OPTIMIZING TRAINING AND COMPETITION PERFORMANCE IN ADAPTED JUDO FOR ATHLETES WITH INTELLECTUAL DISABILITIES

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Abstract: Adapted judo offers an inclusive and competitive environment for athletes with intellectual disabilities, fostering progress in physical, technical, and psychological domains.
Aims. This study aimed to design and validate a personalized training model and evaluate its impact on training progress and competition participation in athletes with intellectual disabilities.
Methods. A mixed-method approach was used over a six-month period. Six athletes aged 15 to 25 from Club Down Bucharest participated in the intervention. Assessments included anthropometric measurements, coordination tests, and functional performance evaluations. Personalized training sessions were held three times weekly, with simulations and periodic evaluations. Data were statistically analyzed pre- and post-intervention.
Results. Improvements were recorded in technical execution (from 60% to 85%), increased motivation and concentration were observed and mentioned by parents and caregivers.
Conclusions. Personalized and regularly evaluated training proved effective for improving technical, physical, and psychological aspects. This model supports inclusive practices in adapted sports. Further studies should explore long-term effects in larger samples
Keywords: adapted judo, intellectual disabilities, personalized training, performance evaluation, inclusion

Introduction

In recent years, inclusive sports have gained recognition for their impact on the development of individuals with intellectual disabilities (Alanazi, 2021). A systematic review highlighted the importance of judo as a means of inclusion for individuals with intellectual disabilities, emphasizing the need for adapted methods and inclusive policies (Pečnikar Oblak et al., 2020). Judo, as a structured and rule-based sport, has shown strong potential for cognitive, physical, and emotional development (Bocioacă et al., 2023; DelCastillo-Andrés et al., 2020).

Literature supports that individualized approaches, when integrated into adapted sports, enhance self-esteem and social inclusion (Meier, 2015; Lumsdaine & Lord, 2021).

Compared to athletes without disabilities, individuals with intellectual disabilities often face specific challenges related to cognitive processing, motor coordination, communication skills, and emotional regulation. These differences can influence their ability to learn complex motor tasks, maintain focus during training, respond to instructions, and cope with competitive stress. Children at risk for developmental coordination disorders often exhibit reduced levels of physical activity, which can impact their long-term motor and social development (King-Dowling et al., 2019). As a result, adapted training programs must consider these unique characteristics by using simplified instructions, repetitive learning, personalized feedback, and structured routines to ensure effective participation and progression in sport.

Several studies have emphasized the numerous benefits of practicing judo for individuals with intellectual disabilities (ID), including those with Down syndrome (DS). Participation in adapted judo programs has been associated with improvements in motor coordination, muscular strength, balance, and flexibility, as well as enhanced self-esteem, emotional regulation, and social interaction (Pan & Davis, 2018; Pierantozzi et al., 2022). Judo's structured nature, based on clear rules and ritualized behavior, provides a predictable and supportive framework that facilitates learning and participation for individuals with cognitive and developmental impairments (Bocioacă et al., 2023). Moreover, Meier (2015) highlighted that adapted combat sports, including judo, can foster a sense of belonging, autonomy, and competence, contributing to the overall well-being and social inclusion of athletes with ID and DS.

Adapted judo retains many elements from traditional practice—such as bowing rituals, basic throwing techniques (nage-waza), and groundwork (katame-waza)—while introducing essential modifications to ensure safety and

accessibility. For athletes with intellectual disabilities and especially those with Down syndrome, specific rules prohibit the use of strangulation techniques (shime-waza) and any actions involving excessive pressure on the cervical spine, due to common conditions like ligamentous laxity and atlanto-axial instability**.** Additionally, matches often begin from a grip position**,** and athletes are grouped based on functional ability rather than strictly by weight. Instruction emphasizes repetition, visual and tactile feedback, and a supportive environment. These adjustments ensure that judo remains a safe, inclusive, and developmentally beneficial sport for individuals with cognitive and physical challenges (Pan & Davis, 2018; Bocioacă et al., 2023; EJU, 2025).

