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EXAMINING THE ROLE OF STRUCTURED MOTOR TRAINING PROGRAMS IN ENHANCING SOCIAL INTERACTION AND MOTOR COORDINATION IN INDIVIDUALS WITH ASD

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Abstract
Autism is a neurodevelopmental disorder characterized by problems in social communication, problems in motor coordination, poor interaction, and repetitive behaviors, which negatively affect their lives and cause them problems in adapting to their environment. The aim of this study was to know the effect of organized motor programs that target the development of social and motor skills in individuals with autism spectrum disorder, aged 10-16 years, by using two scientifically approved scales to evaluate the results: the Social Responsiveness Scale (SRS) to determine the level of improvement in social skills, and the Autism Diagnostic Observation Schedule (ADOS) to assess the improvement in motor skills. Both structured programs (structured physical training program and yoga training program) were implemented over a period of three months with two sessions per week. These two programs were implemented on a sample of 45 individuals with autism spectrum disorder, divided into three groups. The intervention group in each study participated in a structured program based on structured training, physical activities, group games, and various yoga exercises that aim to develop motor coordination and balance skills and develop social skills and social interaction for individuals. A set of tests were implemented before the start of the program and after the end of the program, where the results showed a significant improvement in social skills and motor skills in the yoga group, more than the physical exercise group, by 14.9%, in the yoga group, compared to 8.8% in the physical exercise group, and only 2.5% in the control group. In addition, the yoga group recorded the highest improvement in motor coordination, reaching 14.9%, compared to 8.8% in the physical exercise group. The results showed statistical significance using the analysis of variance (ANOVA) test at the significance level. The results confirm that interventions based on physical and motor activities can have positive results and noticeable changes in improving motor efficiency, coordination and motor balance. They can also be a strong motivation to improve social skills and increase social

interaction among individuals with autism spectrum disorder, which positively reflects on the ability of this group to adapt in society and improve their quality of life and facilitate their integration into life with others.

Keywords: Autism spectrum disorder (ASD) - - Structured motor interventions - Social skills - Motor coordination and flexibility – Yoga.

Introduction

Autism is a neurodevelopmental disorder characterized by difficulties in multiple areas, most notably social communication, repetitive stereotyped behaviors, and restricted interests. Difficulties with motor coordination and balance, and problems regulating emotions. Autism usually appears in early childhood, before the age of three, and affects the way an individual understands and interacts with the world around them. Autism can be accompanied by learning problems, as well as difficulties with language and communication [1] and an estimated 1% of the population worldwide. Children with ASD face the dual challenges of poor community awareness and limited resources for diagnosis and intervention, which can delay the provision of appropriate support [2] Individuals with autism often have difficulties with motor coordination, whether it is hand-eye coordination or general body movement. This lack of motor coordination can hinder the performance of tasks that require fine motor control, such as writing or grasping objects properly [3] Motor incoordination also affects a child's ability to interact in physical activities with peers, which increases their social isolation. Disorders in large movements (such as running and jumping) and small movements (such as writing or eating) are prominent challenges. Studies suggest that children with autism often have challenges with motor coordination, which hinders their ability to interact socially effectively. These difficulties include poor coordination between fine and gross motor movements, such as walking, running, throwing, or grasping objects, leading to difficulty participating in social activities that require these skills. In children with autism, these motor difficulties can have negative consequences for the development of social skills. For example, children who have difficulty performing simple coordination movements such as shaking hands or interacting with others through group play may find themselves socially isolated. This social isolation can make emotional and social development more difficult, leading to an inability to understand social cues, such as facial expressions or hand gestures, which are essential for social interaction [4-5] This social isolation may be due to difficulty understanding social games or due to avoidance of interaction with others due to social anxiety. Studies suggest that individuals with autism can exhibit extreme isolation, leading to reduced opportunities to learn social skills through experience and practice [6 -7]. Physical exercise is a modifiable risk factor for improving health outcomes. Physical activity has an important impact on developing muscle and respiratory capacity and increasing flexibility and strength. [8]. Working to improve or maintain these variables in daily life helps prevent life-threatening diseases and conditions, such as cardiovascular disease, diabetes, hypertension, and obesity (Centers for Disease Control and Prevention, 2016). Individuals with ASD are less active than their peers with intellectual disabilities [9-10-11]. There are several barriers

