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Intervention with Physical Activity and Nutrition Program Adapted to Individuals with Autism with Eating Problems

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Abstract

The aim of the research is to reveal the results of the intervention with a physical activity and nutrition program adapted to autistic individuals with eating problems. Among the single-subject research models, the multiple probe model across behaviors with a single initial probe phase was used. The population of the research consists of adolescent individuals with mild autism and obesity problems. The sample of the research consists of one (1) person determined by simple random sampling method among the families who voluntarily agreed to participate in the research. The research lasted twenty-eight (28) weeks. The data obtained were recorded by weighing before starting the study, every week after the start of the study, and the week when the study ended. The data obtained at the end of the application was analyzed by showing it on a graph. The data obtained was converted into point scores and turned into a line graph to reveal the change that occurred. It was observed that there were significant changes in the weight of the individual participating in the research over the weeks. Considering the results obtained, it can be said that the exercise and diet programs implemented during the research were effective.
Keywords: Autism, Nutrition, Physical Activity, Adolescent, Obesity

Yeme Problemi Olan Otizmli Bireylere Uyarlanmış Fiziksel Aktivite ve Beslenme Programı ile Müdahale

Öz

Araştırmanın amacı, yeme problemi olan otizmli bireylere uyarlanmış fiziksel aktivite ve beslenme programı ile müdahalenin sonuçlarını ortaya koyabilmektir. Tek denekli araştırma modellerinden tekli başlangıç yoklama evreli davranışlar arası çoklu yoklama modeli kullanılmıştır. Araştırmanın evrenini, hafif düzeyde otizmli, obezite sorunu olan adolesan bireyler oluşturmaktadır. Araştırmanın örneklemini, araştırmaya gönüllü katılmayı kabul eden ailelerin arasından basit tesadüfi örnekleme yöntemiyle belirlenen bir (1) kişi oluşturmaktadır. Araştırma yirmi sekiz (28) hafta sürmüştür. Çalışmaya başlamadan önce, başladıktan sonra her hafta ve çalışmanın sona erdiği hafta tartı ile ölçüm yapılarak elde edilen veriler kayıt altına alınmıştır. Uygulama sonunda elde edilen veriler, grafik üzerinde gösterilerek analiz edilmiştir. Elde edilen veriler, nokta puana dönüştürülerek, meydana gelen değişimi ortaya koymak için çizgi grafiğe dönüştürülmüştür. Araştırmaya katılan bireyin haftalara göre kilosunda belirgin değişiklikler olduğu görülmüştür. Elde edilen sonuçlara bakıldığında araştırma süresince uygulanan egzersiz ve diyet programlarının etkili olduğu söylenebilir.
Anahtar Kelimeler: Otizm, Beslenme, Fiziksel Aktivite, Adolesan, Obezite

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INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by impairment in communication, social, and motor skills, repetitive and stereotyped behaviours, typically emerging within the first three years of life and continuing throughout the individual's lifetime (Aktitiz et al., 2019; Broder-Fingert et al., 2014; Fujiwara et al., 2016). While the exact cause of autism is not fully understood, it is believed that in addition to genetic factors, environmental factors such as viruses, medications, radiation, and prenatal exposures may also play a role (Kim & Leventhal, 2015; Önal & Uçar, 2017; Özeren, 2011). The most fundamental symptoms observed in individuals with autism are difficulties in reciprocal communication, excessive attachment to objects, repetitive and stereotyped behaviours, extreme reactions to differences, avoidance of eye contact, and challenges in social activities and motor performance (Odabaş, 2016; Sowa & Meulenbroek, 2012). It has been noted that individuals with autism experience sensory issues, with these problems being more prominent in the auditory and tactile senses. They may have difficulties in interpreting or responding to social and sensory signals conveyed through these senses (Al-Heizan et al., 2015; Önal & Uçar, 2017).

In individuals with autism, eating behaviour disorders and digestive system problems are frequently encountered. It has been reported that the main reason for this is their limited food intake due to avoidance of certain foods based on texture and/or taste (food selectivity). Eating problems, such as consuming only specific textures and colors of food, avoiding trying new foods (neophobia), increased or decreased sensitivity to the smell, taste, and texture of foods, and difficulties in chewing, are quite common in individuals with autism. It has been observed that individuals with autism display aggressive behaviour when encountering new foods and tend to consume mostly the same foods by sticking to specific routines. Indeed, nutrition has an undeniable impact on reducing symptoms and behavioural issues in individuals diagnosed with autism, controlling associated medical conditions, and addressing deficiencies in certain elements. The implementation of proper nutrition strategies by families plays an important role in the positive development of the quality of life for individuals with autism (Aktitiz et al., 2019; Girli et al., 2016; Harris & Card, 2012; Merdan & Çetin, 2020; Uçar & Samur, 2017).