Despite the growing interest in adapted sports, research focusing specifically on athletes with intellectual disabilities (ID) remains limited, and there is a shortage of trained coaches with expertise in this area. Structured, evidence-based programs are still scarce, especially in disciplines such as judo, where adaptations for intellectual and developmental disabilities require specific pedagogical and methodological approaches. Nevertheless, organizations like the European Judo Union for Adapted Judo have developed national and international guideline**s** that regulate the participation of athletes with ID and Down syndrome in dedicated competitions. These frameworks aim to ensure safety, equity, and accessibility for all participants. Moreover, numerous studies emphasize that inclusive sports participation significantly contributes to social integration, physical health, emotional stability, and self-confidence among people with disabilities (Lumsdaine & Lord, 2021; Meier, 2015; Kiuppis, 2018).

Previous studies have shown that judo-based training programs can improve physical function and reduce fall risk in adults, including individuals with specific needs (Arkkukangas et al., 2020).

Hypothesis

It is hypothesized that athletes with intellectual disabilities who follow a personalized and adapted training program will show significant improvement in technique execution, physical performance,. Additionally, these improvements are expected to positively influence competition results.

This research advances the hypothesis that a sustained personalized and adapted sports training programs will lead to significant improvements in motor skills, specific technique execution, and overall physical performance among athletes with intellectual disabilities, reinforcing the numerous benefits of sports participation.

Study Objectives

The main objective was to design and validate a personalized judo training model for athletes with intellectual disabilities and evaluate the effectiveness of this program on their:

- Physical fitness (strength, flexibility, aerobic capacity),
- Technical performance in judo (throwing techniques and tactical execution),
- Motivational indicators and engagement in training,
- Performance in competition-like contexts.

A secondary objective was to analyze the correlation between progress in training and results in simulated competitions.

Materials and Methods

The study was conducted over a period of six months at Club Down Bucharest and other partner institutions, between 2020 and 2025.

The study group consisted of 12 athletes with intellectual disabilities – Down syndrome (Table 1), their ages ranged from 15 to 25 years, recruited from *Club Down Bucharest*. Participation was voluntary, and informed consent was obtained from each athlete and their parents, in accordance with the Ethics Committee's approval. All participants followed the proposed training program and were evaluated both at the beginning and at the end of the 12-week intervention (with 3 sessions per week) as shown in tables 2 and 3. The same assessment protocol was applied post-intervention in order to record and compare the athletes' progress throughout the training period. Study inclusion criteria were the presence of disability, participation in all assessment and training sessions.

Table 1.-Anthropometric Profile of Athletes in Adapted Judo

Parameter	**Athletes with Intellectual Disabilities**
Average age (years)	19.3
Average Height (cm)	150 ± 8
Average Weight (kg)	72 ± 9
Arm span (cm)	149 ± 7

Our findings are consistent with previous studies involving individuals with intellectual disabilities and Down syndrome who participated in adapted judo programs. Similar to the results reported by Pan and Davis (2018), as well as Pierantozzi et al. (2022) and Descamps et al. (2024), the present study highlights the positive impact of adapted judo on physical performance, coordination, psychological well-being, and self-confidence. This alignment reinforces the effectiveness of structured judo interventions tailored to the specific needs of this population.

In order to demonstrate the beneficial effects of practicing this sport among individuals with Down syndrome, we chose to present the recorded improvements quantified through the following assessment methods with validated tools:

1. **Anthropometric measurements**: Height, weight, arm span, triceps skinfold.
2. **Physical fitness tests**:
   - Handgrip dynamometer (arm strength),
   - Sit-and-reach test (flexibility),
   - 12-minute shuttle run (aerobic endurance).
3. **Technical evaluation**:
   - Observation-based rating sheet,
   - Quality of tactical application (e.g., grip control, attack timing, use of space, response to opponent's moves)
4. **Psychological evaluation**:
   - Interviews with athletes and parents (qualitative component).
5. **Competition scoring**:
   - Points obtained in controlled matches,
   - Referee evaluations.