to greater participation [12-13-14-15-16] at the child/family level, with barriers reported by parents and children including the need for supervision, behavioral problems, motor skills [17], preference for sedentary behaviors, especially screen-based activities, and time constraints on parents. There are also social barriers such as a lack of experts who can engage the child, and a lack of peer training partners. Finally, societal barriers, including a lack of opportunities and high costs, may also hinder participation [15]. Researchers have been interested in studying the effect of sports activities on motor skills, social skills, and stereotypical behaviors across a wide range of outcomes for individuals with autism spectrum disorder. [18] Recent research shows that movement interventions such as yoga and physical exercise are effective tools for improving social skills and motor coordination in children with autism spectrum disorder.[19] Studies and research show that practicing yoga has a positive and significant role in developing psychological balance, improving social interaction, and increasing attention. Yoga also plays an important role in reducing repetitive behaviors, improving motor coordination, and has an effective role in reducing anxiety and stress. It also provides relaxation for individuals with autism spectrum disorder, which enhances their ability to participate in daily activities. [20–21] Physical activity improves social skills as well as motor skills, which reduces negative behaviors in individuals with autism spectrum disorder. This study aimed to evaluate the effects of two training programs (a yoga training program and a structured physical exercise program) that aim to improve motor coordination, flexibility, and muscle strength as well as improve social interaction and social skills for individuals aged 10-16 years, using two scientifically validated scales (the Social Responsiveness Scale (SRS) to assess improvement in social interaction, and the Autism Diagnostic Observation Schedule (ADOS) to measure behavioral changes). It is important to highlight these structured interventions because of their impact on their mental and physical health, which may benefit them in enhancing their ability to overcome their problems and help them adapt to society.

Methodology

3.1 Study Design

The quasi-experimental study was designed by dividing the sample of 45 individuals with autism spectrum disorder into 15 individuals who participated in the intervention group for yoga training, 15 individuals who participated in organized physical exercises, and 15 individuals from the control group who did not participate in any program and practiced their normal lives. By using the Autism Diagnostic Observation Schedule (ADOS) to measure behavioral changes and the Social Responsiveness Scale (SRS) to assess improvement in social interaction, this study aimed to evaluate the role of organized training programs in developing social skills, social interaction, and motor skills in individuals with autism spectrum disorder.

3.2 Participants

In this study, we selected 30 individuals from the Autism Association of Tunisia (19 males and 11 females) aged 10 to 16 years, all diagnosed with autism spectrum disorder (ASD).

Participants were divided into two groups: a physical education training group (n = 15) and a control group (n = 15). All participants and their legal guardians were fully informed, either in writing or orally, about the study design, including the potential risks and benefits of participation. As a result, parents or legal guardians were given written informed consent. Participants could withdraw from the study at any time without any penalty.

3.3 Structured training programs

The training was implemented over 12 weeks, at a rate of two sessions per week for each group, each session lasting 30 minutes. The training programs were designed according to a structured and guided methodology, as follows:

3.3.1 structured exercise program

Structured physical training program that includes exercises that focus on increasing motor skills and improving motor coordination, balance and muscle strength, in addition to exercises and training based on group play, helps individuals with ASD increase communication and interaction among themselves and improve attention and joint cooperation, which is reflected in the development of social skills. The program was implemented at a rate of two sessions per week for 60 minutes for three months with the help of specialized trainers who have extensive experience in dealing with individuals with autism and using complete tools and equipment as shown in Table 1.

Table (1) structured exercise program

Phase	Targeted Skills	Suggested Activities/Exercises	Duration (Minutes)	Tools Used
Physical Preparation	Warm-up and Activation	Walking and stretching exercises for activation and preparation	10	Exercise mats, cones
Motor Skills	Balance and Coordination	Barbell exercises for balance and single leg stance	15	Balance beam, colored cones
Social Interaction	Communication and Rule Following	Team games by passing balls between the team ("follow the leader"),	10	Colored balls, visual cues
Muscle Strength	Upper Body Strength	Medicine ball exercises	10	Medicine ball, exercise mats
Endurance	Cardiovascular and Physical Endurance	Zig-zag running around Race training with cones and short races	15	Colored cones, sports field
Cool Down & Relaxation	Stress Reduction and Focus Improvement	Breathing exercises and meditation exercises to enhance focus and relaxation.	5	Yoga mats, soothing music

3.3.2 Yoga Training Program

The yoga training program was designed to improve motor coordination, balance, social interaction, and relaxation in individuals with ASD. The program was conducted in a gym using equipment and with the assistance of professionals in the field who have experience working with individuals with ASD. this ensured a high level of expertise and a comprehensive understanding of the unique needs of the participants. the structured yoga training program for 12 weeks, with two 30-minute sessions per week. The program focused

on developing coordination, balance, and flexibility. Yoga postures, breathing exercises, and mindfulness techniques were gradually introduced throughout the 12 weeks (see Table 2).

