

Comparison of the effect of 8 weeks of resistance training with the use of spirulina on the physical indicators of children aged 5 to 7 years with autism spectrum

Comparaci3n del efecto de 8 semanas de entrenamiento de resistencia con el uso de espirulina en los indicadores f3sicos de ni1os de 5 a 7 a1os con espectro autista



Sanaz Alamdar
Saeid Rostami



[Kristina Igumnova26](#)

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Resumen

Introducción: recientemente ha aumentado la prevalencia de los trastornos del espectro autista, que es una condición del neurodesarrollo. El autismo es el tercer trastorno del desarrollo más común después del retraso mental y la parálisis cerebral.

Este estudio comparó el efecto de 8 semanas de entrenamiento de resistencia con el uso de espirulina en las características físicas de niños de 5 a 7 años con espectro autista. Métodos: este estudio es pre-test y post-test y es de tipo cuasi-experimental. Un total de 30 pacientes aprobados por un médico con espectro autista en el grupo de edad de 5 a 7 años, incluidos 15 niños y 15 niñas, participaron aleatoriamente en este estudio con un formulario de consentimiento de los padres.

Los pacientes se dividieron en 3 grupos de 10, cada grupo incluía 5 niños y 5 niñas. El primer grupo, el grupo control "Media y desviación estándar de edad ($6,87 \pm 0,87$) años, talla ($111,13 \pm 1,08$) cm, peso ($27,3 \pm 3,2$) kg y porcentaje de grasa ($27,3 \pm 1,4$) kg", el segundo grupo que a las 8 semanas solo tomaron suplementos "Media y desviación estándar de edad ($6,2 \pm 0,78$) años, talla ($116,9 \pm 2,52$) cm, peso ($28,4 \pm 3,02$) kg y porcentaje de grasa ($27,4 \pm 0,42$) kg" y el tercer grupo "Media y desviación" Criterio de edad ($6 \pm 0,81$) años, talla ($116 \pm 0,87$) cm, peso ($27,20 \pm 4,1$) kg y porcentaje de grasa ($26,1 \pm 0,05$) kg, que realizaron entrenamiento de resistencia durante 8 semanas. Para el análisis estadístico del software SPSS-16 se realizó un estudio de motricidad básica y componentes del autismo a partir del tercer test de Ulrich, test de Kolmogorov-Smirnov para comprobar la normalidad de los datos y coeficiente de correlación de Pearson, respectivamente.

Se utilizó una asociación entre el ejercicio y la suplementación y el aumento de la fuerza muscular.

Se utilizó la prueba t pareada para confirmar o rechazar las hipótesis y la prueba t independiente para comparar grupos y la validez de la prueba de Ulrich. Se utilizó el coeficiente alfa de Cronbach para confirmar la confiabilidad de la prueba de Ulrich. Resultados: Los resultados mostraron que se observó una diferencia significativa en las variables mencionadas entre los tres grupos ($P < 0,05$). De modo que el aumento de fuerza en el grupo de ejercicio fue más efectivo que el grupo suplementado y el grupo control. Conclusiones: De acuerdo a los hallazgos de este estudio, se puede concluir que 8 semanas de entrenamiento de resistencia con el uso del alga espirulina sobre los indicadores físicos de los niños de 5 a 7 años con espectro autista y por lo tanto, como programa efectivo puede ser sobre el agenda de entrenadores deportivos y terapeutas ocupacionales.

Estar mentalmente colocado. Palabras clave: Alga espirulina, Trastornos del espectro autista, Entrenamiento de resistencia, Niños, Indicadores físicos

Abstract

Introduction: recently, the prevalence of autism spectrum disorders, which is a neurodevelopmental condition, has increased. Autism is the third most common developmental disorder after mental retardation and cerebral palsy. This study compared the effect of 8 weeks of resistance training with the use of spirulina on the physical characteristics of children aged 5 to 7 years with an autism spectrum.

