

The Impact of an Adapted Sports Activities Program on Developing Certain Motor, Skill, and Social Traits in Children with Down Syndrome

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Abstract: This study sought to evaluate the influence of a modified sports activities program on the enhancement of particular motor and social abilities in children with Down syndrome. The sample comprised ten youngsters aged 8 to 10 years. The researcher employed a series of motor skills assessments and a social skills scale, with the program executed over eight weeks, comprising three sessions weekly. The results indicated statistically significant enhancements in all assessed skills between the pre- and post-tests, with the post-test demonstrating superior outcomes. The enhancements were ascribed to the program's efficacy, which included activities centered on concentration, observation, and group interaction. The results underscore the significance of tailored physical activities in improving balance, locomotor speed, coordination, and social interaction in children with Down syndrome. The study advocates for the incorporation of adapted sports programs within educational and therapeutic frameworks for children with disabilities and proposes future research including bigger sample sizes and extended follow-up durations to substantiate the long-term impacts.

Keywords: adapted sports activities program, motor and social skills, children with down syndrome

Introduction

Regardless of whether a person has a physical, physiological, psychological, or social disability, many nations around the world have expressed a strong interest in them. The desire to make the most of their remaining skills and potential with the least amount of work is the source of this passion. All facets of society must work together to prepare these people and integrate them into the community in order to accomplish this aim (Mahy et al., 2010; Yu et al., 2022).

A disability is a condition that makes a person dependent on the help of others by limiting their capacity to execute one or more important daily living duties. Down syndrome, a chromosomal defect that impacts brain function and the nervous system, is one of the most prevalent intellectual disabilities, resulting in a variety of difficulties. This abnormality shows up as functional deficits, congenital organ

problems, and facial characteristics. As with other children, a kid with Down syndrome needs comprehensive training and care (Ulrich et al., 2001; Robles-Bello et al., 2020).

One of the biggest problems that children with Trisomy 21 experience is motor abnormalities. These conditions are typified by erratic, haphazard movements. These fundamental motions go from chaotic to more directed motions (Ulrich et al., 2001; Oreskovic et al., 2022). Recent research has shown that children with Down syndrome have problems with motor perception, especially in general balance, which impacts tasks including walking, hopping, throwing, standing, jumping, and balanced walking. These issues show up as frequent object collisions, walking difficulties, and difficulties with activities that require coordination of muscles (Connolly et al., 1993; Jobling & Cuskelly, 2006).

Deficits in social skills are also apparent in these kids, who have trouble interacting with others and playing in groups. This frequently leads to a failure to interact with peers in an effective manner (Mahy et al., 2010; Canales et al., 2021).

A key component of psychological therapy is physical activity, which mainly uses play to alleviate internal conflicts and emotions while also fostering motor skill development. Because it stimulates the senses, physical activity is therefore essential for motor perception training and physical education (Mahy et al., 2010; Fredes et al., 2021). By teaching kids how to use toys in a useful way, play can also help reduce stereotyped behaviours. This will eventually help them change their behaviour and stop doing the same things over and over again (Ulrich et al., 2001; Hendrix et al., 2021).

In light of this, creating structured, scientifically based motor activities specifically for kids with Down syndrome is crucial. In today's society, early childhood planning is essential since it helps youngsters acquire a variety of life concepts, experiences, and abilities (Connolly et al., 1993; Mahy et al., 2010).

Numerous research have looked at the effects of modified physical activities on people with Down syndrome, both domestically and abroad. The importance of family support and the necessity of specialised programs to increase physical activity participation were highlighted in a Saudi Arabian study that examined mothers' perceptions of physical activity levels, benefits, facilitators, and barriers for their children with Down syndrome (Alghamdi et al., 2021). Similar to this, Bricout (2015) highlighted the useful ways that sports can support good well-being in people with Down syndrome, proposing that prevention starts at birth and that parents should be taught constructive parenting techniques from an early age. Additionally, according to Muñoz-Llerena et al. (2024), physical education programs for people with Down syndrome should offer learning opportunities that go beyond simple game play in order to help them become physically educated individuals. In people with Down syndrome, modified physical activity regimens have also been shown to improve motor skills, balance, muscle tone, and strength, which fosters independence and self-reliance in day-to-day activities (Ma et al., 2024). To ascertain the impact of physical education and physical activity interventions on children with Down syndrome, Montalva-Valenzuela et al. (2024) conducted a meta-analysis of the literature, emphasising the significance of customised interventions in enhancing their physical