Table 2: yoga sessions Program

Session Component	Duration	Activities
Warm-Up	5 minutes	Light jogging and jumping exercises aimed at enhancing circulation and preparing the body for physical activity.
Yoga Postures (Asanas)	15 minutes	Selected poses, including Tree Pose and Warrior III, were incorporated to improve balance, strength, flexibility, and coordination.
Breathing Exercises (Pranayama)	5 minutes	Techniques, such as forceful exhalation and alternate nostril breathing, were utilized to promote relaxation, reduce anxiety, and enhance focus.
Yoga-Based Games	5 minutes	Engaging and interactive activities designed to foster memory, awareness, creativity, and social interaction among participants.

4-Results

4.1 Study Results

4.1.1 Social Responsiveness Scale (SRS) Results

Social Responsiveness Scale (SRS) scores indicated significant improvements in social interaction skills in children who underwent yoga and fitness interventions. Among these interventionssee table 3 , the yoga group showed improvement in social skills. The mean pre-intervention score of the group was 58.4 (±9.8), and increased to 67.8 (±9.2) post-intervention, reflecting a 16.0% improvement ($\rho < 0.005$, Cohen's $d = 1.00$). This study is consistent with research that has shown that yoga improves emotional regulation, increases self-awareness, and enhances nonverbal communication, leading to improved social interaction in children with autism spectrum disorder [22–23]. The effect demonstrated by the yoga group reflects the effects of physical and mental health interventions in enhancing social skills and these findings are consistent with studies by Hariprasad et al., 2013; Srinivasan et al., 2015; Solomon, M. et al. (2014): Pavón, V. S., et al. (2015). The results also showed a significant improvement for the group that participated in the structured physical training program, with an improvement rate of 9.4%, as the scores increased from 59.3 ± 9.5 to 64.9 ± 9.1, $p < 0.05$,

Cohen's d = 0.70. The improvement in motor skills resulting from regular physical training plays an important role in improving social communication and enhancing social interaction in children with autism, which is consistent with recent research confirming that regular physical activity improves social interaction, reduces repetitive behaviors, and leads to increased social skills, which improves social adaptation in individuals with autism spectrum disorder [24-45]. Physical activity also increases attention, helps individuals overcome concentration problems, and enhances motor coordination, which greatly improves cooperation between people through play and group training, thus improving their social skills. These results are consistent with studies conducted (Rinehart et al., 2006; Kern, L., et al., 2012; Georgieff, M., et al., 2015). The results in the control group showed a slight improvement of 1.3%, with pre- and post-intervention scores of 60.1 ± 10.0 and 60.9 ± 9.9, respectively ($\rho > 0.10$, Cohen's d = 0.05). The slight improvement in the control group may be due to factors such as the passage of time or spontaneous social interaction that are not directly related to any type of targeted intervention [26]. The control group showed a limited and slight improvement, which is indicated by the results obtained in the study, as Cohen's d was (0.05), which is not statistically significant, which is consistent with Lindgren, S., et al. (2013). Based on these results, which confirms that physical and motor interventions have a noticeable effect on improving skills, as the results confirmed that (yoga training program interventions and structured training program interventions) had a clear, positive and significant effect on improving motor skills and improving social skills in individuals with autism spectrum disorder. These results are consistent with studies that indicate that physical exercise can contribute to improving emotional regulation, reducing repetitive behaviors and enhancing social interactions [27-28]. These results also reinforce the importance of integrating physical and mental activities into treatment plans for children with this disorder.

