The Effects of Physical Activity on the Physical and Cognitive Development of Individuals with Developmental Disabilities

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By

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Table of Contents

Abstract

Physical activity is essential for promoting both cognitive and physical development, especially for individuals with Developmental Disabilities. Low activity levels can lead to obesity, motor delays, and reduced cognitive functioning, which will impact their quality of life. Evidence suggests that engaging in regular physical activity at a young age can lead to significant improvements in coordination, memory, and academic performance. The purpose of this synthesis was to review literature on the effects of physical activity on physical and cognitive development with individuals with developmental disabilities.

Chapter 1 – Introduction

Individuals who have Down Syndrome are often at risk for living a sedentary lifestyle. This negatively impacts their cardiorespiratory capacity, motor development, cognitive ability, and overall physical fitness (Izquierdo-Gomez et al., 2015). Their lack of physical activity is what leads to obesity, lower muscle mass, and a lower sympathetic nervous system response (Izquierdo-Gomez et al., 2017). Motor delays in infants with Down syndrome affect safety and quality of life (Hauck et al., 2020). These delays are why infants are physically dependent on caregivers for so long (Hauck et al., 2020). However, research has demonstrated the benefits of structured physical activity interventions. Exercises like aquatics, sports, and video games are improving motor skills, fitness, and functional mobility in the Down Syndrome population. Other activities such as, cognitively enriched physical activities are emerging as tools to enhance executive function and motor competence, starting at a young age (Biino et al., 2021). Case studies and experiments have demonstrated the improvements targeted training has had on cognitive and motor abilities (Alesi et al., 2014). While further longitudinal research is needed to determine the lasting effects of these interventions, the current data indicates that having physical activity part of people with Down Syndrome daily regimen can enhance cognitive development, motor skills, and improve their overall well-being.

Statement of the Problem

Individuals with Down Syndrome face a lot of challenges that are related to physical health, motor development, and cognitive development. These challenges are often heightened due to their sedentary lifestyle. This then causes problems like obesity, reduced physical fitness, and motor delays, which thus impacts their quality of life (Hauck et al., 2020). Even though

evidence suggests that physical activity can improve motor and cognitive abilities in people with Down Syndrome (Alesi et al., 2014; Boer & Beer, 2019), they still lack access to exercise programs tailored to their needs. As much as caregivers and parents want to help, they are uncertain about what type of physical activity is most beneficial for enhancing physical fitness and cognitive development. Even though the benefits of physical fitness on cognitive development are known, there is still a need for longitudinal studies to fully understand the long-term effects of the interventions. This synthesis will identify effective forms of physical activity and promote their integration into daily routines for people with Down Syndrome.

Purpose of the Synthesis

The purpose of this synthesis project is to review the literature on the effects of physical activity on the physical and cognitive development of individuals with developmental disabilities.

Operational Definitions

Down Syndrome: A genetic condition caused by the presence of an extra chromosome, resulting in intellectual disability, physical abnormalities, and developmental delays

Physical Activity: Any movement of the body that results in energy expenditure

Motor Skills: The ability to perform movements of the body, ranging from basic gross motor skills to fine motor skills

Cognitive Development: The progression of mental abilities such as problem solving, memory, attention, and executive function

Cognitive Enriched Physical Activity: Physical activity that incorporate elements designed to engage cognitive processes, such as task-based exercises.

Motor Competence: The ability to perform a variety of physical tasks and motor activities effectively

Research Questions

This research will be guided by three research questions:

1. What types of physical activity interventions most effectively improve motor skills in individuals with Down Syndrome
2. How does participation in cognitive enriched physical activity impact cognitive development in children and adolescents with Down Syndrome
3. What is the long-term effect of structured physical activity on the cognitive abilities and academic performance of individuals with Down Syndrome

Delimitations

1. Articles in this synthesis are from 2014 to present
2. Articles in this synthesis are peer reviewed and full text
3. Articles relating to Down Syndrome were used in this synthesis
4. Articles relating to physical activity were used in this synthesis
5. Articles discussing the benefit of physical activity for individuals with Down Syndrome are in this synthesis

Chapter 2 – Methods and Procedures

The purpose of this chapter is to review the methods and procedures used to determine the effects of physical activity on the physical and cognitive development of individuals with developmental disabilities. The studies in this synthesis were located using the EBSCO database from SUNY Brockport's Drake Memorial Library. Within the EBSCO database the following were searched: SPORTDiscus, Academic Search Complete and PsycINFO. The search primarily looked for peer-reviewed articles and published in academic journals.