outcomes. The need for focused strategies to promote regular physical activity in this population is further highlighted by reports that children with Down syndrome engage in less physical activity than their peers, including those with other developmental delays (Chan et al., 2024). When taken as a whole, these studies highlight the many advantages of modified physical activities for people with Down syndrome, such as enhanced physical well-being, social engagement, and general quality of life.

Based on the researchers' experience working with this population and ongoing trips to specialised facilities, it has been noted that these facilities prioritise psychosocial treatment for this condition while ignoring its motor component. But the most important therapy components that can simultaneously support children's social and motor development are play and movement. Thus, by investigating how modified sports activities affect the development of specific motor and social abilities in kids with Down syndrome, the current study seeks to further this area for this population.

Materials and methods

The sample

Ten children with Down syndrome made up the research sample. They were chosen based on a number of requirements, such as having Down syndrome, being between the ages of eight and ten, not having any organic heart or chest diseases, and not having any additional intellectual or sensory disabilities. As indicated in Table 1, the research sample was homogenised according to study-related factors such as height, weight, and age. The study was conducted at the Elmachaal Association for Children with Autism and Down Syndrome in Sougueur, Tiaret, Algeria.

Table 1. Descriptive Statistics of the Research Sample Variables

Variable	Unit of measurement	Mean	Standard deviation	Median	Skewness coefficient
Age	years	9.12	0.34	9.00	0.647
Height	cm	122.1	3.68	122.00	0.123
Weight	kg	33.75	2.45	34.00	0.611

Table 1 makes clear that the values of the skewness coefficient varied from 0.123, which was the lowest, to 0.647, which was the highest. These numbers show that the research sample is homogeneous in these important factors because they fall between +3 and -3.

Research Tools

Motor Skills Tests

Based on scientific references (Hassan & Al-Mufti, 2004; Al-Hilali, 2004; Hassan, 2009), the researcher created a battery of tests to assess motor skills in children ages 6 to 10. A panel of knowledgeable professors reviewed these abilities and gave their approval, stating that they were appropriate for the sample's age and specificity (Table 2). The following tests were part of the battery:

Table 2. Battery of tests to assess motor skills

Skill type	Description	Objective
Balance skills	Walking on a balance beam	To measure balance
Locomotor Speed Skills	Standing long jump	To measure explosive leg power
Handling and Manipulation Skills	Throwing a ball with the hand / Throwing the ball upward and catching it	To measure arm explosive power / Accuracy in catching the ball

The validity and reliability of the tests were assessed using prior research and scientific references. By administering the tests (test-retest) to a sample of four youngsters from the research community who were not part of the main sample between October 10-18, 2024, the researcher was able to determine the test's reliability coefficient.

Table 3. Validity and reliability of motor skills tests

Skill / Test	Test 1 (M1 / SD1)	Test 2 (M2 / SD2)	Test Reliability	Test Validity
Walking on balance beam - Forward	1.75 / 0.50	1.94 / 0.43	0.82	0.72
Walking on balance beam - Backward	1.98 / 0.42	1.73 / 0.66	0.71	0.86
Walking on balance beam - Sideways	1.72 / 0.71	1.65 / 0.51	0.68	0.68
Standing Long Jump	1.69 / 0.67	1.75 / 0.53	0.80	0.89
Throwing ball with the hand	5.71 / 0.62	5.69 / 0.65	0.82	0.90
Throwing and catching ball upward	5.4 / 0.46	5.51 / 0.50	0.75	0.86

For the evaluated motor skills, the results in Table 3 show generally acceptable levels of test validity and reliability. Notably, tests like the standing long jump and throwing ball with the hand show good reliability (both > 0.80) and high validity (0.90 and 0.89, respectively), indicating significant consistency and relevance to the desired motor abilities. The Walking on Balance Beam-Sideways test, on the other hand, has the lowest validity and reliability (0.68 for both), suggesting that it may need to be further improved or standardised in order to improve measurement consistency. Although some tests may benefit from further development to improve psychometric qualities, overall, the results support the use of these tests, especially for the assessment of dynamic and gross motor skills.