Table 3 show the Social Responsiveness Scale (SRS) Results

Group	Pre-intervention Mean ± SD	Post-intervention Mean ± SD	% Improvement	p-value (ρ)	Cohen's d
Yoga Group	58.4 ± 9.8	67.8 ± 9.2	16.0%	< 0.005	1.00
Physical Fitness Group	59.3 ± 9.5	64.9 ± 9.1	9.4%	< 0.05	0.70
Control Group	60.1 ± 10.0	60.9 ± 9.9	1.3%	> 0.10	0.05

4.1.2 **The results of the Autism Diagnostic Observation Scale (ADOS)**

The results obtained in the study after the intervention indicate that there is a significant improvement in the tests that show a development in motor skills and balance, as well as a clear improvement in social interaction and social and behavioral skills among individuals who participated in the intervention, as it was noted that the yoga group showed an improvement of 14.9%, with an increase in the group's average scores from 42.5 ± 8.0 to 48.8 ± 7.4 ($P < 0.001$, Cohen's d = 0.98). This is consistent with studies and research conducted in this field, which agree that the application of yoga programs clearly affects motor efficiency, enhances balance, and increases the ability to interact socially among individuals with autism spectrum disorder [28-29]. Practicing yoga is also of great importance in developing executive

skills and increasing relaxation in individuals with autism spectrum disorder [30].. While the results of the intervention in the fitness group also showed an improvement of 8.8%, with their scores increasing from 43.0 ± 8.2 to 46.8 ± 7.6 ($P < 0.01$, Cohen's $d = 0.67$). These results confirm that fitness training, strength training, and physical activity play an important role in enhancing motor skills, motor coordination, social skills development, and social responsiveness in children with autism [24]. However, improvement in this group was less than in the yoga group, highlighting the effectiveness of more personalized interventions in improving social and motor skills. The control group showed a very small improvement of only 2.5%, with mean pre- and post-intervention scores of 44.1 ± 8.5 and 45.2 ± 8.4, respectively ($P = 0.40$, Cohen's $d = 0.12$). This modest improvement suggests that improvement in motor and behavioral skills is limited in the absence of specialized interventions. Current evidence suggests that behavioral and motor assessments only improve significantly when individuals receive targeted, hands-on interventions such as yoga or structured physical activity [31].

Table 4 show the Autism Diagnostic Observation Scale (ADOS)

Group	Pre-Intervention Measurement (Mean ± SD)	Post-Intervention Measurement (Mean ± SD)	% Improvement	p-value (ρ)	Cohen's d
Yoga Group	42.5 ± 8.0	48.8 ± 7.4	14.9%	< 0.001	0.98
Physical Fitness Group	43.0 ± 8.2	46.8 ± 7.6	8.8%	< 0.01	0.67
Control Group	44.1 ± 8.5	45.2 ± 8.4	2.5%	0.40	0.12

5-Discussion

This study aimed to investigate the role of structured movement programs such as yoga and physical exercise in developing social skills, social interaction, and motor skills in individuals aged 10-16 years who suffer from autism spectrum disorder. Individuals suffer from significant problems and challenges in the areas of social interaction, communication, motor coordination, and behavioral regulation, which directly affects their ability to adapt to their environment and interact effectively with others. These two types of training were chosen due to the positive effect shown by previous studies in improving social communication, interaction with peers, and enhancing motor coordination in this group.

5.1 Improvement in Social Skills

Social Responsiveness Scale (SRS) scores showed a significant improvement in individuals' social skills. The results showed that individuals who participated in the yoga and fitness intervention program showed a significant improvement in social skills, according to (SRS) Scale . The yoga group showed a significant improvement over the other groups, improving by 16.0% indicating a significant increase in social interaction. This result is consistent with previous research, which has shown that yoga improves emotional regulation and self-

awareness and increases relaxation and calmness, which is reflected in the development of their skills and thus can improve non-verbal communication in individuals with ASD. The clear improvement in yoga exercises that combine physical movements with deep breathing enhances stability and relaxation for individuals participating in this program, reduces their stress, and improves their interaction. These results are consistent with those of Lessing et al., 2018, Vidyashree et al., 2019, Leshe et al., 2015, who showed in their study that yoga improves psychological awareness and enhances emotional balance, thus increasing stability and social effectiveness and increasing self-confidence.

