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Research Article

The Effect Of Corrective Exercises With The Janda Approach On Balance, Coordination, Motor Performance, And Quality Of Life In Autistic Children With Lower Cross Syndrome.

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Abstract

Lower Cross Syndrome is a postural imbalance causing anterior-posterior and upper-lower muscle asymmetry in the trunk. This syndrome is observed in children with autism due to neurological impairments and motor defi-ciencies. This study aims to examine the effect of corrective exercises based on the Janda approach on balance, coordination, motor performance, and quality of life in autistic children with lower cross syndrome.

This semi-experimental study included 24 autistic children who were randomly divided into two groups: 12 in the experimental group and 12 in the control group. The experimental group underwent Janda-based correc-tive exercises for eight weeks, three sessions per week, lasting 30–40 minutes per session. Pre-test and post-test assessments included balance and coordination tests (KTK test), motor performance evaluation (FMS test), autism screening questionnaire, and the modified checklist for quality of life assessment. Statistical analysis was conducted using SPSS software, employing Shapiro-Wilk, Levene's test, independent t-test, and ANCOVA, with a significance level of $p \leq 0.05$.

Keywords : *Lower Cross Syndrome, Autism Spectrum Disorder, Balance, Coordina-tion, Motor Performance, Quality of Life.*

INTRODUCTION

Motor Impairments and Parental Stress in Autism Spectrum Disorder: The Impact of Lower Cross Syndrome.

Individuals with autism spectrum disorder (ASD) experience complex neurodevelopmental impairments, which manifest in a heterogeneous range of symptoms. Autism is estimated to affect **13.4 per 1,000 children** and is characterized **by repetitive and restrictive behaviors, motor stereotypies, and communication disorders**, which persist throughout life. These challenges are often accompanied by **sleep and eating difficulties, non-verbal communication deficits, emotional dysregulation, and motor impairments**.

One of the most significant motor abnormalities in autistic children is **Lower Cross Syndrome**, which **affects balance, coordination, motor performance, and quality of life[1-4]**. Previous studies indicate that **the stress levels of parents of autistic children are significantly higher** than those of parents with neurotypical children or children with other disabilities. In existing research, **parental stress is identified as an independent factor affecting the development and well-being of autistic children and their parents**, ultimately **reducing the quality of life for children with ASD[5]**.

Lower Cross Syndrome and Its Impact on Motor Function

Lower Cross Syndrome is associated with **tightness in the lumbar extensors and hip flexors**, combined with **weakness in the deep abdominal and gluteal muscles**. Janda classified Lower Cross Syndrome into two types:

Type A: Characterized by increased hip extension and lumbar movement.

Type B: Characterized by greater lumbar flexion and abdominal instability[38].

One of the primary impairments in autistic children is **reduced motor function**. Studies indicate that **physical interventions can enhance motor skills, social performance, strength,**

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and endurance in children with ASD. Initial assessments of motor skills **can serve as a valuable screening tool for autism**. Several aspects of motor skills in autistic individuals have been examined, revealing **significant impairments in static and dynamic balance, motor planning, coordination, and fine motor precision[6-8]**.

Children with autism not only experience **social and communication limitations** but also **motor impairments**, including **timing deficits and poor postural coordination. Developmental Coordination Disorder (DCD)** is a common **neurodevelopmental condition closely related to ASD**. Both conditions often co-occur, making postural control and motor coordination **essential components of functional independence**.

Postural control refers to the ability to **maintain, achieve, or restore a state of balance during any activity**. From a **cognitive science perspective**, balance control is particularly **complex**, as it involves **the integration of sensory processing, motor planning, and precise muscle activation[9-12]**. Motor coordination difficulties in autistic individuals emerge in early childhood and persist into adulthood, often affecting **fine motor control, eye-hand coordination, and postural stability**. These challenges may also impact **motor imagery and movement visualization[12-9]**.