Social Skills Scale

Social skills were measured using the Hassan (2009) scale. There are 27 objects total, spread across nine domains:

- Imitation
- Auditory response
- Play patterns
- Group activities
- Helping behaviors
- Non-verbal communication skills

- Joint attention skills
- Theory of mind skills

On a scale of 1 to 3, each item is given a rating based on how well it captures the child's behaviour. The replies are added up to determine the final score, which can go as high as 98. The reliability coefficient of the scale was (0.81). Hassan (2009) The specialist is responsible for filling out the scale.

Foundations of the Proposed Program

Using a variety of references and scientific sources, the researchers created a program of modified physical exercises designed to enhance specific motor and social abilities (Hassan, 2009; Al-Mufti, 2014). Experts and supervisors with expertise in the treatment and rehabilitation of people with impairments evaluated the program.

Several crucial prerequisites are included in the suggested program:

- Modified exercises that target every muscle and joint in the body, especially the upper body (arms, back, and abdomen).
- A range of focus and observation activities, as well as motor and sensory-motor games, to promote certain motor abilities (manipulation, handling, and balancing).
- Sufficient rest intervals of one to three minutes in between workouts.
- A training approach that is wave-like and used all week long.

Implementation of the Proposed Program

Over the course of eight weeks, from November 1, 2024, to January 5, 2025, the researchers implemented the suggested modified physical activities program three times a week, for a total of twenty-four training sessions for the experimental group.

The group took part in each 45-minute session while being closely watched by the researchers. The use of appropriate training techniques in the context of physical education and motor education was emphasised.

Three sections made up each session:

- Preparatory Section: Consists of both a general and targeted warm-up.
- Main Part: Using adjusted physical exercises and participating in chosen sports activities appropriate for the kids' skill levels to help them develop their social and motor skills.
- Final Section: Contains relaxing and calming techniques to help the kids get back to their regular selves.

The statistical analysis

The required statistical analyses for the study data were carried out using the SPSS software. In addition to the skewness coefficient, which measures how closely the distribution resembles a normal distribution, the mean and standard deviation were used to determine the trends of the responses and the extent of their dispersion. Additionally, the association between variables was examined using Pearson's simple correlation coefficient, and the significance of differences between group means was evaluated using the t-test.

Results

Analysis of the first hypothesis

There are statistically significant differences between the pre-test and post-test of the experimental group in motor skills.

Table 4. Presents the results of the pre- and post-tests for the experimental group in motor skills

Skill	Pre-Test (M)	Pre-Test (SD)	Post-Test (M)	Post-Test (SD)	df	Calculated t	Tabulated t	Significance at 0.05
Walking on the balance beam (forward)	2.29	0.24	2.75	0.52	08	3.52	2.77	Significant
Walking backward	2.11	0.42	2.35	0.69	08	5.04	2.77	Significant
Walking sideways	1.77	0.15	2.56	0.58	08	5.18	2.77	Significant
Jumping	1.25	0.25	1.81	0.78	08	4.56	2.77	Significant
Throwing a ball by hand	5.52	0.45	6.30	0.35	08	7.21	2.77	Significant
Throwing the ball upward and catching it	5.43	0.22	6.10	0.45	08	6.85	2.77	Significant

The experimental group's motor ability pre- and post-test results are shown in Table 4. With t-values ranging from 3.52 to 7.21 and all surpassing the tabulated t-value of 2.77 at the 0.05 significance level with 8 degrees of freedom, the results demonstrate statistically significant improvements in all six motor skills evaluated.

To be more precise, the average improvement in participants' forward walking speed on the balance beam increased from 2.29 to 2.75. This development points to better equilibrium and synchronisation. The notable improvements in mean scores (from 2.11 to 2.35 for backward walking and from 1.77 to 2.56) for sideways walking suggest an improvement in spatial orientation and lateral movement control, two essential components of physical agility. Better muscular coordination and leg strength were reflected in an increase in jumping ability, which went from an average of 1.25 to 1.81.