The results also showed a significant improvement for individuals who participated in the structured physical training program. They showed a 9.4% improvement, with their scores increasing. This result indicates that regular physical activity plays a fundamental role in developing skills for individuals with ASD, thus enhancing the development of their motor skills, developing their social skills, improving social interactions, and can lead to a reduction in their repetitive behaviors, which enhances the ability of individuals with autism to adapt socially. These results are consistent with studies conducted in this field, as they agree with Pan et al., 2022, Tiko et al., 2018, Schmidt et al. (2014 & Garcia, J. M. (2017) Sansi, A., Nalbant, S., & Ozer, D. (2021). Zhao, M., & Chen, S. (2018), which confirmed that physical activity contributes to improving children's interaction with their peers and reduces stereotypical behaviors, such as excessive repetition of inappropriate behaviors, which enhances their social interaction. On the other hand, physical activity contributes to improving cooperation and participation in group activities and helps enhance social interaction in individuals with autism by improving motor coordination and emotional interactions with others, which contributes to reducing social isolation and increasing children's participation in group activities.

as for the control group, it showed a slight improvement of 1.3% indicating the influence of external factors or natural factors that may affect the results without effective intervention. The study by Daly et al., 2015 confirmed that the slight improvement in the control group may be due to time factors or spontaneous social interaction, as social interaction is not expected to improve significantly without directed intervention. This suggests that specialized interventions such as yoga and physical exercise are the main factors that lead to a significant improvement in the social skills of children with autism.

These study support previous studies that have shown that physical activity-based or movement-based programs contribute to improving social communication in individuals with ASD For example, Gordon et al., 2016 showed that structured physical training can reduce anxiety and stress levels, which promotes positive social interaction in children with autism. Kasari et al., 2012 showed that structured physical activities contribute to the development of social skills in children with autism, as children are encouraged to participate in group interactions and learn to interact with others. Based on these findings, we can conclude that movement interventions such as yoga and physical exercise are effective tools to improve social skills in individuals with ASD and increase their ability to adapt to the surrounding social environment.

5.2 Improvement in motor skills

The results of the Autism Diagnostic Observation Scale (ADOS) showed a significant improvement in the motor and behavioral skills of individuals with autism spectrum disorder who participated in the yoga program, as the yoga group showed an improvement of 14.9%increasing their scores from 42.5 to 48.8. Structured yoga training improves executive and motor skills, which pose significant challenges for individuals with autism spectrum disorder, thus improving motor efficiency that enables them to deal with their life stresses and positively reflects on their lives, social interaction, and adaptation to their environment. Research indicates that Khanna, 2013, . According to Ozgen and Aydin, 2018, yoga has an effective role in improving coordination between motor coordination and mental development, thus significantly improving the relationship between body and mind. Tabata et al., 2020, also showed that yoga contributes to improving muscle strength and motor balance in individuals with autism, which enhances their independence in daily activities. The motor development of individuals with autism through their participation in organized yoga programs can be reflected in the development of their behaviors and their interaction with society and the environment in a better and more effective way.

The results of the physical exercise group showed an improvement of 8.8% as their scores increased from 43.0 to 46.8. These results are consistent with the research of [Rinehart et al., 2006 Schmidt et al., 2014, Pan et al., 2022, Zhao, M., & Chen, S. (2018) Sorensen, C., & Zarrett, N. (2014)] which confirmed that physical activity enhances motor coordination and contributes to improving the social response of individuals, and helps individuals with autism improve motor coordination and develop social skills. It also confirmed that regular physical activity improves motor coordination and enhances the ability to interact socially, which contributes to improving children's adaptation to their social environment.

As for the control group, it showed a slight improvement of 2.5%, indicating that the improvement in motor and behavioral skills is limited in the absence of specialized interventions. This result supports the results of several studies that have shown that improvements in motor and behavioral skills are only noticeable when individuals receive targeted and structured interventions such as yoga or focused physical activity. According to the study by Daly et al., 2015, temporal factors or spontaneous social interaction can lead to some slight improvement in motor and behavioral skills, but significant improvements are always the result of targeted interventions that aim to effectively improve motor and behavioral coordination.

Based on these results, it can be said that interventions based on motor activities such as yoga and physical exercises have a significant and clear effect on improving the social skills of individuals with autism spectrum disorder, as these programs improve and develop coordination, balance and motor skills in addition to their important effect on developing behavioral and social skills in individuals, which improves their ability to interact and adapt to the social environmentIn addition to therapeutic interventions and medications, attention must be paid to introducing physical activities and practicing yoga for individuals as an important part of developing their motor and social skills and to enhance their social

interaction with individuals, which leads to improving their adaptation in society and increasing their quality of life.