Methods: this study is pre-test and post-test and is of quasi-experimental type. A total of 30 patients approved by a physician with autism spectrum in the age group of 5 to 7 years, including 15 boys and 15 girls, randomly participated in this study with a parental consent form. Patients were divided into 3 groups of 10, each group including 5 boys and 5 girls. The first group, the control group Mean and standard deviation of age (6.87 ± 0.87) years, height (111.13 ± 1.08) cm, weight (27.3 ± 3.2) kg and fat percentage (27.3 ± 1.4) kg, the second group that 8 weeks They only took supplements Mean and standard deviation of age (6.2 ± 0.78) years, height (116.9 ± 2.52) cm, weight (28.4 ± 3.02) kg and fat percentage (27.4 ± 0.42) kg and the third group Mean and deviation Criterion of age (6 ± 0.81) years, height (116 ± 0.87) cm, weight (27.20 ± 4.1) kg and fat percentage (26.1 ± 0.05) kg, who performed resistance training for 8 weeks. For statistical analysis of the SPSS-16 software, a study of basic motor skills and autism components was performed from Ulrich's third test, Kolmogorov-Smirnov test to check the normality of the data and Pearson correlation coefficient, respectively. An association between exercise and supplementation and increased muscle strength was used. Paired t-test was used to confirm or reject the hypotheses and independent t-test was used to compare groups and the validity of the Ulrich test was used. Cronbach's alpha coefficient was used to confirm the reliability of the Ulrich test. Results: The results showed that a significant difference was observed in the mentioned variables between the three groups ($P < 0.05$). So that the increase in strength in the exercise group was more effective than the supplemented group and the control group. Conclusions: According to the findings of this study, it can be concluded that 8 weeks of resistance training with the use of spirulina algae on the physical indicators of children 5 to 7 years with autism spectrum and therefore, as an effective program can be on the agenda of sports coaches and occupational therapists. Be mentally placed

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Sanaz Alamdar

ORCID: [0000-0003-3093-9329](https://orcid.org/0000-0003-3093-9329)

Source | Filiación:

student at Ragheb Isfahan University

City | Ciudad:

Iranian

e-mail:

sani.deol1@gmail.com

Dr Saeid Rostami

ORCID: [0000-0001-9760-6620](https://orcid.org/0000-0001-9760-6620)

Source | Filiación:

Supervisor Ragheb Isfahan University

BIO:

Docente Universidad: Supervisor Ragheb Isfahan University

City | Ciudad:

Iranian

e-mail:

srostami20@gmail.com

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Comparación del efecto de 8 semanas de entrenamiento de resistencia con el uso de espirulina en los indicadores físicos de niños de 5 a 7 años con espectro autista

Sanaz **Alamdar**
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Introduction

Recently, the prevalence of autism spectrum disorders, which is a neurodevelopmental condition, has increased. Autism is the third most common developmental disorder after mental retardation and cerebral palsy, with a prevalence of one in 335 reported in the early decade. This rate has been increasing recently. According to the latest research in 2009, 1 in 91 people in the United States and 1 in 66 people in the United Kingdom have autism. It is worth noting that the prevalence of these disorders in boys is 3 times higher than girls and its symptoms are more severe in girls. Symptoms of these disorders include the following: Disorders of social interaction, disorders of communication and speech, disorders of sensory and perceptual processing, and behavioral disorders (American Psychiatric Association, 2000). Although social deficits are a hallmark of autism, motor function is often abnormal in these children. There are other related symptoms in addition to the above symptoms that are not part of the diagnostic criteria for autism, but are neurologically and clinically critical, including disorders of motor coordination, posture, and gait pattern. And noted joint mobility, motor skills, and physical fitness and motor development. Other motor disorders observed in autism include defects and delays in motor movement skills, object control, dexterity skills, ball training, balance and motor drawing skills, defects in imitation, and motor apraxia. Some researchers have suggested that defects in children with autism, such as inability to imitate movement, are actually due to a motor impairment that leads to sequencing and planning of motor impairment (ACARA, 2012).

Movement impairment is a disorder of basic motor skills such as poor motor coordination (in the torso and limbs), inability to control posture, low response speed, uncoordinated gait, impaired balance and motor control, weakness in gross motor skills, and Thin and ultimately low muscle tone Which is due to defects in the frontal and prefrontal lobe areas and lack of cerebellar communication with the mentioned areas and leads to the inability of a child with autism to imitate skillful body responses and as a result problems in social skills, communication with others. Rejection by others and the process of learning and independence in the daily activities of their lives. Children with autism do not eat well because they do not eat all the fruits, vegetables, and so-called bad foods. Their digestive system does not function well, and they suffer from constipation. Muscles are overweight (Bareli, 2007).