Given that individuals with SD may have communication and processing difficulties**,** referee evaluations are based not only on standard judo criteria, but also on adapted verbal and non-verbal cues, ensuring that athletes understand instructions and are judged fairly. Evaluators are trained to use simplified commands, supportive gestures, and visual prompts, with an emphasis on safety, cooperation, and appropriate technical behavior rather than competitive aggression.

The assessment of competitive performance was conducted through simulated matches organized under adapted judo conditions. Scoring criteria followed the **European Judo Union (EJU) guidelines for athletes with intellectual disabilities**, which emphasize safety, technical clarity, and control over brute force.

Each athlete participated in three controlled bouts per session, and **points were awarded based on successful execution of techniques** such as *ippon*, *waza-ari*, and *osaekomi-waza*, adjusted to the athlete's ability level.

In addition to numerical scoring, **referees completed standardized evaluation sheets**, which focused on:

- Technical execution (precision, grip control)
- Safety and compliance with adapted rules
- Tactical behavior and decision-making

The evaluation forms were adapted specifically for this study to ensure accessibility and reliability. Final scores were recorded and analyzed to assess individual progress and match-readiness.

Operational Research Process

The practical steps of the research, from planning to the dissemination of results, were detailed, including data collection, implementation of the training program, final evaluations, and statistical analysis. This operational process allowed for progress monitoring and constant adaptation of interventions.

Graphical Representation of the Training Plan

To ensure a progressive and personalized training process, two graphical models were developed to illustrate the structure and evolution of the adapted judo training program over 12 weeks.

The first visual representation (**Figure 1**) outlines the weekly distribution of the training process, structured into four main phases: Initial Evaluation & Adaptation, Learning Basic Techniques, Technical Consolidation & Coordination, and Application & Competition Simulation.

The second figure (**Figure 2**) is a two-axis graph that demonstrates the gradual increase in training volume and intensity across the program. This

visual emphasizes the progressive adaptation based on athletes' accumulated experience, balancing physical effort and skill acquisition.
In addition, a simplified arbitration sheet was developed to ensure fair and consistent evaluation during competition simulations. The sheet includes specific sections for match time, scoring, penalties, and technical observations, and is adapted to the cognitive and communicative needs of athletes with intellectual disabilities.
Furthermore, an initial evaluation of each athlete's physical and technical abilities was conducted prior to starting the program. This classification process supported the customization of training goals and the balanced assignment of partners during practice and competition simulations

Figure1. Visual overview of the 12-week adapted judo training plan divided into four progressive phases.

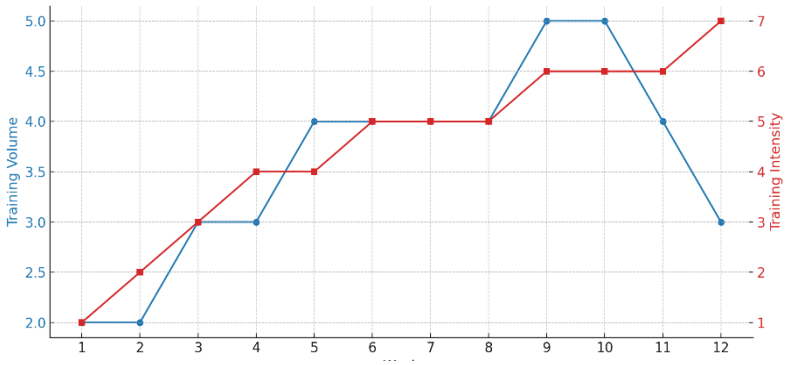

Figure 2. Two-axis graphical representation of the training plan, illustrating the progression in training volume (blue) and intensity (red) over 12 weeks.