Academic Search Complete

To find articles relevant to this synthesis, certain keywords were used. The search words included: physical activity and cognitive development, motor development and down syndrome, and adapted physical education were used to refine and narrow the results. In addition, filters were added to limit results to full-text, peer-reviewed articles published between 2011 and 2024. The searches using physical activity and motor development produced 17,320 results. After that 10,878 results were found. Finally, cognitive skills and exercise interventions were added which yielded 265 results. From here, 4 articles were selected for inclusion in this synthesis.

SPORTDiscus

This database showed relevant research when using the following terms: motor skills, Down Syndrome, cognitive development, and adapted physical activity. Filters were also applied to only show full-text, peer-reviewed articles published between 2011 and 2024. 89 articles were retrieved, and 5 were chosen for the synthesis.

PsycINFO

The PsycINFO database was searched using combinations of the terms Down Syndrome, cognitive development, motor skills, and physical activity interventions. Filters were applied to include full-text, peer-reviewed articles published between 2011 and 2024. This search yielded 42 articles of which two were selected for the synthesis

Sources

Ten peer-reviewed articles were selected for this synthesis. The articles contain physical activity programs including aquatics, cognitive enriched activities, and adapted sports. The articles in this synthesis are from the following journals: Neuropsychiatric Disease and Treatment, Journal of Intellectual Disability Research, Physical Education and Sport Pedagogy, Adapted Physical Activity Quarterly, Research in Developmental Disabilities, and Bulletin of the Transylvania University of Brasov: Series IX- Sciences of Human kinetics

Participants

The total number of participants used within the critical mass was 468, ranging from ages 3 to 35. All participants had a clinical diagnosis of Down Syndrome. 55% of participants were male, while 45% were female. The inclusion of such a wide age range allowed researchers to see the impacts of physical activity on both early development and long-term development. In the school-based studies, the children were enrolled in mandatory physical education programs, while in clinical settings, participants were volunteering.

Data Collection and Analysis

Various methods of data collection and analysis was used. Quantitative testing, observational data, and qualitative reflections were the most used. Assessments like the Gross

Motor Function Measure, Body Schema assessment, Wii Fit balance and agility tracking, Functional Fitness Tests, Cognitive assessments, Psychosocial questionnaires, and teacher/parent feedback forms were used.

For data analysis, the studies used statistics to summarize the test results before and after the intervention. To see if the physical activity had any effects, they used Inferential statistical tests. Paired sample t-test and independent t-test were used to compare the changes between the different groups over time. The researchers used Cronbach's alpha to check the reliability of their surveys. The Mann-Whitney U test was used for smaller sample sizes

Chapter 3: Review of Literature

The purpose of this chapter is to explore the effects of physical activity on the physical and cognitive development of individuals with developmental disabilities. In particular the following topics will be discussed; how physical activity interventions can improve motor skills, physical fitness levels, and cognitive development in the down syndrome population.

Cognitive Development

Executive Function and Academic Performance

Biino et al. (2021) looked at the effects of Cognitively Enriched Physical Activity (CEPA) on motor competence and executive function in preschool aged children. The purpose was to see how combining cognitive challenges and physical activity could improve movement and cognitive development. The intervention included 68 children aged 4 to 6, half were put into a control group while the other half was put into an experimental group. The intervention consisted of physical activity and problem-solving activities and lasted 12 weeks. They found that integrating cognitive challenges into physical activities enhances both movement and cognitive abilities. The study highlighted how CEPA improved problem solving, decision making, and adaptive movement. All of this led to improvements in executive function such as working memory, cognitive flexibility, and inhibitory control.

In a related study, Morales et al. looked at the relationships between physical activity, perceptual motor performance, and academic learning in school children aged 9 to 16. Researchers wanted to understand the correlation between physical activity and cognitive function and academic achievement. 310 students took a standardized test for motor skills and academic performance. Physical activity logs and cognitive assessments were tracked throughout the school year. They saw that higher levels of physical activity are associated with improved

motor skills, which leads to better cognitive function and academic achievement. They highlighted the role of movement-based activities in improving children's ability to process information, concentration, and academic performance.

Physical Development

Body Schema and Spatial Awareness

Singuran et al. (2023) looked at the impact of swimming and aquatic exercises on the development of body schema (the unconscious metal representation of the position, movement, and orientation of the body in space) in children with Down Syndrome. The study involved 25 children aged 6 to 10 years old. The intervention was a 10-week aquatic program. It consisted of two swimming sessions a week and had activities that are supposed to enhance coordination, spatial awareness, and posture control. The study showed how water-based activity enhanced motor skills, spatial awareness, and overall body perception, all areas that are difficult for children with Down Syndrome. It was noted that the buoyancy and resistance provided by water created an optimal environment for improving coordination, muscle tone, and postural control while also reducing risk of injury.