Resistance exercises such as going up and down stairs, platforms or chairs, climbing ramps, crossing obstacles with high posts, etc., strengthen the muscles and their high performance (Cairney, Hay, Fought, Hawes; 2005).

Spirulina algae today play an important role in improving and promoting human health. Spirulina is a great superfood that contains 65% protein and amino acids, 20% carbohydrates, 6% water, 5% fat, 3% minerals, and 1% vitamins. it is provided and consumed as a supplement. High therapeutic properties of these algae such as increase the immune system, regulate cholesterol and clogged arteries, reduce allergic reactions, prevent cancer, prevent the progression of AIDS virus, increase brain function, prevent stroke and dementia, reduce bilirubin levels Reduce body acidity, prevent eye diseases, treat type 1 and 2 diabetes, improve liver function, treat anemia, improve heart function and lower blood pressure, improve muscle strength, regulate weight and improve gastrointestinal function, vitality Skin and tooth health. Spirulina is protection against Parkinson's and, osteoarthritis, etc. With antioxidants and vitamins B and A, it compensates for the anemia that is common in children and does not cause the delay caused by it. Due to its high protein and levels, its levels of calcium, magnesium, minerals, and antioxidants, it also improves muscle function (Nielsen, Balachandran, Christensen, Pugh, Tamta., Sufka, Pasco; 2010).

Therefore, considering the above and the fact that so far no research has been done on the use of spirulina algae with resistance training on children with autism spectrum, the researcher seeks to answer whether the effect of 8 weeks of resistance training with the use of spirulina algae Does it affect the physical characteristics of children aged 5 to 7 with autism spectrum disorders?

Materials and methods

Because the implementation of this research was not completely under control, this research is among the quasi-experimental research. The pre-test research design was performed at the beginning of the first training session and supplementation, and the post-test was performed at the last training and supplementation session. After obtaining the consent of the parents of the participating children and ensuring that they were selected based on the Gilliam Gars test form in the autism spectrum category and the similar habits of the children (Łaska-Mierzejewska, 1999). On the day of the test, their demographic information (height, weight, age) was measured. 30 selected 15 girls and 15 boys who were randomly (lottery) divided into three groups, 10

people taking spirulina supplementation, 10 people's resistance and balance exercises, and 10 people in the control group. Before starting the intervention program, all subjects underwent a workshop to learn how to perform the exercises correctly. Before and after the training protocol, the dependent variables of the study were evaluated from all subjects. Pre-test assessments included measuring ball and movement skills using the Ulrich test and measuring muscle strength using hand-held and digital dynamometers. IMS (Isometric muscle strength) was measured using a hand-held dynamometer (Lafayette Instrument®, Lafayette, UK) that could quantify up to 136.1 kgf. The muscle groups measured bilaterally were shoulder abductors, elbow flexors, elbow extensions, knee flexors, knee openers, dorsi flexors, and plantar flexors.

Exercises were performed for 8 weeks and two sessions per week (in each session of resistance training) based on both training programs. Each training session included 25 muniments of resistance training. 30-45s between sets and 60 to 10-s rest between each exercise.

Spirulina algae supplement, which was in the form of tablets and each tablet was 300 mg and the dose for children was 1 tablet per day (Kirby, Sugden, Beveridge, Edwards; 2008).

Results

Due to the normality of the data, the Pearson correlation coefficient was used in both groups to show the relationship between resistance training and increasing muscle strength and the supplement group and increasing muscle strength in both groups was $P > 0.05$. That is, there was a significant relationship between supplementation and increasing muscle strength and resistance training and increasing muscle strength. After 8 weeks of training, there was a significant relationship between pre-test and post-test muscle strength in the subjects of the resistance and balance training group. ($p < 0.05$). Therefore, the research hypothesis was confirmed.

Table 1.
Degree of freedom and level of significance and t-test in paired t-test in pre-test post-test in measuring the increase in strength of resistance and balance training group.

Muscle strength	t	df	sig
Pre-test and post-test	2.46	40	000.

Source: self made

After 8 weeks of supplementation, there was a significant relationship between pre-test and post-test muscle strength in the subjects

In the spirulina algae supplementation group ($p < 0.05$). Therefore, the research hypothesis was confirmed.

Table 2.
Degree of freedom and level of significance and t-test in paired t-test in pre-test and post-test in measuring the increase in strength of the supplemented group.