The Importance of Corrective Exercises

Numerous studies have highlighted the positive impact of **balance training (13-15), coordination exercises (16-17), and motor skill interventions (18-19)** on the quality of life (20-22) in children with autism. Given these findings, the present study aims to **investigate the effects of Janda-based corrective exercises on balance, coordination, motor performance, and quality of life in autistic children with Lower Cross Syndrome**.

MATERIALS AND METHODS

From among the autistic children at the Doost Autism Center in Tehran, **24 children** with **Lower Cross Syndrome**, identified through the **Thomas Test**, were selected based on the inclusion criteria for the study. They were randomly divided into two equal groups, and informed consent forms along with a **modified screening checklist** were given to their families. The consent form explained that participants **could withdraw at any stage of the research if they wished**.

One group was the **experimental group (12 children)**, consisting of autistic children who performed **Janda-based corrective exercises**. The control group (12 children) included autistic children who did **not** participate in the corrective exercise program.

The **inclusion criteria** consisted of **boys and girls aged 6–16 years** diagnosed with **Lower Cross Syndrome and autism**, possessing **medical records**, and having an **IQ between 50 and 80**, as classified by the **Stanford-Binet Intelligence Scale**.

The **exclusion criteria** included **injuries and pain during the study, absence of medical records, missing more than two or three non-consecutive training sessions, and parents' unwillingness to continue participation**.

The **Janda-based corrective exercise protocol** included **three sessions per week, each lasting 30–40 minutes, over a period of eight weeks (two months)**.

Research Instruments

In this study, **the Thomas Test** was used to diagnose **Lower Cross Syndrome** in autistic children. The measurements were recorded using a **goniometer**. The child was placed in a **supine position on a platform**, and their **dominant leg was brought towards the abdomen**. Some children were able to hold their own leg, while others required assistance. The **non-dominant leg was measured using the goniometer**, with its **center positioned at the greater trochanter**. The **movable arm of the goniometer** was aligned with the midline of the femur, while the fixed arm was positioned along the body's midline. The **initial angle of measurement was 180 degrees**, and as the **stationary leg bent**, the movement of the **goniometer's arm was recorded**. The same test was repeated for the **non-dominant leg**.

The **Thomas Test** allows practitioners to assess four muscles that are prone to tightness:

- **Iliopsoas muscle,**
- **Rectus femoris muscle,**
- **Tensor fasciae latae,**
- **Iliotibial band[23].**

To **assess quality of life**, the **modified autism screening checklist** for **toddlers** was used.

To **evaluate balance and coordination**, the **KTK Test** was administered, which includes four components:

1. ***Walking on three beams (BB):*** Participants walk **forward** and **backward** on three beams of different widths (**3m length, 6cm, 4.5cm, and 3cm widths,** and **5cm height**). Each participant had **three attempts**, taking **24 steps per beam**, with a maximum total score of **72 points (3 × 3 × 8 = 72)**.
2. ***Side jump (JS):*** Jumping laterally over a **60cm-long, 4cm-wide, and 2cm-high beam** for **15 seconds**. The **number of correct jumps** was recorded.
3. ***Lateral movement (MS):*** Participants were required to **move a wooden plank (25cm × 25cm × 2.5cm) from one side to another** within **20 seconds** while stepping onto each plank. The **total number of moved planks** was counted.
4. ***Single-leg hopping (HH):*** Hopping on foam pads **(60cm length, 20cm width, 5cm height). Each successful**

hop added an extra foam layer, with a maximum score of **78 points**. The **first foam scored 3 points, the second scored 2, and the third scored 1[24-26]**.

The **KTK test** demonstrated a **reliability coefficient of 0.97**, ensuring sufficient validity for raw scores **(WB: 0.80, MS: 0.84, HH: 0.96, JS: 0.95)[26]**.