The rate of obesity, which is considered as the biggest health problem in recent years, is increasing day by day in childhood and adolescence. Individuals with neurodevelopmental disorders like autism may experience decreased levels of physical activity due to poor motor performance and reduced participation in sports activities because of behavioural issues. They are more likely to be at risk of being overweight or obese compared to typically developing individuals, due to specific dietary habits and excessive consumption of high-calorie foods. As they age, this risk is reported to increase. Genetic or behavioural conditions, sleep disorders, the degree of autism, and the side effects of medications are factors that contribute to an increased risk of obesity (Broder-Fingert et al., 2014; Çevik-Güner & Bilkay, 2022; Şengüzel et al., 2021; Vinck-Baroody et al., 2015). Obesity is generally associated with adverse health outcomes, including insulin resistance, diabetes, heart

disease, depression, and certain types of cancer. Since it often persists into adulthood, preventing obesity in autistic individuals is crucial (Dhaliwal et al., 2019; Srinivasan et al., 2014). Despite trying different dietary treatments to minimize the problems related to obesity and behavioural symptoms, there is currently no proven nutritional approach with established effectiveness. It is emphasized that personalized nutrition and physical activity programs, along with informing parents, are effective in preventing obesity (Derer, 2018; Girli et al., 2016; Özer & Kurşun, 2022; Srinivasan et al., 2014; Uçar & Samur, 2017).

In addition to its effects on preventing obesity and promoting overall health, physical activity has been found to be a strong complementary therapy in improving academic achievement, focus, motor performance, social communication, reducing stereotypical and aggressive behaviours, and positively enhancing behavioural and cognitive symptoms (Keskin et al., 2017; Lang et al., 2010; Marzouki et al., 2022; Sowa & Meulenbroek, 2012; Toscano et al., 2021). Individuals diagnosed with autism spectrum disorder have a higher rate of balance, movement, and coordination disorders compared to typically developing individuals. It has been stated that physical activities also contribute to the development of such motor skills. It is observed that physical activity plays an important role in maintaining the essential functions of autistic individuals, increasing their quality of life, and enhancing cognitive and social skills (Arslan & İnce, 2015; Derer, 2018; Keskin et al., 2017; Uzunçayır & İlhan, 2021).

When the literature was scanned, it was seen that there were various studies on individuals with autism, but there were not many scientific studies on this subject. Since there are few studies on this subject, it was decided to conduct this study. The aim of this research is to reveal the results and significance of the intervention with a tailored physical activity and nutrition program for individuals with autism who have eating problems.

MATERIAL AND METHOD

Research Model

One of the single-subject research models, single-start, inter-behavioural multiple probe model was used. n the single-baseline, multiple-probe design, a measurement related to the target behaviour is taken before the study, and then measurements are taken throughout the study to track the same behaviour for assessment purposes (Özdamar, 2003).

Research Group

The population of the research consists of adolescent individuals with mild-level autism and obesity problem living in Isparta province. The sample of the research consists of one (1) individual selected through simple random sampling method from among the families who constitute the population and voluntarily agree to participate in the study. Detailed information was provided to the selected individual about performing personalized physical activities and implementing a diet program. Additionally, the family was requested to provide support for the implementation of the personalized diet program prepared by an expert (Nutrition and Dietetics Specialist).

Study Duration and Targeted Skills

The research lasted for 28 weeks. In individuals with autism, issues such as difficulties in social communication, initiating or terminating an action or activity, and weaknesses in motor skills may be present. It is aimed to correct the nutritional problems of the individual participating in the research, to control the weight problem and to gain the habit of regular physical activity.

Ethical Approval

Ethics committee approval was received for this study from Clinical Research Ethics Committee (E- 87432956.050.99-347127, Date:14.09.2022).

Data Collection Tool

The weight of the individual was tracked using a Tanita measurement device before the study started, weekly during the study, and finally on the week the study ended. These measurements were recorded by the researcher.