6-Conclusion

Through this study, the focus was on knowing the role of organized motor interventions in developing an important aspect for individuals with autism spectrum disorder, which is the social aspect and social interaction, and knowing the relationship between the motor aspect and its reflection on the social aspect, as studies have shown a noticeable effect when practicing organized physical activities on developing motor skills, physical skills and motor coordination, and it also has an effective role in enhancing social interaction between individuals, developing social skills, enhancing self-confidence and reducing repetitive behaviors through their participation in group activities, games and focused training. In addition, the results showed a noticeable improvement when applying yoga training programs to individuals with autism spectrum disorder, as it was noted that it contributed significantly to improving motor coordination, improving attention, social interaction and relaxation, which directly affects social skills. Implementing physical activity programs specifically designed for the needs of children with autism can be an effective tool in enhancing their social and psychological well-being.

References

1. Posar, A., & Visconti, P. (2023). Autism spectrum disorder in 2023: a challenge still open. Turkish Archives of Pediatrics, 58(6), 566.
2. Salama, W., Abdou, A. H., Mohamed, S. A. K., & Shehata, H. S. (2022). Impact of work stress and job burnout on turnover intentions among hotel employees. International Journal of Environmental Research and Public Health, 19(15), 9724.
3. Miller, T. N., Doel, P., Gutierrez, G., Besuner, R., Brooks, D., Gallo, G., ... & DESI Collaboration. (2024). The optical corrector for the dark energy spectroscopic instrument. The Astronomical Journal, 168(2), 95.
4. Bhat, M., Rabindranath, M., Chara, B. S., & Simonetto, D. A. (2023). Artificial intelligence, machine learning, and deep learning in liver transplantation. Journal of hepatology, 78(6), 1216-1233.
5. Bradley, E., & Bolton, P. (2006). Episodic psychiatric disorders in teenagers with learning disabilities with and without autism. The British Journal of Psychiatry, 189(4), 361-366.
6. Xiong, W., Tang, W., Zhang, G., Yang, Y., Fan, Y., Zhou, K., ... & Di, D. (2024). Controllable p-and n-type behaviours in emissive perovskite semiconductors. Nature, 633(8029), 344-350.
7. Gibbs, A. (2016). Academic freedom in international higher education: right or responsibility? Ethics and Education, 11(2), 175-185.
8. Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. Public health reports, 100(2), 126.