To **assess motor function**, the **FMS (Functional Movement Screen)** was used, consisting of:

1. Squat
2. Step-over hurdle
3. Inline lunge
4. Shoulder mobility
5. Active straight leg raise
6. Core stability
7. Rotary stability

Scoring Criteria

- **3 points:** If the participant **performed the movement correctly without compensation**.
- **2 points:** If the movement was **completed but with compensatory mechanics**.
- **1 point:** If the **movement could not be performed correctly, even with compensation**.
- **0 points:** If the participant **experienced pain** during the movement[27].

The **maximum score for the FMS test was 21 points**, and a **score ≤14 indicated a high risk of sports-related injuries**. The **FMS test reliability coefficient was reported at 0.97**, confirming its **accuracy for adolescent assessments[27]**.

Table 1.

Week 1 **Warm-up**: Walking on a balance beam **forward and backward**.	
Seated squats	**2 sets of 10 reps**
Standing STR (front)	**2 sets of 10 reps**
Standing STR (back)	**2 sets of 10 reps**
Hip bridge	**2 sets of 10 reps**
Leg stepping over obstacles	**3 rounds with a 3-second pause**
Pilot sit-ups	**2 sets of 10 reps**
Week 2 **Warm-up**: Walking on a balance beam **forward and backward with a futsal ball**.	
Wall squats	**3 sets of 15 seconds**
Standing STR (side)	**3 sets of 10 reps**
Lying under-belly straight leg raise	**3 sets of 10 reps**
Hip bridge with foot on step	**3 sets of 10 reps**
Step-up with knee raise	**2 sets of 10 reps**
Hamstring stretch	**3 sets of 10 seconds**
Week 3 **Warm-up**: Walking on a narrow balance beam **forward and backward with a futsal ball**.	
Squats with a physio ball	**3 sets of 12 reps**
STR with weights on a physio ball (back)	**3 sets of 12 reps**
Straight leg kick with resistance band (hamstring strengthening)	**3 sets of 20 seconds**
STR with weights (front, lying down)	**3 sets of 12 reps**
Kickback	**3 sets of 12 reps**
Hamstring stretch with an extended leg	**3 sets of 10 seconds**
Week 4 **Warm-up**: **Moving cubes**.	
Step squats with mini loop resistance band	**3 sets of 12 reps**

Dead Bug (leg movement only)	**3 sets of 10 reps**
Hamstring strengthening with mini loop resistance band	**3 sets of 12 reps**
Side STR lying down with a mini loop resistance band	**3 sets of 12 reps**
Step jump + landing – 3 sets of 12 reps	**3 sets of 12 reps**
Side jump onto a marked target	**4 sets of 10 reps**
Back extensions with opposite arm and leg (quadru-ped position)	**3 sets of 30 seconds**
Balance on a BOSU ball (disturbance with resistance band, both feet)	**3 sets of 30 seconds**
Week 5 Warm-up: Cube Transfer, Balance on Balance Beam	
Standing STR with resistance band (front)	**3 sets of 12 reps**
Pelvic movement in standing position	**3 sets of 12 reps**
Lunges with resistance band	**3 sets of 12 reps**
Stork balance with disturbance (using resistance band)	**3 sets of 20 seconds**
Single-leg balance on BOSU ball with disturbance (using resistance band) –	**3 sets of 20 seconds**
Pelvic rotation stretch	**3 sets of 12 reps**
Week 6 **Warm-up: Moving cubes and walking on a balance beam**.	
Step-up + squat	**3 sets of 12 reps**
Single-leg hip bridge	**3 sets of 12 reps**
Two-leg balance on a stability platform	**3 sets of 30 seconds**
Single-leg balance on a stability platform	**3 sets of 30 seconds**
Balance on BOSU ball with disturbance (using re-sistance band)	**3 sets of 30 seconds**
Step-down + stork balance	**3 sets of 12 reps + 10 seconds balance in stork posi-tion**
Week 7 **Warm-up: Moving cubes and balancing on a balance beam**.	
Lunges	**3 sets of 10 reps**
Single-leg balance on a balance board while holding a ball	**3 sets of 30 seconds**
Plank with hands on BOSU ball	**3 sets of 20 seconds**
Single-leg balance on a trampoline with disturbance (using resistance band)	**3 sets of 30 seconds**
Forward jumps onto marked targets	**3 sets of 12 reps**
Landing + squat	**3 sets of 12 reps**
Week 8 **Warm-up: Moving cubes and walking on a balance board**.	
Single-leg balance on a stability platform	**3 sets of 30 seconds**
Balance on a stability platform with disturbance (using resistance band)	**3 sets of 30 seconds**
Landing + squat + double-leg jump	**3 sets of 12 reps**