Coaches can use these evaluations and training cues to personalize training programs for athletes with Down syndrome. This process is carried out in several stages, as presented below.

1. Identifying Skills and Strengths
Personalized training: Evaluations help coaches and instructors understand the current skill level of each athlete. Based on these assessments, they can tailor training sessions to meet individual needs, focusing on skill development and improving weaknesses.
Personalized Adaptive Judo Training
Training Goals:
- Develop technical and physical skills specific to judo.
- Improve coordination, balance, and strength.
- Increase confidence and self-esteem through success in sports activities.
Training Structure:
➡ Warm-up (10 minutes)
- Light jogging: 5 minutes of general body warm-up.
- Mobilization exercises: Dynamic stretching for joints.
- Balance exercises: Standing on one leg to improve stability.
➡ Technique and Application (20 minutes)
Objective: Improve basic techniques and apply them in a judo context.
- Throwing techniques: Practicing basic throws adapted to each athlete's level and abilities.
- Drilling: Repeating techniques multiple times, focusing on correctness and control.
➡ Game-Based Application (15 minutes)
Objective: Simulate competition conditions to apply techniques in a controlled environment.
- Adaptive randori: Controlled sparring exercises.
- Feedback and adjustments: Coaches provide individualized feedback to improve techniques and strategies.
➡ Recovery and Stretching (10 minutes)
Objective: Promote active recovery and injury prevention.
- Stretching and relaxation: Stretching exercises for the main muscle groups used in judo.

- Final feedback: Opportunity to discuss individual progress and set goals for future sessions.

2. Setting Realistic and Measurable Goals

Defining Progress: Evaluations provide an objective basis for setting and tracking each athlete's progress over time. This allows both athletes and coaches to have clear, measurable goals.

3. Adapting Training Programs and Strategies

Individualized Instruction: Based on evaluations, coaches can adjust training programs to meet the specific needs of each athlete. This includes adapting teaching techniques and instructional strategies to maximize understanding and progress in the sport.

Adaptive Judo Lesson Plan for Athletes with Intellectual Disabilities

Lesson Goal: Develop basic judo skills and improve coordination and self-confidence in athletes with intellectual disabilities.

Lesson Structure:

Warm-up (10 minutes)

- Light jogging in place.
- Mobilization and stretching exercises.
- Breathing and relaxation exercises.

Basic Judo Technique (20 minutes)

- Demonstration and explanation of the selected technique.
- Partner or small group practice with individualized support.

Coordination and Balance Exercises (15 minutes)

- Balance exercises on one leg.
- Games involving coordination and cooperation.

Practical Application in a Play-Based Context (10 minutes)

- Mini-games applying techniques in a competitive but friendly environment.
- Encouraging communication and collaboration.

Stretching and Final Feedback (5 minutes)

- Final stretching to relax muscles.
- Discussion about achievements and areas for improvement.
- Setting goals for the next session.

4. Promoting Confidence and Self-Esteem

Building Confidence: Evaluations provide athletes with the opportunity to observe and recognize their progress over time. This helps build confidence in their abilities and enhances self-esteem.

Self-Confidence Evaluation Model for Judokas with Intellectual Disabilities

Evaluation Purpose:

Measuring the level of self-confidence of athletes in the context of practicing judo and identifying aspects that require additional support.

Necessary Tools:

- Individualized evaluation sheets for each athlete.
- Questions and activities adapted to each athlete's level of understanding and communication.
- A scoring system or subjective evaluation for recording results and observations.

Evaluation Steps:

1. Introduction and Establishing a Trusting Environment (5 minutes)

Objective: Creating a safe and supportive atmosphere for athletes during the evaluation.

Activities:

- Discussion on the importance of self-confidence in sports and daily life.
- Ensuring that athletes understand the purpose and benefits of the evaluation for themselves.