In terms of object handling abilities, the average scores for hand-throwing a ball and throwing it upwards to catch it went raised from 5.52 to 6.30 and 5.43 to 6.10, respectively. Improvements in motor planning, accuracy, and hand-eye coordination are indicated by these alterations. Although there were some increases in standard deviation, the tailored physical activity program was beneficial since there were consistent positive changes across all skills. The program's concentration on structured motor exercises requiring observation, focus, and engagement—thereby improving physical abilities through fun and purposeful tasks—is what the researcher says is responsible for these outcomes.

Analysis of the second hypothesis

There are statistically significant differences between the control group and the experimental group in social skills.

Table 5. Presents the results of the pre- and post-tests for the experimental group in social skills

Scale	Pre-Test (M)	Pre-Test (SD)	Post-Test (M)	Post-Test (SD)	df	Calculated t	Tabulated t	Significance at 0.05
Social skills	55.67	4.87	63.87	5.42	08	5.82	2.77	Significant

Table 5 presents the pre- and post-test results for the experimental group in social skills. The findings reveal a statistically significant improvement, with the mean score increasing from 55.67 in the pre-test to 63.87 in the post-test. The calculated t-value (5.82) exceeds the tabulated value (2.77) at the 0.05 significance level, with 8 degrees of freedom, confirming the significance of the result.

This marked increase indicates that the participants developed stronger social behaviors, including cooperation, communication, sharing, and empathy. The adapted physical activity program played a key role in fostering these improvements, as it involved activities that encouraged interaction, group participation, and mutual support. The inclusion of team-based and attention-focused tasks likely helped children engage more confidently with others, improving their social connections and emotional regulation. These findings support the second hypothesis and highlight the positive social impact of the sports-based intervention, which was not limited to physical development but extended meaningfully into the social domain.

Discussion

This study's results offer solid evidence of the beneficial effects of an adapted sports activities program on the enhancement of motor and social skills in children with Down syndrome. The results correspond with earlier studies that emphasize the essential function of physical activity in enhancing the motor and social skills of children with disabilities (Mahy et al., 2010; Bricout, 2015). The notable enhancements in motor skills, including balance, locomotor speed, and dexterity, align with the therapeutic benefits of play and exercise in fostering motor coordination and muscle strength (Ulrich et al., 2001; Ma et al., 2024).

The improvement of social skills, including communication, collaborative activities, and shared attention, further emphasizes the efficacy of physical activity programs in promoting social integration and communication among children with Down syndrome (Hassan, 2009; Canales et al., 2021). young enhancements are notably important considering the social obstacles young children frequently encounter, including issues in establishing peer relationships and participating in cooperative play (Mahy et al., 2010). The incorporation of focus and attention-oriented activities in the customized sports program likely facilitated these beneficial improvements, enhancing both physical coordination and social relations in group environments.

The program's success can be ascribed to its customized approach, which included exercises specifically intended for children with Down syndrome, according to their distinct needs and capabilities. The incremental, wave-like training approach facilitated suitable advancement, while the incorporation of both motor and sensory-motor activities ensured a comprehensive targeting of abilities. This comprehensive strategy, which harmonized physical activity with social interaction, fostered an environment favorable to both personal and communal development. The limited sample size and absence of long-term follow-up in this investigation may restrict the generalizability of the results. Additional study utilizing bigger sample sizes and extended longitudinal tracking is necessary to validate the enduring effects of these programs and investigate possible long-term advantages for children with Down syndrome.

Conclusions

This research illustrates the efficacy of a modified sports activities program in improving motor and social abilities in children with Down syndrome. The findings indicate that meticulously organized physical exercise programs tailored for this demographic can result in substantial enhancements in physical capabilities and social engagement, therefore fostering the overall development and welfare of these youngsters. The favorable results of this program highlight the significance of incorporating physical activity into the everyday routines of children with Down syndrome to promote motor and social development. Subsequent study ought to concentrate on increasing the sample size and investigating the long-term ramifications of these interventions. The findings underscore the necessity for educational institutions and therapy centers to incorporate adapted physical activities as an integral element of their programs for children with disabilities, thereby promoting a more comprehensive approach to their development.

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