Analysis of Data

At the end of the intervention, the collected data was analyzed and presented on graphs for visual representation and analysis. Due to the participation of only one (1) participant in the study, the data collected during the starting week and the subsequent twenty-eight (28) weeks were transformed into line graphs using statistical analysis software. Obtained data is converted into point-score in accordance with the scale protocol and converted into a line chart to reveal the change (Özdamar, 2013).

FINDINGS AND DISCUSSION

In this part of the research, the results obtained as a result of the analysis of the data obtained in the research are included.

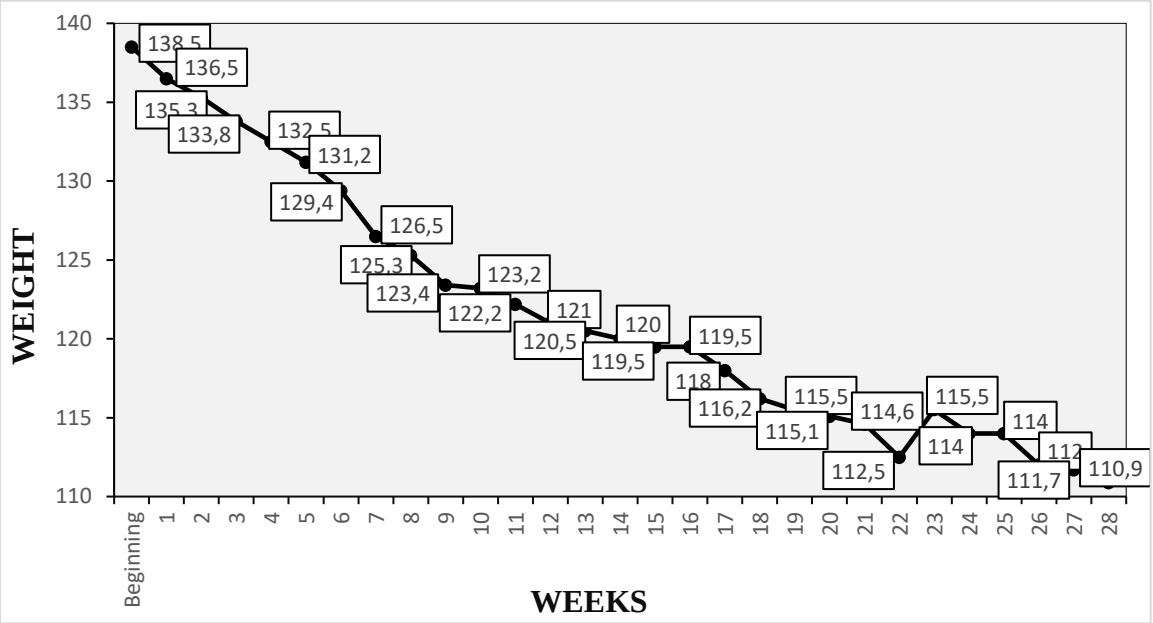

Figure 1. Change graph of participant's weight values according to weeks

In Figure 1, the significant differences in the weight change of the individual participating in the study according to the weeks are indicated. While the initial weight of the individual was 138.5 kilograms, it decreased to 110.9 kilograms at the end of the study. It is seen that the difference between the start and end data is 27.6 kilograms.

In this study, the results of the intervention with a physical activity and nutrition program adapted to individuals with autism with eating problems were examined. First of all, the family of the individual participating in the study was interviewed and the nutritional history was taken and information about their habits was collected. As a result of the data obtained, it was seen that the physical activity level of the individual was insufficient, he had obsessions about consuming sugary drinks and he was overly fond of a certain drink. It has been determined that he consumes only certain foods in his meals, avoids consuming some foods, has a certain eating pattern and feels uneasy when this order is violated. Nutrition problems are commonly encountered in individuals with autism. The eating disorders observed in the participant in this study are consistent with the diagnostic characteristics of autism. In a study examining eating behaviours in children and adolescents with neurodevelopmental disorders and typically developing individuals, the prevalence of atypical eating behaviours was found to be 70% in individuals with autism, which is 5 times higher than in individuals with other neurodevelopmental disorders (13%) and 15 times higher than in typically developing individuals (5%). The most commonly observed atypical eating behaviour in individuals with autism is the selective consumption of specific foods (Mayes &

Zickgraf, 2019). In a study comparing autistic children aged 6 to 18 with neurotypical children, it was found that autistic children had more limited food diversity and higher rates of behavioural problems during mealtime (Molina-López et al., 2021). In a study conducted with children and adolescent individuals diagnosed with autism, it was found that adolescents had lower levels of physical activity and higher food selectivity compared to children. Additionally, their Body Mass Index (BMI) values were higher. It is thought that this is due to the fact that as children get older, the difficulty experienced by families in directing them to physical activity increases (MacDonald et al., 2011; Nor et al., 2019).