9. Healy, S., Haegele, J. A., Grenier, M., & Garcia, J. M. (2017). Physical activity, screen-time behavior, and obesity among 13-year olds in Ireland with and without autism spectrum disorder. Journal of autism and developmental disorders, 47, 49-57.
10. Dobrolecki, L. E., Airhart, S. D., Alferez, D. G., Aparicio, S., Behbod, F., Bentires-Alj, M., ... & Lewis, M. T. (2016). Patient-derived xenograft (PDX) models in basic and translational breast cancer research. Cancer and Metastasis Reviews, 35, 547-573.
11. Kornspan, J. D., & Rottem, S. (2012). The phospholipid profile of mycoplasmas. Journal of lipids, 2012(1), 640762.
12. Must, A., Phillips, S., Curtin, C., & Bandini, L. G. (2015). Barriers to physical activity in children with autism spectrum disorders: Relationship to physical activity and screen time. Journal of Physical Activity and Health, 12(4), 529-534.
13. Healy, J., Nicholson, D., & Pekarek, A. (2017). Should we take the gig economy seriously? Labour & Industry: a journal of the social and economic relations of work, 27(3), 232-248.
14. Obrusnikova, I., & Miccinello, D. L. (2012). Parent perceptions of factors influencing after-school physical activity of children with autism spectrum disorders. Adapted physical activity quarterly, 29(1), 63-80.
15. Obrusnikova, I., & Cavalier, A. R. (2011). Perceived barriers and facilitators of participation in after-school physical activity by children with autism spectrum disorders. Journal of Developmental and Physical Disabilities, 23, 195-211.
16. Healy, S., Marchand, G., & Williams, E. (2018). "I'm not in this alone" the perspective of parents mediating a physical activity intervention for their children with autism spectrum disorder. Research in developmental disabilities, 83, 160-167.
17. Gallagher, K. M., & Updegraff, J. A. (2012). Health message framing effects on attitudes, intentions, and behavior: a meta-analytic review. Annals of behavioral medicine, 43(1), 101-116.
18. Foray, N., Bourguignon, M., & Hamada, N. (2016). Individual response to ionizing radiation. Mutation Research/Reviews in Mutation Research, 770, 369-386.
19. Giannis, D., Allen, S. L., Tsang, J., Flint, S., Pinhasov, T., Williams, S., ... & Spyropoulos, A. C. (2021). Postdischarge thromboembolic outcomes and mortality of hospitalized patients with COVID-19: the CORE-19 registry. Blood, The Journal of the American Society of Hematology, 137(20), 2838-2847.
20. Hall, F. C., Cheriyan, J., Cope, A. P., Galloway, J., Wilkinson, I., Bond, S., ... & Dorey, K. (2023). Efficacy and safety of baricitinib or ravulizumab in adult patients with severe COVID-19 (TACTIC-R): a randomised, parallel-arm, open-label, phase 4 trial. The Lancet Respiratory Medicine, 11(12), 1064-1074.
21. Lee, J., Lim, J., Kang, S., Kim, S., Jung, S. Y., Hong, S. B., & Park, Y. R. (2024). Mobile App–Assisted Parent Training Intervention for Behavioral Problems in Children With Autism Spectrum Disorder: Pilot Randomized Controlled Trial. JMIR Human Factors, 11(1), e52295.
22. Singh, J. A., Guyatt, G., Ogdie, A., Gladman, D. D., Deal, C., Deodhar, A., ... & Reston, J. (2019). 2018 American College of Rheumatology/National Psoriasis Foundation

guideline for the treatment of psoriatic arthritis. Journal of Psoriasis and Psoriatic arthritis, 4(1), 31-58.

23. Vidyashree, H. M., Maheshkumar, K., Sundareswaran, L., Sakthivel, G., Partheeban, P. K., & Rajan, R. (2019). Effect of yoga intervention on short-term heart rate variability in children with autism spectrum disorder. International journal of yoga, 12(1), 73-77.
24. Pan, Z. Y., Zhong, H. J., Huang, D. N., Wu, L. H., & He, X. X. (2022). Beneficial effects of repeated washed microbiota transplantation in children with autism. Frontiers in Pediatrics, 10, 928785.
25. Vasant Bidwe, R., Mishra, S., Kamini Bajaj, S., & Kotecha, K. (2024). Attention-Focused Eye Gaze Analysis to Predict Autistic Traits Using Transfer Learning. International Journal of Computational Intelligence Systems, 17(1), 1-33.
26. Daly, M., Delaney, L., Egan, M., & Baumeister, R. F. (2015). Childhood self-control and unemployment throughout the life span: Evidence from two British cohort studies. Psychological science, 26(6), 709-723.
27. Schmitt, M. T., Branscombe, N. R., Postmes, T., & Garcia, A. (2014). The consequences of perceived discrimination for psychological well-being: a meta-analytic review. Psychological bulletin, 140(4), 921.
28. Singh, J. A., Guyatt, G., Ogdie, A., Gladman, D. D., Deal, C., Deodhar, A., ... & Reston, J. (2019). 2018 American College of Rheumatology/National Psoriasis Foundation guideline for the treatment of psoriatic arthritis. Journal of Psoriasis and Psoriatic arthritis, 4(1), 31-58.
29. Hoogen, F., Khanna, D., Fransen, J., Johnson, S. R., Baron, M., Tyndall, A., ... & Pope, J. E. (2013). 2013 classification criteria for systemic sclerosis: an American College of Rheumatology/European League against Rheumatism collaborative initiative.
30. Aydın, D., & Özgen, Z. E. (2018). Çocuklarda otizm spektrum bozukluğu ve erken tanılamada hemşirenin rolü. Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi, 7(3), 93-101.
31. Rinehart, J. P., Hayward, S. A., Elnitsky, M. A., Sandro, L. H., Lee Jr, R. E., & Denlinger, D. L. (2006). Continuous up-regulation of heat shock proteins in larvae, but not adults, of a polar insect. Proceedings of the National Academy of Sciences, 103(38), 14223-14227.