5. Self-Perception Evaluation (10 minutes)

Objective: Encouraging athletes to reflect on and express their level of self-confidence in various aspects of judo practice.

Activities:

- Each athlete completes a simple evaluation sheet with questions about their confidence in:
  - The ability to learn and apply new techniques in judo.
  - The ability to face challenges and learn from mistakes.
  - Confidence in their physical abilities and coordination during training and competitions.
- Athletes can use scales from 1 to 5 to rate their confidence level in each aspect or express their feelings in an adapted way (e.g., using colors or symbols to indicate confidence level).

6. Observations and Feedback (10 minutes)

Objective: Observing athletes' behavior and attitude during practical activities and providing constructive feedback.

Activities:

- The coach or evaluator observes the athletes as they perform judo activities.
- Attention is given to attitude, expression, and level of engagement in activities.
- After each activity or exercise, individual feedback and support are provided to improve self-confidence and performance.

7. Discussion and Planning (5 minutes)

Objective: Encouraging athletes to express their feelings and set goals to improve self-confidence in the future.

Activities:

- Open discussion about the evaluation results and how they can be supported to increase self-confidence.
- Setting small, achievable goals to work on improving self-confidence in upcoming training sessions or competitions.

Additional Observations:
- The evaluation must be adapted to each athlete's level of understanding and communication.
- Feedback should be encouraging and constructive, focusing on positive aspects and small steps for improvement.
- Regular evaluations can help monitor progress in self-confidence and adjust support strategies accordingly.

By implementing this adapted evaluation model, athletes with intellectual disabilities in judo can benefit from proper support for developing self-confidence and improving their performance in sports.

The second phase of training plan is structured over a period of 12 weeks and includes weekly objectives and specific activities. As presented in **Table 1,** the plan is based on principles of progressivity and repetition, taking into account the special needs of the participants, the development of skills and abilities related to basic technique (Hon-Judo), as well as the improvement of motor qualities..


Figure 3 and 4. Judo training of Down syndrome athletes

Figure 3 and 4 eloquently capture trainer providing individualized instruction, indicating a judo specific grip emphasizing the importance of technical refinement and guidance for athletes with Down syndrome, suggesting the complexity of training sessions.

Case study and the practical examples of training weekly steps plan:

An example of a ***second phase*** weekly plan included varied activities over 12 weeks, with a frequency of 3 training a week, with progressive adaptations in intensity and volume to ensure continuous development:
• Weeks 1-2: Introduction and familiarization (e.g., ice-breaking games, basic techniques).
• Weeks 3-6: Reinforcement and repetition of basic techniques.
• Weeks 7-11: Advanced techniques and competition preparation.
• Weeks 12: Application and competition simulation, along with final performance assessments and post-intervention evaluations.

Training sessions and participant attendance

The ***initial phase*** of the program focused on preparing the athletes for structured training and performance assessment. Each subject participated in 12 sessions (4 weeks) of familiarization with the requirements and rules of judo. In the last week of this period the initial assessment was performed.

This preparatory period was essential for familiarization with the training environment (tatami), the use of equipment (judo-gi), interaction and cooperation with teammates, and understanding adapted judo terminology. Additionally, it aimed to gradually increase tolerance to physical effort, introduce basic safety norms, and reinforce the practice of breakfall techniques (ukemi) as a foundation for safe execution.

The ***second phase*** was a 12-week intervention phase included three training sessions per week, totaling 36 sessions. After the last session of this phase (session 36) the last evaluation was performed. Each session lasted approximately 60 minutes and was individualized according to the athletes' specific needs and functional abilities. Participation in all scheduled sessions was a prerequisite for inclusion in the final analysis. Only those athletes who completed all 36 sessions were considered for data evaluation. Attendance was carefully monitored, and no dropouts or

absences were recorded during the intervention period. In week 12 of the intervention phase, both competition simulations and final performance assessments were conducted, providing the data for post-intervention analysis.