When the literature is examined, it is found that individuals with autism tend to have a strong tendency to prefer specific foods, avoid diversity in their food choices, and show resistance to this (Orhan, 2014). Based on the observations and information obtained from the participating parent, it was determined that the individual with autism experienced significant eating problems, and the family lacked sufficient knowledge in this regard, resulting in weight and health problems. According to these data, a diet program that would be most suitable for quickly adapting to the diet process and an exercise program aimed at reducing fat mass and increasing muscle mass were prepared.

At the end of the first month, it is seen that the body weight of the individual has decreased from 138.5 kilograms to 132.5 kilograms and a loss of 6 kilograms has been achieved. The reason for the significant weight loss in the first month could be attributed to the individual moving away from harmful fast-food habits, transitioning to a healthier eating routine, increasing physical activity level, and the body quickly adapting to these changes. To overcome the obsession with sugary beverages, the first step taken was to reduce the amount of consumed beverages. In addition, increasing the number of meals and providing healthy alternatives as replacements were considered factors that contributed to reducing the desire for sugary beverages and helping the individual to lose weight. Although the effect of physical activity in the treatment of obesity is known, there are few studies investigating the effect of physical activity on individuals with autism and weight loss (Srinivasan et al., 2014). In the study of Pitetti et al. (2007), on adolescent individuals with developmental disabilities, including individuals with autism; It was determined that the body mass index decreased, and the energy expenditure increased in the group that was given treadmill training for 9 months compared to the group that did not receive the training. In a similar study, a program incorporating diet, physical activity, and psychological support was implemented, and a 10-week weight monitoring was conducted. According to the obtained data, no effect on body composition was observed, but improvements in lifestyle were reported (Hinckson et al., 2013).

Based on the data obtained at the end of the 2nd month in the research process, it is observed that the individual's body weight has decreased from 132.5 kilograms to 125.3 kilograms, resulting in a difference of 7.2 kilograms after completing the first month, it can be attributed to the individual's adaptation to the new dietary regimen and physical activity program, as well as the effect of exercise on increasing metabolism. A gradual approach has been demonstrated in implementing healthy lifestyle changes and restricting access to undesirable foods, and the family was asked not

to keep unhealthy foods at home. During this process, by the 2nd month, it can be stated that the obsession with sugary beverages was completely overcome, and with the addition of preferred foods to the diet, weight loss increased. In studies on the effect of physical activity on children with autism, it has been reported that it contributes to socialization, social skills, communication skills and physical development (Aksoy, 2020; Kaya & Alp, 2022; Odabaş, 2016). In a 15-month follow-up study, a 14-year-old individual with autism was subjected to an adapted physical education program. At the end of the study, it was found that motor skills were positively affected, and there was an improvement in the individual's quality of life (Akın & Alp, 2019). In a similar study, 30 autistic individuals between the ages of 10-16 were followed up with a physical activity program including 8-week stretching exercises, and it was observed that their motor skills increased compared to the control group (Şimşek, 2017). In another study, a peer-mediated adapted physical activity program consisting of 21 training sessions was applied to a 12-year-old male individual diagnosed with autism. At the end of the training, it was reported that communication skills improved, and it contributed to his physical and cognitive development as well as his ability to communicate with peers (Yarımkaya et al., 2017).

While the body weight of the individual was 125.3 kilograms at the beginning of the 3rd month, it decreased to 119.5 kilograms at the end of the 4th month, and it was stated that the weight loss continued in 2 months with a difference of 5.8 kilograms. In this process, no weight change was observed between the 15th week and the 16th week. The reason for this may be that the individual participating in the study consumes only certain foods and does not want to go out of his habits, and that the nutrition program cannot be adequately changed for weight loss and that it is regulated on certain foods. In research involving adolescents with autism, it was found that 46.4% of the participants rejected specific foods, and 14.3% avoided trying new foods. This situation can reduce food diversity and nutrition quality, leading to eating disorders in individuals and consequently causing developmental deficiencies and health problems (Girli et al., 2016). In a study investigating the nutrition and gastrointestinal problems of individuals with autism, it was found that 62.6% had a limited eating routine, and 20.5% exhibited selective eating habits. Among the participants, 19.6% did not consume meat and meat products, and 18.6% consumed fast food more frequently. As a result of consuming a single type of food, the gut flora is negatively affected, which in turn impacts the immune system and increases the risk of infections (Merdan & Çetin, 2020).