FINDINGS

In the descriptive statistics section, the demographic characteristics of the participants were first examined. The descriptive indicators, including minimum and maximum age, mean age, mean weight, mean height, and mean BMI, were analyzed and presented for each research group.

Table 2.

Group	Number	Mean Weight	Mean Age	Mean Height	Mean BMI	Min Age	Max Age
Experimental Group	10	21.1	9.8	1.32	16.87	6	14
Control Group	10	41.49	9.5	1.37	22.17	5	14

In the **table** below, the descriptive statistical results of the dependent variables, sepa-rated by groups, were measured for pre-test and post-test

Table 3.

Variable	Measurement Stage	Experimental Group		Control Group	
		Mean	SD	Mean	SD
Balance and Coordination	Pre-test	43.33	24.53	55.58	23.16
	Post-test	78.91	22.87	56.50	22.93
Motor Performance	Pre-test	17.08	5.63	16.08	5.74
	Pre-test	24.83	6.27	17.50	5.90
Lower Crossed Syndrome (Using a Goniometer: Dominant Leg on the Edge of the Table in Prone Position or Measuring the Non-Dominant Leg)	Pre-test	69.50	7.99	62.91	11.57
	Pre-test	74	6.99	62.83	10.72
Lower Crossed Syndrome (Using a Goniometer: Non-Dominant Leg on the Edge of the Table in Prone Position or Measuring the Dominant Leg)	Pre-test	59.91	14.02	63	12.007
	Pre-test	66.50	12.62	63.58	11.01
Lower Crossed Syndrome (Using a Goniometer: Non-Dominant Leg on the Edge of the Table in Prone Position or Measuring the Dominant Leg)	Pre-test	19	19.02	15	5.64
	Pre-test	17	20.14	13.91	4.90
Lower Crossed Syndrome (Using a Goniometer: Non-Dominant Leg on the Edge of the Table in Prone Position or Measuring the Dominant Leg)	Pre-test	17.41	18.79	13.91	6.93
	Pre-test	16	20.10	13.25	5.98

The variable test for coordination and balance consists of four items, and we have sep-arately provided the descriptive statistics for each stage of the coordination and bal-ance test in the table below.

Table 4.

Variable	Measurement Stage	Experimental Group		Control Group	
		Mean	Standard Deviation	Mean	Standard Deviation
Walking (BB)	Pre-Test	30.08	20.34	44.08	20.58
	Post-Test	61.75	10.34	43.58	20.18
Jumping Sideways (JS)	Pre-Test	4.58	4.75	3.91	4.07
	Post-Test	5.75	6.06	4.16	4.48
Sideways Movement (MS)	Pre-Test	4.66	3.93	4.33	2.53
	Post-Test	8.33	4.49	5.50	3.08
Single-Leg Stance (HH)	Pre-Test	4	5.90	3.25	4.13
	Post-Test	4.75	7.05	3.25	4.13

Quality of Life

Another variable in this research is the quality of life. In this study, we assessed quality of life using a modified checklist for autism screening in early childhood, which was provided to families (this form was given to families only once). Each question had a score that we calculated.

Table 5. Description of the Variable (Quality of Life) in the Research.

Variable	Experimental Group		Control Group	
	Mean	Standard Deviation	Mean	Standard Deviation
Quality of Life	13.50	2.57	14.33	3.02

Since the independent variable of the study is corrective exercises with a Janda approach, which divides our sample into two groups (experimental and control), and the dependent variable is measured continuously, a two-way analysis of covariance (ANCOVA) was used to examine the variables of balance, coordination, motor performance, and lower cross syndrome.