Early Motor Development

Turning over to early physical development, Hauck et al. (2020) looked at the correlation between motor development and physical activity regarding infants with Down Syndrome and infants that are typically developing. The researchers wanted to determine how early physical activity might influence motor milestones. The study had 36 infants from 12 to 18 months old, 18 were diagnosed with Down Syndrome. Direct observations and standardized motor development test were used for a 6-month period. The results showed that infants who engaged in regular physical activity had enhanced motor skills.

Gross Motor Skills and Functional Fitness

Similarly, Alesi et al. (2014) looked at the advancement of motor and cognitive abilities due to training programs regarding three children with Down Syndrome. The purpose of this study was to determine if targeted physical activity could improve task performance and reaction time. The participants had bi-weekly aerobic and coordination training for 8 weeks. Tests were conducted pre and post intervention to allow for comparisons. This case study showed improvements in task reaction times after participating in exercise training programs.

In addition, Boer and Beer (2019) looked at the impact of aquatic exercises on the physical and functional fitness of adults with Down Syndrome living in intellectually disabled care centers in South Africa. The study had 40 adults with Down Syndrome, 20 were assigned to the 6-week aquatic training while 20 were put in a non-active control group. The intervention had water-based exercises sessions 3 times a week. A non-randomized controlled trial showed that with aquatic training the adults showed improvements in the 16-meter Progressive Aerobic Cardiovascular Endurance Run, 6 Minute Distance Walk Test, Sit and Reach, and the Modified Curl Up tests, compared to the controlled group who did not participate in this aquatic exercise program. After six weeks the people with Down Syndrome partaking in the aquatic training improved significantly.

Moreover, Silva et al. (2019) looked at the impact of Wii based exercise on physical fitness, coordination, and functional movement regarding adults with Down Syndrome. The experiment included 30 adults who were randomly assigned to the experimental group or the control group. The intervention group partook in Wii-based exercises that focused on balance, strength, and flexibility 3 times a week for 8 weeks. The Euro Fit Test Battery and body composition analysis was taken before and after intervention. An analysis of variance showed the

two groups having a vast difference for endurance strength, explosiveness, and flexibility. The t-test favored the group being tested regarding limb movement speed, leg strength and mobility, as well as body weight.

Perić et al. (2022) looked at the impact soccer programs had on motor skills retention and social behaviors regarding adults with Down Syndrome. In the study there were 28 participants between 14 and 18 years old. They were divided into a control and intervention group. The intervention group took part in soccer training 2 times a week for 10 weeks. The main focus for the study was motor learning, teamwork, and social interaction. This experimental design showed the experimental group had improved tremendously in the motor skill measurements and in all psychosocial variables. The soccer program impacted psychosocial characteristics way more than the motor learning of the adolescents.

Longitudinal Impacts of Physical Activity

Looking at long term effects, Izquierdo-Gomez et al. (2017) conducted a longitudinal study where they looked at the changes in physical activity among adolescents with Down Syndrome. The study consisted of 50 adolescents between 12 and 18 years old. Over a two year span annual assessments of physical activity were tracked using accelerometers and self-reports. The study saw a decline in physical activity levels over time. The researchers also emphasized the importance of promoting sustained physical activity in this population, because lower activity levels are associated with health risks and lower functional abilities.

Similarly, Izquierdo-Gomez et al. (2015) looked at the associations between physical activity, fatness, and physical fitness in adolescents with Down Syndrome. 90 participants aged 11 to 19 were used in the study. Physical activity was measured by using accelerometers and body composition assessments and fitness levels were tracked. They noted that more intense

physical activity is linked to lower body fat percentages and improved physical health. Adolescents with Down Syndrome tend to have lower physical activity levels compared to their peers, which may lead to higher obesity rates and reduced cardiovascular fitness.

In conclusion, all studies stated the role that physical activity has in enhancing cognitive and physical development in individuals with developmental disabilities. Whether it's cognitively enriched activities, aquatics, or sport programs, physical activity is a great form of intervention to improve executive function, motor skills, body awareness, and overall fitness. With these implications, healthier lifestyles and improved quality of life are future long-term benefits. Incorporating consistent and developmentally appropriate physical activity into individuals with developmental disabilities' daily routine will lead to improvements in growth, learning, and overall well-being.

Chapter 4

Results, Discussion and Recommendations for Future Research

The purpose of this chapter is to present the results of the review of literature on the effects of physical activity on the physical and cognitive development of individuals with developmental disabilities and how these results align with the purported research questions which guided this synthesis project. In addition, recommendations for future research as it relates to physical and cognitive development for people with developmental disabilities are presented.