When the study data is examined, a weight loss of 4.4 kilograms was achieved in the 5th month, and the body weight decreased from 119.5 kilograms to 115.1 kilograms. As the process of adapting to the diet progressed, the foods that the autistic adolescent individual avoided but were considered to contribute to their development were added to their diet through trial-and-error method, and information was provided about alternative foods and food preparation strategies to the family. As a result, it was observed that the individual started consuming many foods that they previously did not want to eat. It can be said that this situation affects the eating behaviour and health of the individual positively by increasing the food variety and nutritional quality. It has been observed that methods such as presenting only the preferred food, not allowing him to eat when he refuses, and verbal warning cause eating problems at a rate of 67% (Kodak & Piazza, 2008). In an

intervention study conducted with a 14-year-old male child with autism, it was stated that enriching vegetables with spices and seasonings and presenting them simultaneously helped to promote vegetable consumption and prevent rejection behavior towards vegetables (Ahearn, 2003).

According to the data on the graph, there was a weight gain at week 23 during the 6th month, and a loss of 1.1 kilograms was observed by the end of this month. The reason for the observed weight gain and relatively low weight loss during this period could be attributed to the fact that this period coincided with a holiday week, during which exercise might have been interrupted, and meal patterns might have become irregular due to the holiday celebrations. Additionally, the family might not have been able to provide the necessary care and attention to the diet plan during this time. When working with individuals with special needs, considering family support is one of the most important factors in getting behaviour change accepted and integrated (Peña & Payne, 2022). In a study involving 164 individuals diagnosed with autism between the ages of 4 and 18, food selectivity and consequently obesity were identified as the most significant issues. It was noted that families frequently resorted to methods such as distraction, allowing the child to consume more fluids, giving preferred foods as rewards, but these methods did not effectively resolve eating behaviour problems and did not lead to long-term changes (Bicer & Alsaffar, 2013). In a study involving families of individuals with autism, it was determined that stress factors related to taking care of the children hindered the parents' ability to find time for themselves and prepare healthy meals. Early intervention for behaviour change was emphasized, and providing opportunities for the child to make choices among acceptable options and reducing the quantity of unhealthy choices at home were highlighted. It was also recommended to increase participation in physical activities with the child (Polfuss et al., 2016).

According to the data obtained in the last month, it was observed that there was no change in weight in the first week, but in the last week, there was a difference of 3.1 kilograms, with the weight being 110.9 kilograms. The reasons for the continued weight loss could be attributed to the individual's adaptation to the diet plan, modifications made to the nutrition program based on the individual's consumption patterns, and the continuity of exercise. In a study, the experiences of parents in instilling healthy lifestyle changes in 8 disabled children with excessive weight problems were examined, and their progress was monitored by a dietitian. It was concluded that strategic progress in encouraging physical activity, addressing food selectivity, and making lifestyle changes is essential. Moreover, having expert supervision during this process provided parents with a positive experience. Furthermore, it has been emphasized that personalized programs and recommendations tailored to the individual's specific needs and preferences are more effective than general recommendations (Peña & Payne, 2022). In a study conducted on intellectually disabled and autistic overweight children and adolescents, a 10-week nutrition and physical activity program was implemented to manage weight. At the end of the program, a decrease in the consumption of sugary foods, improvements in their physical health, a reduction in body mass index, and a decrease in waist circumference were observed (Hinckson et al., 2013).

CONCLUSION AND RECOMMENDATIONS

As a result of the research, it was concluded that when individuals with autism who have eating problems are intervened with an adapted physical activity and nutrition program, negative eating behaviors can be changed and obesity, which is frequently encountered in individuals with autism, can be prevented. It was concluded that limited food consumption was expanded with gradual behavioral change, providing nutritional diversity and reducing obsessive behavior. It can be said that a regularly applied diet and exercise program has positive results in normalizing the eating disorders and eating habits of children with autism. Providing socio-economic and psychosocial support to parents is believed to improve both the quality of life of individuals with autism and their parents.

The number of samples in future studies may be increased. The working time can be further extended. Studies can be conducted on children in other groups with special needs (Down, Hyperactivity, mental development deficiency, etc.).