Muscle strength	t	df	sig
Pre-test and post-test	1.92	49	000.

Source: self made

Evaluation of the reliability of the Ulrich test (TGMD-3)

According to the result of calculating the

Cronbach's alpha coefficient from Table (3), in ball and movement skills, considering that the minimum acceptable value of these indicators is 0.6; therefore, so it can be said that the value of this content reliability coefficient for ball skills and confirms shifts in all three groups.

Table 3
Cronbach's alpha coefficient and standard error for the ball skills scale and its displacement subscales.

Group	Variable	Cronbach's alpha	Standard measurement error
Control	Movement	0.74	1.88
	Ball skills	0.77	2.30
	Total	0.75	3.05
Consumption of algae	Movement	0.78	1.88
	Ball skills	0.81	2.32
	Total	0.79	2.91
exercises	Movement	0.80	1.30
	Ball skills	0.83	1.92
Total	Total	0.81	2.25

Source: self made

Independent t-test and validation of the Ulrich test

This test was used to compare the increase in muscle strength in three groups of control, supplementation and resistance, and balance exercises and construct validity (Lefevre, Beunen, Steens, Claessens & Renson, 1990). It was a significant relationship between the two groups, with intervention in increasing power. ($p < 0.05$). According to the mean and standard deviation of the three groups in Table (4), it

was found that the increase in muscle strength in the resistance and balance training group was more than the supplement and control group. The test also has

Validity.

All statistical calculations were performed at a significant level of 0.05 using the SPSS 16 software.

Table 4.
Mean and standard deviation and degree of freedom and level of significance and t in the independent t – test to compare the increase in muscle strength in the three groups.

t	df	sig	
2.33-	31.5	0.026	Total

group	Average	Standard deviation
Consumption of algae	1.60	0.75
exercises	2.35	1.22
Control	1.21	0.23

Source: self made

The results of the tests showed an increase in muscle strength with resistance training and supplementation. Also, in the group that did resistance training, the increase in strength was greater than the supplementation group.

Conclusion

The results showed that a significant difference was observed in the mentioned variables between the three groups ($P < 0.05$). So that the increase in strength in the exercise group was more effective than the supplemented group and the control group. According to the findings of this study, it can be concluded that 8 weeks of resistance training with the use of spirulina algae on the physical indicators of children 5 to 7 years with autism spectrum and therefore, as an effective program can be on the agenda of sports coaches and occupational therapists. Be mentally placed. This study compared the results of 8 weeks of resistance training with the use of spirulina on the physical indicators of children aged 5 to 7 years with autism. This study is consistent with the research of Vacant (2020), Seraj et al. (2017), and Machiavelli and Todd (2016), but is inconsistent with the research of Lloyd and Machida (1997).

Vacant (2020) showed that intervention exercises combined with balance and coordination exercises on an unstable surface improve students' better service skills. In this study, training in resistance and balance exercises had a positive effect on muscle balance and strength.

Seraj et al. (2017) the results showed the superiority of spirulina in the strengthening and growth of children. Which has a good performance if consumed in the right amount and in the right dose. Spirulina algae supplementation affected brain function.

A report by Macie and Todd (2016) found that children with autism spectrum disorders have more problems discussing postural stability than normal children. A large movement is impressive. In this study, training in resistance and balance exercises had a positive effect on muscle balance and strength.

Lloyd & Machida (1997) Although the intervention of strength training and profundity did not significantly improve the balance of specimens in autistic boys on dynamic balance, but these exercises had a positive effect on maintaining the dynamic balance of specimens on the balance board. Had. The cause can be traced to the wrong training methods and that the muscle strengthening was not done properly. In this study, resistance and balance exercise increased and improved balance.

Research limitations were: Lack of complete control of the subjects' activity in 24 h a day,

Failure to attend exams on time, Prevalence of Covid disease – 19 but strict quality control and quantity of sports exercises, continuous monitoring of the performance of exercises, and communication with rehabilitation and occupational therapy specialists during the research period of positive points the study was present.

According to the findings of this study, it can be concluded that resistance training with the use of spirulina algae is effective on the physical indicators of children 5 to 7 years old with an autism spectrum and therefore as an effective exercise program and a supplement, in the agenda of sports coaches and occupational therapist's autism.

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