuevo/Resolución%203803%20de%202016.pdf

Mohd Nordin, A., Ismail, J., & Kamal Nor, N. (2021). Motor development in children with autism spectrum disorder. *Frontiers in Pediatrics, 9*, 598276. https://doi.org/10.3389/fped.2021.598276

Molina-López, J., Leiva-García, B., Planells, E., & Planells, P. (2021). Food selectivity, nutritional inadequacies and mealtime behavioral problems in children with autism spectrum disorder. *International Journal of Eating Disorders, 54*(12), 2155–2166. https://doi.org/10.1002/eat.23631

Montiel Arreaga, R. C., Culque Nuñez, C. A., Zurita Espinoza, K. J., & Baidal Tircio, R. A. (2025). Fomentando el desarrollo integral: El rol del juego en programas de educación física y recreación para niños con TEA. *Retos, 68*, 1710–1720. https://doi.org/10.47197/retos.v68.116450

Naranjo-Galvis, C. A., Trejos-Gallego, D. M., Correa-Salazar, C., Triviño-Valencia, J., Valencia-Buitrago, M., Ruiz-Pulecio, A. F., Méndez-Ramírez, L. F., Zabaleta, J., Meñaca-Puentes, M. A., Ruiz-Villa, C. A., Orjuela-Rodríguez, M., Carmona-Hernández, J. C., & Salamanca-Duque, L. M. (2025). Anti-inflammatory diet and probiotic supplementation as strategies to modulate immune dysregulation in autism spectrum disorder. *Nutrients, 17*(16), 2664. https://doi.org/10.3390/nu17162664

Nova, R., Morales, G., & Ahumada, D. (2022). Factores nutricionales y alimentarios asociados al desarrollo y comportamiento del espectro autista: Un resumen de la evidencia. *Revista Chilena de Nutrición, 49*(6), 753–759. https://doi.org/10.4067/s0717-75182022000700753

Ohara, R., Kanejima, Y., Kitamura, M., & Izawa, K. P. (2019). Association between social skills and motor skills in individuals with autism spectrum disorder: A systematic review. *European Journal of Investigation in Health, Psychology and Education, 10*(1), 276–296. https://doi.org/10.3390/ejihpe10010022

Oliveira, K. S. C., Fontes, D. E., Longo, E., Leite, H. R., & Camargos, A. C. R. (2023). Motor skills are associated with participation of children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 53*(4), 1403–1412. https://doi.org/10.1007/s10803-021-05318-9

Pan, C. Y., Chu, C. H., Tsai, C. L., Sung, M. C., Huang, C. Y., & Ma, W. Y. (2016). The impacts of physical activity intervention on physical and cognitive outcomes in children with autism spectrum disorder. *Autism, 21*(2), 190–202. https://doi.org/10.1177/1362361316633562

Paquet, A., Olliac, B., Golse, B., & Vaivre-Douret, L. (2015). Current knowledge on motor disorders in children with autism spectrum disorder. *Child Neuropsychology, 22*(7), 763–794. https://doi.org/10.1080/09297049.2015.1085501

Paquet, A., Olliac, B., Golse, B., & Vaivre-Douret, L. (2019). Nature of motor impairments in autism spectrum disorder: A comparison with developmental coordination disorder. *Journal of Clinical and Experimental Neuropsychology, 41*(1), 1–14. https://doi.org/10.1080/13803395.2018.1483486

Pérez-Cabral, I. D., Bernal-Mercado, A. T., Islas-Rubio, A. R., Suárez-Jiménez, G. M., Robles-García, M. Á., Puebla-Duarte, A. L., & Del-Toro-Sánchez, C. L. (2024). Exploring dietary interventions in autism spectrum disorder. *Foods, 13*(18), 3010. https://doi.org/10.3390/foods13183010

Ranieri, A., Mennitti, C., Falcone, N., La Monica, I., Di Iorio, M. R., Tripodi, L., Gentile, A., Vitale, M., Pero, R., Pastore, L., D'Argenio, V., Scudiero, O., & Lombardo, B. (2023). Positive effects of physical activity in autism spectrum disorder: How it influences behavior, metabolic disorder and gut microbiota. *Frontiers in Psychiatry, 14*, 1238797. https://doi.org/10.3389/fpsyt.2023.1238797

Reyes Oyola, F. A., Palomino Devia, C., & Aponte López, N. W. (2025). Desarrollo motor grueso en escolares colombianos. *Retos, 71*, 641–654. https://doi.org/10.47197/retos.v71.116345

Romero Lozano, H., Quintero Reina, M., Romero Cuestas, C. A., Andrades Grassi, J. E., & Prado Pérez, J. R. (2025). Perfil motriz de niños escolares en condición de discapacidad intelectual. *Retos, 71*, 174–190. https://doi.org/10.47197/retos.v71.115815

Ruggeri, A., Dancel, A., Johnson, R., & Sargent, B. (2019). The effect of motor and physical activity intervention on motor outcomes of children with autism spectrum disorder: A systematic review. *Autism, 24*(3), 544–568. https://doi.org/10.1177/1362361319885215

Salamanca, L. M., Naranjo, M. M., Díaz, L. M., & Salinas, R. I. (2016). Cross-sectional study of developmental coordination disorder with behavior problems. *Revista Ciencias de la Salud, 14*(3), 351–363. https://doi.org/10.12804/revsalud14.03.2016.04

Srikantha, P., & Mohajeri, M.H. (2019). The possible role of the microbiota–gut–brain axis in autism spectrum disorder. *International Journal of Molecular Sciences, 20*(9), 2115. https://doi.org/10.3390/ijms20092115

Tomova, A., Soltys, K., Kemenyova, P., Karhanek, M., & Babinska, K. (2020). The influence of food intake specificity in children with autism on gut microbiota. *International Journal of Molecular Sciences, 21*(8), 2797. https://doi.org/10.3390/ijms21082797

Tye, C., Runicles, A. K., Whitehouse, A. J. O., & Alvares, G. A. (2019). Characterizing the interplay between autism spectrum disorder and comorbid medical conditions: An integrative review. *Frontiers in Psychiatry, 9*, 751. https://doi.org/10.3389/fpsyt.2018.00751

Wang, L. A. L., Petrulla, V., Zampella, C. J., Waller, R., & Schultz, R. T. (2022). Gross motor impairment and its relation to social skills in autism spectrum disorder: A systematic review and two meta-analyses. *Psychological Bulletin, 148*(4), 273–300. https://doi.org/10.1037/bul0000358

Wang, Q., Yang, Q., & Liu, X. (2023). The microbiota–gut–brain axis and neurodevelopmental disorders. *Protein & Cell, 14*(10), 762–775. https://doi.org/10.1093/procel/pwad026

Whyatt, C., & Craig, C. (2013). Sensory–motor problems in autism. *Frontiers in Integrative Neuroscience, 7*, 51. https://doi.org/10.3389/fnint.2013.00051

Yu, Y., Huang, J., Chen, X., Fu, J., Wang, X., Pu, L., Gu, C., & Cai, C. (2022). Efficacy and safety of diet therapies in children with autism spectrum disorder: A systematic review and meta-analysis. *Frontiers in Neurology, 13*, 844117. https://doi.org/10.3389/fneur.2022.844117

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