In order to effectively prevent and treat these conditions and to develop early intervention strategies, individualized applications should be made, and the level of physical activity should be increased. In managing food selectivity, obsessive behaviours, and weight issues in individuals with autism, a multidisciplinary approach involving professionals such as doctors, dietitians, physical education experts, and occupational therapists is essential. Programs addressing nutrition issues should be developed, and particular emphasis should be given to behaviour modification. Educating and providing necessary training to families, especially in regard to behaviour change, is crucial in overcoming these challenges. Parents should be sufficiently informed about healthy eating and physical activity by experts. Considering the socio-economic conditions of parents, a personalized diet program should be prepared by a specialist based on the needs of individuals with autism. Low-cost, non-specialized physical activity programs that can be fun for individuals with autism can be prepared to ensure their active participation in physical activity.

Research Limitations

In this study, a single-subject research model was used. In the single-subject research model, a small number of samples can be used. Therefore, the number of samples was limited to one person. In the single-subject research model, since the sample size is not suitable for the presentation of the findings with a table, the representation of the findings is reflected in line graphs.

Conflict of Interest: There are no personal or financial conflicts of interest among the authors regarding the scope of the study.

Authors' Contribution: Study Design; HA, DY –Data Collection; DY –Statistical analysis; HA –Manuscript Preparation; DY, HA.

Ethical Approval
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Decision/Protocol number: E- 87432956.050.99-347127

REFERENCES

Ahearn, W. H. (2003). Using simultaneous presentation to ıncrease vegetable consumption in a mildly selective child with autism. *Journal of Applied Behavior Analysis*, *36*(3), 361–365. https://doi.org/10.1901/jaba.2003.36-361.

Aktitiz, S., Yalçın, E., & Göktaş, Z. (2019). Dietary approaches in the treatment of autism spectrum disorders. *Health Academy Kastamonu, 4*(2), 127–143. https://doi.org/10.25279/sak.435435

Akın, S., & Alp, H. (2019). Effect of adapted game-aided physical education program on the motor skills of children with autism spectrum disorders: Longitudinal case study. *Journal of Curriculum and Teaching*, *8*(3), 63-72. https://doi.org/10.5430/jct.v8n3p63.

Aksoy, Y. (2020). The Effects of physical activities as recreational activities on social communication in children with autism. *Gaziantep University Journal of Sports Sciences*, *5*(1), 1–9. https://doi.org/10.31680/gaunjss.689747.

Al-Heizan, M.O., Alabdulwahab, S.S., Kachanathu, S.J., & Natho, M. (2015). Sensory processing dysfunction among Saudi children with and without autism. *Journal of Physical Therapy Science, 27*(5), 1313–1316. https://doi.org/10.1589/jpts.27.1313

Arslan, E., & İnce, G. (2015). The Effect of a 12-week exercise program on gross motor skill levels of children with a typical autism. *International Journal of Sports, Exercise & Training Sciences*, *1*(1), 51–62. https://doi.org/10.18826/ijsets.66769

Bicer, A. H., & Alsaffar, A. A. (2013). Body mass index, dietary intake and feeding problems of Turkish children with autism spectrum disorder (ASD). *Research in Developmental Disabilities*, *34*(11), 3978–3987. https://doi.org/10.1016/j.ridd.2013.08.024.

Broder-Fingert, S., Brazauskas, K., Lindgren, K., Iannuzzi, D., & Cleave, J. V. (2014). Prevalence of overweight and obesity in a large clinical sample of children with autism. *Academic Pediatrics, 14*(4), 408–414. https://doi.org/10.1016/j.acap.2014.04.004

Çevik-Güner, Ü., & Bilkay, İ. (2022). Parents' perceptions and concerns about obesity in children with autism. *YOBU Journal of Health Sciences Faculty*, *3*(1), 14–24.

Derer, A. (2018). *Examination of physical activity, motor proficiency, and social skill levels in children with autism.* Master Thesis, Pamukkale University, Institute of Health Sciences, Department of Psycho Social Field in Sports, Denizli.