The overall training program spanned a total of 16 weeks. However, only the last 12-week period was included in the analysis of the intervention.

Confidence Evaluation Model used

For the coach of an athlete with disabilities, a model for monitoring self-confidence serves the following purposes:

- Creating a trust-based environment.
- Self-assessment using evaluation sheets.
- Observations and feedback during activities.
- Discussion and setting goals for improvement.

Table 1. Weekly Training Plan applied to the subjects

Week	Day 1	Day 2	Day 3
1	Presentation, Icebreaker Games, Assessment of skills	Presentation, Icebreaker Games, Assessment of skills	Presentation, Icebreaker Games, Assessment and rules explanation
2	Warm-up, Presentation, Icebreaker Games	Warm-up, Greeting, Familiarization with Kimono	Warm-up, Balance Exercises
3	Warm-up, Greeting, Controlled Falls	Warm-up, Basic Techniques (O Soto Gari)	Warm-up, Movement Games
4	Warm-up, Repetition of Basic Techniques	Warm-up, Practicing Techniques with a Partner	Warm-up, Introduction to Kesa Gatame
5	Warm-up, Holding Techniques	Warm-up, Team Games	Warm-up, Strengthening Basic Techniques
6	Warm-up, Introduction to Advanced Techniques	Warm-up, Practicing Technique Combinations	Warm-up, Judo Technique Games
7	Warm-up, Advanced Techniques (Ippon Seoi Nage)	Warm-up, Technique Combinations	Warm-up, Practicing Technique Combinations
8	Warm-up, Match Simulations	Warm-up, Competition Tactics	Warm-up, Competition Games
9	Warm-up, Match Simulations	Warm-up, Competition Strategies	Warm-up, Competition Games
10	Warm-up, Friendly Competition	Warm-up, Individual Feedback	Warm-up, Group Feedback
11	Warm-up, Progress Evaluation	Warm-up, Setting Future Goals	Warm-up, Discussions and Conclusions
12	Warm-up, Physical and functional evaluations	Warm-up, Endurance, technical-tactical and psychosocial evaluations	Warm-up, Competition simulation

***Notes:* Continuous adaptation of the training program is a key factor when working with disability persons**

Working with individuals with intellectual disabilities (ID) or Down syndrome (DS) must be engaging, stimulating, and enjoyable, rather than monotonous or repetitive. This is an essential aspect to highlight, not only in practice but also for future research in adapted physical education. The coach must remain flexible and ready to continuously adapt training activities based on the needs, responsiveness, and progress of each participant.

It is particularly important to emphasize that adaptations which leverage the athletes' strengths and support them in overcoming their challenges are especially effective, particularly in the case of individuals with Down syndrome. Communication strategies such as simple language, visual cues, positive reinforcement, and patience are key elements that enhance motivation and facilitate learning in adapted judo sessions.

The coach must be flexible and adapt activities based on the needs and progress of each participant. The trainer can rely on some aspects in communication with the disability athletes, like:

➡ **Repetition and clarity:** Instruction should be clear and repetitive to ensure understanding and retention of techniques.

➡ **Positive feedback:** Constant encouragement and positive feedback are essential for maintaining participants' motivation. Icebreaker Games can help to increase motivation, decrease stress or negative emotions also.

This plan can be adjusted based on each participant's skill level and the group's learning pace.

The adapted judo training program was structured into standardized weekly sessions designed to

meet the specific needs of athletes with intellectual disabilities and Down syndrome. Each session lasted approximately 90 minutes and followed a consistent format that combined technical learning, physical development, and social interaction.

The **table 2** presents the typical structure of a training session, including warm-up, technical instruction, games for balance and coordination, partner exercises, match simulations, and a cool-down period. Each segment was designed with clear objectives and tailored content to promote safety, engagement, and progressive skill acquisition.