Table 6.

Variable	sig	F	Partial Eta Squared
Walking Path (BB)	0.001	37.401	0.640
Side Jumping (JS)	0.042	0.042	0.183
Sideways Movement (MS)	0.008	8.715	0.293
HH Test (HH)	0.040	4.811	0.186
KTK Test	0.001	49.269	0.701
Motor Performance	0.001	53.682	0.719
Selective Mutism Syndrome with Toe-Walking Test (Dominant Foot)	0.269	1.289	0.058
Selective Mutism Syndrome with Toe-Walking Test (Non-Dominant Foot)	0.142	2.333	0.100

The Effect of Corrective Exercises with the Janda Approach on Balance, Coordination, Motor Performance, and Lower Crossed Syndrome in Children with Autism

As seen in the table above, the significance level for **balance and coordination** (walking, side jumping, sideways movement, and hopping) and **motor performance** is less than the predetermined threshold (P-value = 0.05). This indicates a **significant relationship** between the independent variable of the study and the dependent variable. Therefore, the null hypothesis is rejected, meaning that **corrective exercises with the Janda approach positively impact balance, coordination, and motor performance in children with autism and lower crossed syndrome**.

However, as observed in the table, the significance level for the **Thomas test with the dominant foot and non-dominant foot at the edge of the table** is greater than the predetermined threshold (P-value = 0.05). This indicates that **there is no significant relationship** between the independent and dependent variables. As a result, the **null hypothesis is confirmed**, meaning that **corrective exercises with the Janda approach do not affect lower crossed syndrome**.

Given that the **independent variable** of the study **(corrective exercises with the Janda approach)** divides the sample into two groups (experimental and control) and the **dependent variable (quality of life)** is measured continuously, the **independent t-test** (a parametric test) was used.

Table 7.

Variable	F	T	Df	Sig
Quality of Life	0.800	-0.727	22	0.475

Given that the **significance level (0.475)** obtained from the **independent t-test** is greater than the predetermined threshold (0.05), we conclude that **there is no significant difference in the quality of life factor between the experimental and control groups**.

Therefore, the **null hypothesis is confirmed**, meaning that **corrective exercises with the Janda approach do not affect the quality of life of children with autism and lower crossed syndrome**.

DISCUSSION

Morteza Taheri (2016), in a study titled "**Comparison of Reaction Time and Balance in Children with Autism and Typically Developing Children**," examined 15 children with autism and **15 healthy boys aged 8 to 10 years**, selected randomly.

To assess reaction time, a **reaction time measurement tool** was used, and **the Biodex device** was employed to evaluate balance in both groups. The results showed that children with autism had **weaker performance** in all three aspects of balance: **overall balance, lateral balance, and anterior-lateral balance**. Additionally, **both simple and choice visual reaction times** were lower in children with autism.

This study concluded that **children with autism have impaired balance performance and weaker reaction times compared to typically developing children**. This study aligns with previous research.

Akbar Moeini et al. (2019) conducted a study titled "**The Effect of Eight Weeks of Proprioceptive Training on Motor Coordination in Children with Autism Spectrum Disorder**." The study included **16 children aged 5 to 12 with autism**, who were randomly assigned into **homogeneous control and experimental groups** based on the results of the **Bruininks-Oseretsky subtests**. The experimental group participated in **24 sessions of proprioceptive training**, while the control group engaged in **standard occupational therapy** for the same duration. After the intervention, post-tests were conducted for both groups. The results showed **no significant differences in subtests related to eye-hand coordination and bilateral coordination**, but the study concluded that **proprioceptive training improved motor coordination in children with autism**. These findings are consistent with the present study.