Dhaliwal, K. K., Orsso, C. E., Richard, C., Haqq, A. M., & Zwaigenbaum, L. (2019). Risk factors for unhealthy weight gain and obesity among children with autism spectrum disorder. *International Journal of Molecular Sciences, 20*(13), 1-29. https://doi.org/10.3390/ijms20133285

Fujiwara, T., Morisaki, N., Honda, Y., Sampei, M., & Tani, Y. (2016). Chemicals, nutrition, and autism spectrum disorder: A Mini-Review. *Frontiers in Neuroscience, 10*(APR), 1–7. Article 174. https://doi.org/10.3389/fnins.2016.00174

Girli, A., Özgönenel, S. Ö., Sarı, H. Y., & Ardahan, E. (2016). Assessment of nutritional status in children with autism. *Children and Civilization, 1,* 87–99.

Harris, C., & Card, B. (2012). A Pilot study to evaluate nutritional influences on gastrointestinal symptoms and behavior patterns in children with autism spectrum disorder. *Complementary Therapies in Medicine, 20,* 437–440. https://doi.org/10.1016/j.ctim.2012.08.004

Hinckson, E.A., Dickinson, A., Water, T., Sands, M., & Penman, L. (2013) Physical activity, dietary habits and overall health in overweight and obese children and youth with intellectual disability or autism. *Research in Developmental Disabilities*, *34*(4), 1170–1178. https://doi.org/10.1016/j.ridd.2012.12.006.

Kaya, K., & Alp, H. (2022). Examination of research on the importance of physical education and sports in children with autism: A Meta-Analysis. *International Sport Science Student Studies*, *4*(1), 1–7.

Keskin, B., Hanbay, E., & Kalyoncu, M. (2017). The effects of exercise interventions on sports performance in children with autism aged 5-8 years. *Istanbul University Journal of Sports Sciences*,*7*(2), 50–58.

Kim, Y. S., & Leventhal, B. L. (2015). Genetic epidemiology and insights into interactive genetic and environmental effects in autism spectrum disorders. *Biological Psychiatry, 77,* 66–74. https://doi.org/10.1016/j.biopsych.2014.11.001

Kodak, T., & Piazza, C. C. (2008). Assessment and behavioral treatment of feeding and sleeping disorders in children with autism spectrum disorders. *Child and Adolescent Psychiatric Clinics of North America*, *17*(4), 887–905. https://doi.org/10.1016/j.chc.2008.06.005.

Lang, R., Koegel, L. K., Ashbaugh, K., Regester, A., Ence, W., & Smith, W. (2010). Physical exercise and individuals with autism spectrum disorders: A Systematic review. *Research in Autism Spectrum Disorders*, *4*(4), 565–576.

MacDonald, M., Esposito, P., & Ulrich, D. (2011). The physical activity patterns of children with autism. *BMC Res Notes 4*, 422, 1-5. https://doi.org/10.1186/1756-0500-4-422

Marzouki, H., Soussi, B., Selmi, O., Hajji, Y., Marsigliante, S., Bouhlel, E., Muscella, A., Weiss, K., & Knechtle, B. (2022). Effects of aquatic training in children with autism spectrum disorder. *Biology*, *11*(5), 1–12. Article 657. https://doi.org/10.3390/biology11050657

Mayes, S. D., & Zickgraf, H. (2019). Atypical eating behaviors in children and adolescents with autism, ADHD, others disorders and typical development. *Research in Autism Spectrum Disorders, 64,* 76–83. https://doi.org/10.1016/j.rasd.2019.04.002

Meral, B. F. (2017). Dietary problems in children with autism spectrum disorder and evidence-based behavioral interventions. *Ankara University Faculty of Educational Sciences Journal of Special Education*, *18*(3), 493–508. https://doi.org/10.21565/ozelegitimdergisi.323301

Merdan, F., & Çetin, İ. (2020). Nutrition and gastrointestinal issues in children with autism. *Journal of General Health Sciences*, *2*(3), 126–135. https://doi.org/10.51123/jgehes.2020.3

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 compared to neurotypical children. *International Journal of Eating Disorders*, *54*(12), 2155–2166. https://doi.org/10.1002/eat.23631.

Nor, N. K., Ghozali, A. H., & Ismail, J. (2019). Prevalence of overweight and obesity among children and adolescents with autism spectrum disorder and associated risk factors. *Frontiers in Pediatrics*, *7*(FEB), 1–10. https://doi.org/10.3389/fped.2019.00038.

Odabaş, C. (2016). *Investigation of the effects of regular sports training on individual skills in educable children with autism.* Master's thesis, Bartin University, Institute of Educational Sciences, Department of Physical Education And Sports Teacher, Bartın.