Table 2. Presentation of the distribution of time across exercises categories included in the training program

Training period	Time (minutes)	Exercises
1.Warm-up	**10**	- Light jogging in a circle for general body warm-up. - Mobility exercises for shoulders, wrists, and hips. - Stretching exercises for joint preparation.
2. Adapted judo techniques	**20**	- Demonstration and practice of simple and adapted judo techniques. - Repetition exercises for learning and fixing basic techniques.
3. Balance games and exercises	**15**	- Games involving balance and motor coordination. - Balance exercises on one foot or roller boards.
4. Application of techniques in partnership	**20**	- Pair exercises for applying judo techniques in a controlled environment. - Promoting collaboration and communication between partners.
5. Combat games and match simulations	**15**	- Combat games adapted to participants' skill levels. - Match simulations for applying techniques in a competitive and controlled context.
6. Cool-down and stretching	**10**	- Light cool-down exercises to lower heart rate. - Stretching exercises for muscle relaxation and injury prevention.

Results

We chose to present the motor and functional improvements observed in the group of subjects analyzed.

A total of 12 athletes with intellectual disabilities successfully completed the full adapted judo training program, attending all 36 sessions over the 12-week intervention period. No injuries, dropouts, or missed sessions were recorded throughout the study, ensuring complete data collection for all participants.

Anthropometric data and body composition

While no significant modifications were observed in body height or weight, a decrease in triceps skinfold thickness was recorded (from 12 mm to 9 mm), suggesting a favorable change in body composition, potentially indicating a reduction in subcutaneous fat mass. Arm circumference and BMI remained relatively stable, reinforcing the interpretation that fat reduction may have been accompanied by an increase in lean mass.

Table 3 presents the results of the anthropometric assessment conducted at the beginning and end of the training program. The parameters analyzed include height, body weight, arm circumference, and triceps skinfold thickness.

Table 3. Anthropometric assessment

Measure	Before training	After training
Arm circumference (cm)	27.8 ± 1.3	27.0 ± 1.2
Triceps skinfold thickness (cm)	1,2 cm	0,9 cm
Grip Strength (kgf) (average between the two arms)	17.2 ± 2.8	19.5 ± 3.0
Average BMI	25.4 ± 2.1	25.1 ± 2.2

Physical fitness performance

Functional assessment results indicated improvements in all measured physical parameters. Handgrip strength increased from 15 kg to 20 kg, reflecting progress in upper-body force production. Flexibility, evaluated through the sit-and-reach test, improved from 18 cm to 25 cm, while aerobic capacity, assessed by the 12-minute shuttle run, increased from 1100 m to 1350 m. These results show enhanced musculoskeletal flexibility and cardiovascular endurance after the training period.

Table 4. Functional assessment

Test	Before Training	After Training
Flexibility (cm) **(**sit-and-reach test)	18 cm	25 cm
Aerobic Capacity (m) – 12 min shuttle run	1100 m	1350 m

Table 4 presents the results of the functional assessment conducted before and after the 12-week adapted judo program. Arm strength was measured using a handgrip dynamometer, flexibility was assessed using the sit-and-reach test**,** and aerobic capacity was evaluated based on the distance covered in a 6-minute run. All parameters show measurable improvement after the intervention.

Technical and tactical proficiency

Video analysis and coaching assessments revealed an increase in technical execution accuracy, rising from 60% at baseline to 85% after the intervention. Athletes showed improved execution in throwing techniques, grip control, and overall balance during simulated match conditions. In these simulations, the average number of successful throws per bout increased from 1.2 to 2.6, while the duration of control positions (osaekomi) improved from 7.8 ± 3.5 seconds to 13.4 ± 4.1 seconds.

In addition, tactical assessment demonstrated a higher success rate in decision-making and application of match strategies. Table 5 summarizes this increase in correctly applied tactics, from 60% to 85%, confirming that individualized instruction and repetition positively influenced tactical awareness and combat readiness.