Amir Hossein Haghighi et al. (2023) explored "**The Impact of Combined Physical Education Strategies on Physical Fitness, Behavior, and Social Skills in Children with Autism**." Their study included **16 children with autism aged 6 to 10**, randomly divided into experimental and control groups. The **experimental group** participated in **a two-month program (three sessions per week)**, including **ball games, dancing, and resistance training**. They were assessed on **physical fitness (PF)**—including **hand grip strength, upper and lower body strength, flexibility, balance, and agility**—as well as behavioral characteristics before and after training. The results indicated improvements in **social skills and PF, with balance being one of the key factors**. This study aligns with the findings of the present research.

Hossein Chaleshtari Baharak et al. (2014) examined "**The Effect of Rhythmic Movements on Gross and Fine Motor Skills in Children with Autism Spectrum Disorder**." They selected **22 children with autism** from an educational and rehabilitation center and divided them into two groups of 11. The experimental group participated in **rhythmic movement exercises three times per week, each session lasting 1.5 hours**. The **Bruininks-Oseretsky Test of Motor Proficiency** was used to evaluate motor competence before and after the intervention. The results showed s**ignificant improvements in the experimental group compared to the control group**, indicating that **rhythmic movements enhance both gross and fine motor skills in children with autism**. The study concluded that through **repetition, practice, and imitation of rhythmic movements, children strengthened their sensory and motor perception skills**. These findings are also consistent with the present study.

Balance and coordination exercises in Janda's approach help improve proprioception and visual-motor coordination. This improvement directly affects the balance, coordination, and motor performance of children. Janda's exercises, focusing on visual-motor coordination, help improve both fine and gross motor skills.

Dasa and colleagues (2018), in a study titled "Ground Reaction Force Patterns During Walking in Children with Autism Spectrum Disorder," examined 30 children with ASD and 30 healthy children aged 4 to 12 years. A three-dimensional motion analysis system with eight cameras and two force plates was used to collect VGRF data while the participants walked barefoot at their usual pace. The significant differences revealed that children with autism have difficulty bearing weight during the final standing phase, and this condition affects their walking instability. The results were similar to two other studies (32).

Hadi Moradi and colleagues (2019), in a study titled "The Effect of a Movement Activity Program with Music on Balance, Running Speed, and Agility in Children with Autism," involved 16 children with autism aged 6 to 9 years in Isfahan. These children participated in a movement activity program with music to assess balance performance, running speed, and agility. The children were divided into two groups of eight after assessing their balance, running speed, and agility using the Oseretsky Bruininks test. The experimental group received the movement activities with music for 8 weeks, with 3 sessions per week. Afterward, post-tests for balance, running speed, and agility were conducted. The evidence showed that the movement activities with music had a positive impact on the balance, running speed, and agility of children with autism. Movement activities with music can be considered a beneficial method for children with autism. This study is similar to the research by Hadi Moradi and colleagues (33).

Strengthening exercises in corrective training with Janda's approach help strengthen weak muscles and improve muscle power. This contributes to better motor performance, increased independence, and reduced fatigue in children with autism. Janda's corrective exercises focus on improving muscle tone and reducing hypotonia or hypertonia in children with autism. This improvement directly impacts motor performance, balance, and coordination. Children with inappropriate muscle tone may have difficulty performing both fine and gross motor movements. Janda's exercises aim to strengthen weak muscles and stretch tight muscles, helping to improve this condition. Stretching and flexibility exercises in Janda's approach increase joint range of motion. This contributes to better motor performance, reduced joint stiffness, and greater independence in daily activities.

Down Adams and colleagues (2019), in a study titled "The Relationship Between Child Anxiety and Quality of Life in Children and Parents of Children with Autism Spectrum Disorder," had 64 parents of children with autism complete questionnaires related to autism characteristics, anxiety symptoms, and the quality of life for both the child and the parents. Parents of children with high anxiety reported lower quality of life for both the child and the parents. Anxiety symptoms may be an important factor that influences specific aspects of the quality of life of children within the autism spectrum. The results of both studies were consistent (34).