Orhan, B. E. (2014). *The effect of movement education on social skills in autism*. Master's thesis, Gazi University, Institute of Educational Sciences, Department of Physical Education And Sports Teacher, Ankara.

Önal, S., & Uçar, A. (2017). Dietary approaches in the treatment of autism spectrum disorder. *Ankara Journal of Health Sciences, 6*(2), 179–194. https://doi.org/10.1501/Asbd_0000000070

Özdamar, K. (2003). *Modern scientific research methods.* Kaan Publishing House.

Özer, M., & Kurşun, Z. (2022). Dietary approaches in ındividuals with autism spectrum disorder. *Journal Of Sustainable Educational Studies,* (Ö1), 341–348.

Özeren, G. S. (2011). Autism spectrum disorder and a perspective through the lens of evidence. *Acıbadem University Journal of Health Sciences, 2*(4), 184–194.

Peña, C. M., & Payne, A. (2022). Parental experiences of adopting healthy lifestyles for children with disabilities living with overweight and obesity. *Disability and Health Journal*, *15*(1), Article 101215. https://doi.org/10.1016/j.dhjo.2021.101215.

Pitetti, K. H., Rendoff, A. D., Grover, T., & Beets, M. W. (2007). The efficacy of a 9-month treadmill walking program on the exercise capacity and weight reduction for adolescents with severe autism. *Journal of autism and developmental disorders, 37*(6), 997-1006. https://doi.org/10.1007/s10803-006-0238-3

Polfuss, M., Johnson, N., Bonis, S.A., Hovis, S.L., Apollon, F., & Sawin K.J. (2016). Autism spectrum disorder and the child's weight–related behaviors: A Parents' Perspective. *Journal of Pediatric Nursing*, *31*(6), 598–607. https://doi.org/10.1016/j.pedn.2016.05.006.

Sowa, M., & Meulenbroek, R. (2012). Effects of physical exercise on autism spectrum disorders: a meta-analysis. *Research in Autism Spectrum Disorders, 6,* 46–57. https://doi.org/10.1016/j.rasd.2011.09.001

Srinivasan, S. M., Pescatello, L. S., & Bhat, A. N. (2014). Current perspectives on physical activity and exercise recommendations for children and adolescents with autism spectrum disorders. *Physical Therapy*, *94*(6), 875–889. https://doi.org/ 10.2522/ptj.20130157.

Şengüzel, S., Cebeci, A. N., Ekici, B., Gönen, İ., & Tatlı, B. (2021). Impact of eating habits and nutritional status on children with autism spectrum disorder. *Journal of Taibah University Medical Sciences, 16*(3), 413–421. https://doi.org/10.1016/j.jtumed.2020.11.010

Şimşek, F. (2017). *The Effect of stretching exercises on balance performance in children with autism spectrum disorder aged 10-16*. Master's Thesis, Istanbul Gelişim University, Institute of Health Sciences, Department of Coach Education, Bartın.

Toscano, C. V. A., Barros, L., Lima, A. B., Nunes, T., Carvalho, H. M., & Gaspar, J. M. (2021). Neuroinflammation in autism spectrum disorders: Exercise as a "Pharmacological" tool. *Neuroscience and Biobehavioral Reviews, 129,* 63–74. https://doi.org/10.1016/j.neubiorev.2021.07.023

Uçar, K., & Samur, G. (2017). Current dietary treatment approaches in autism therapy. *Nutrition and Dietetics Journal, 45*(1), 53–60.

Uzunçayır, D., & İlhan, E. L. (2021). Being a coach for children with special needs: A Qualitative assessment in accordance with coachers' opinions. G. Hergüner & A. S. Yücel (eds.) *A Multidisciplinary approach to sports and health sciences.* Güven Plus Grup A.Ş. Yayınları:

Vinck-Baroody, O. de, Shui, A., Macklin, E. A., Hyman, S. L., Leventhal, J. M., & Weitzman, C. (2015). Overweight and obesity in a sample of children with spectrum disorder. *Academic Pediatrics, 15*(4), 396–404. https://doi.org/10.1016/j.acap.2015.03.008

Yarımkaya, E., İlhan, E. L., & Karasu, N. (2017). Examination of changes in communication skills of an individual with autism spectrum disorder participating in peer-mediated adapted physical activities. *Ankara University Faculty of Educational Sciences Journal of Special Education, 18*(2), 225–252. https://doi.org/10.21565/ozelegitimdergisi.319423.