Table 5. Tactical Assessment

Aspect	Before Training	After Training
Correctly Applied Tactics (%)	60%	85%
Successful throws	1.2	2.6
Duration of control positions (osaekomi) in seconds	7.8 ± 3.5	13.4 ± 4.1

Correlation between training and progress

The observed physical and technical progress aligns with the structure and goals of the personalized training program, which gradually increased complexity and included targeted simulation scenarios. The improvements noted in strength, coordination, endurance, and tactical behavior directly reflect the structured approach and constant feedback provided throughout the intervention. These findings support the effectiveness of adapted judo training in enhancing not only fitness-related capacities but also competition-specific skills in athletes with intellectual disabilities.

Discussion

The results align with previous findings on the benefits of adapted sports for individuals with intellectual disabilities (Kiuppis, 2018; Züll & Tillmann, 2019). Technical and physical progress confirms the value of personalization in training (Daunhauer et al., 2020). Psychological improvements further support the holistic impact of adapted judo on the athlete's development (Lumsdaine & Lord, 2021).

Similar programs in other studies also reported progress in motor control, autonomy, and social interaction (Meier, 2015; DelCastillo-Andrés et al., 2020). The competition simulations enhanced engagement and focus, suggesting that periodic challenges improve performance readiness and reduce fear of evaluation (Bocioacă et al., 2023).

The results support the hypothesis that a personalized training program, integrated with periodic assessments and individualized feedback, improves the performance of athletes with intellectual disabilities. The positive correlation between anthropometric improvements, increased strength, and technical progress, along with enhanced self-esteem, indicates the benefits of the

intervention. Compared to the specialized literature, the study reinforces the idea that personalized approaches can reduce barriers and maximize performance, although the small sample size and individual variability represent limitations.

Performance Evaluation and Social Impact

The intervention proved to have a significant impact not only on athletic performance but also on the athletes' self-esteem and social integration. These outcomes underscore the importance of continuous evaluation and individualized feedback throughout the training process.

The study also defined a clear organizational and methodological framework for implementing a personalized training model. This included the establishment of specific research objectives, hypotheses, and methodological steps, ensuring a systematic and rigorous approach to the intervention.

General Recommendations for Implementing the Training Program

The following recommendations are based on practical experience in training athletes with Down syndrome and are intended to guide the effective and safe application of the 12-week adapted judo program:

- **Adapting judo exercises and techniques** to the individual needs and capabilities of each participant.
- Exercises should be simplified or modified to match the motor and cognitive levels of the athletes. This may include reducing the number of movements, using visual supports, or extending the time allocated for learning.
- **Ensuring a safe and supervised environment** during training sessions.

➤ Coaches must ensure that all activities take place in a space free of obstacles, with proper tatami mats, and under constant supervision to prevent injuries, particularly given the joint hypermobility often present in athletes with Down syndrome.

- **Encouraging emotional expression and open communication** between participants and coaches.

➤ Creating a trusting and non-judgmental environment enables athletes to express discomfort, preferences, or emotions more freely, which supports both psychological well-being and learning.

- Promoting team spirit and mutual respect.

➤ Team-based exercises, partner drills, and group feedback sessions help build a sense of belonging and social connection among participants. Emphasizing respect, cooperation, and encouragement supports inclusive team dynamics.

These recommendations can be applied throughout the training plan and are essential for optimizing the benefits of adapted judo for athletes with intellectual disabilities and Down syndrome.

Conclusions

1. The personalized judo training model led to measurable physical improvements (strength, flexibility, endurance).
2. Technical execution improved significantly, reaching a success rate of 85%.
3. Participants demonstrated increased motivation and engagement as observed during training and competition simulations.
4. Competition simulations supported tactical development and emotional regulation.
5. A positive link was observed between individual progress in training and match results.
6. This model is replicable and adaptable to other inclusive sports programs.
7. Future research should include larger samples and explore long-term retention effects.

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