Peyman Zamani and colleagues (2023), in a study titled "Examining Quality of Life, Anxiety Levels, and Satisfaction with Rehabilitation Services in Mothers of Children with Autism in Ahvaz," selected 128 mothers of children with autism and 30 mothers of children requiring non-autistic rehabilitation services. They provided the mothers with a quality of life questionnaire, perceived anxiety scale, and satisfaction questionnaire. The quality of life of mothers with autistic children was lower than that of mothers of non-autistic children; however, no significant difference in anxiety levels and satisfaction between the two groups was found. The mothers' age, education, and employment status influenced the results. Mothers who had received rehabilitation services for less than one month reported lower quality of life and higher anxiety levels compared to those who had received over six months of rehabilitation services. The results of this study indicated that middle-aged, stay-at-home mothers had a lower quality of life than all other mothers. Higher satisfaction was observed among educated mothers, reflecting their higher expectations from rehabilitation services. Both studies reported lower quality of life for children with autism (35).

Improvement in physical, emotional, and mental aspects generally leads to an increased quality of life for children with autism. This improvement can be observed in various areas of the child's life, including social interactions, independence in daily activities, and academic performance.

Saeed Salehi and colleagues (2023), in a study titled "Effect of 12-Week Gait Pattern Training with Light Table on Static and Dynamic Balance in Children with Autism," divided 20 children with autism, aged 6 to 12 years, into two groups of 10. The training group used a light table, while the control group used a plain table to perform gait pattern exercises for 12 weeks (4 sessions of 45 minutes each week) under the supervision of coaches. Static balance was assessed using a foot scan device, and dynamic balance was evaluated using the heel-to-toe walking test. The evidence showed significant improvements in balance status, center of pressure displacement, and dynamic balance, with notable differences between the groups. These results suggest that gait pattern exercises with the light table improve balance and motor performance in children with autism. The findings of this study differ from those of Saeed Salehi and colleagues (36).

Saeed Sadeghi Dinani and colleagues (2024), in a study titled "The Impact of a Movement Program with Gait Pattern Light Table on Cortisol Levels and Sleep Disorders in Children with Autism Spectrum Disorder," involved 20 children with autism, aged 6 to 12 years, divided into two groups of 10. The exercise group used a light table, while the control group used a plain table for the movement program for 12 weeks, with 4 sessions of 45 minutes each week under the supervision of coaches. The results showed a significant reduction in cortisol levels in the exercise group with the light table compared to the control group. Additionally, there was a significant improvement in sleep disorders in the exercise group compared to the control group. Therefore, gait pattern exercises combined with visual and auditory feedback can be effective in reducing cortisol levels and sleep disorders in children with autism. The results of this study do not align with those of Saeed Sadeghi Dinani and colleagues (37).

Zahra Malekirami and colleagues (2016), in a study titled "The Impact of Swiss Ball Exercises on Sensory-Motor Functioning in Three Boys with Autism," involved three children with autism who performed Swiss ball exercises for nine weeks. Sensory-motor function was assessed using the Neuropsychological Assessment of Sensory-Motor Functioning test during the intervention and two weeks after its conclusion, with final assessments conducted two months after participation. The interventions proved effective. The results showed significant improvements in sensory-motor functioning in boys with autism who participated in Swiss ball exercises. The findings of this study do not align with those of Zahra Malekirami and colleagues (38).

Corrective exercises with Janda's approach, by impacting physical, emotional, and mental aspects, can significantly contribute to the improvement of balance, coordination, motor performance, and quality of life for children with autism. However, these exercises should be designed and implemented by trained specialists, taking into account the specific needs of each child with autism.

CONCLUSION

The aim of the present study was to investigate the impact of corrective exercises with Janda's approach on balance, coordination, motor performance, and quality of life in children with autism affected by lower cross syndrome. The results indicated that corrective exercises with Janda's approach positively influenced balance, coordination, and motor performance. However, no improvement was observed in quality of life or lower cross syndrome. In this study, corrective exercises with Janda's approach can be considered an effective method for improving balance, coordination, and motor performance.

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