Results

The results of this review of literature revealed the following. Structured and cognitively enriched physical activity interventions were associated with improvements in motor competence, physical fitness, and cognitive development. Activities like swimming, adapted sports, Wii based gaming, and cognitively enriched physicality helped improve executive functions, spatial awareness, and gross motor skills. Endurance, balance, mobility, and psychosocial well-being were also improved after these exercise interventions.

Discussion

Interpretations

As part of this literature review, several research questions were posted. The first research question “What types of physical activity interventions most effectively improve motor skills in individuals with Down Syndrome?” The research demonstrates that aquatics, adapted soccer, and Wii based exercise were effective in enhancing motor skills, functional fitness, and coordination.

Aquatics was effective because it reduced injury while encouraging strength and movement. Interventions that emphasize enjoyment and consistency yielded the most improvement.

The second question “How does participation in cognitively enriched physical activity impact cognitive development in children and adolescents with Down Syndrome?” found that incorporating cognitive tasks within physical activity improved problem solving and memory in preschool children with Down Syndrome. Physical activity led to better academic performance and information processing. The combination of movement and mental activity stimulates brain function and cognitive growth.

The final question “What is the long-term effect of structured physical activity on the cognitive abilities and academic performance of individuals with Down Syndrome?” saw the emphasis on the importance of maintaining physical activity over time. Decline in physical activity was associated with reduced physical fitness and increased health risks. Long term cognitive effects were not extensively measured in many studies. However, early evidence shows that engagement in physical activity can lead to sustained improvement in physical function and cognitive function.

Implications

This synthesis has many implications for physical educators, administrators, coaches, and therapists working with people with developmental disabilities. Previous research and these results both show that structured, enjoyable, and cognitively enriched physical activity influences physical and cognitive development. This synthesis adds to prior research by emphasizing the value of physical movement combined with cognitive challenges and their ability to improve cognitive growth.

Some practical implications could be that P.E programs incorporate aquatics, adapted sports, and/or interactive gaming, to improve motor and executive function. Studies show that consistency and secure structured environments played a part in the success. Socialization and increased confidence could have been a contributing factor for academic success instead of physical activity. Being able to control this in the future could lead to different results.

Recommendations for Future Research

In reviewing the data based on the effects of physical activity on the physical and cognitive development of individuals with developmental disabilities, the following limitations were noted. Many of the studies sample sizes were small, this ultimately limited the generalization of the findings. Not all of the studies had long term follow up assessments to determine if the improvements were sustained. Due to all the studies not having the same interventions, time periods, and intensity, the comparisons were hard to track.

Based on these limitations and other insights related to the literature the following recommendations for future research should be considered:

1. The need for long term longitudinal studies; this will help determine if cognitive and physical development is sustained over time.

2. Larger sample sizes; this will help with generalizability.

3. Have standardized interventions; this will help to compare multiple studies to one another.

4. Assess motivation and enjoyment as mediators of physical activity.

5. Exploring how effective technology-based interventions compare to “traditional” exercise programs.

6. Researchers should develop and test interventions that are specifically for adolescents and adults with developmental disabilities since a lot of research already focuses on children with developmental disabilities.

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Appendix

Article Summary

Article Title 1:

Improvement of Gross Motor and Cognitive Abilities by an Exercise Training Program: Three Case Reports

Journal:

Neuropsychiatric Disease and Treatment

Date of Publication:

2014

Purpose of the Research:

The research examined the effects of a exercise training program on gross motor skills and cognitive abilities on children with developmental coordination disorder

Number of Subjects Total (tally all subjects):

3

Number of Subjects by Demographic Traits (male, female, girls, boys, athletes, non-athletes, coaches, teachers, parents....):

Children with developmental coordination disorder. 2 boys, Male 1 was a 10 year old with a mental age of 4. Male 2 was a 14 year old boy with a mental age of less than 4 years old. Female 1 was 14 years old with a mental age of less than 4.

How was the data collected (surveys, observations, focus groups, interviews…) What were the names of the surveys used if applicable:

Standardized test and assessments were used to measure gross motor and cognitive abilities before and after intervention. The "Movement Assessment Battery for Children" and "Cognitive Ability Test" were used throughout.

How long did the researchers collect the data:

The intervention lasted about 5 months with the structured exercise training sessions.

Other information about how the data was obtained:

The study uses a case report methodology. They were all tracked individually instead of in a experimental design. The exercise program included coordination, balance, and cognitive engagement workouts.

How was the data analyzed:

Motor and cognitive pre test and post test scores were compared. The researchers also analyzed improvement in coordination and cognitive function in each child.

What were the findings/results:

Based on the "Movement Assessment Battery for Children" the children showed significant improvement in gross motor skills. Cognitive function also improved after the training regimen. They discovered that there is a positive link between physical activity and cognitive performance in children with developmental coordination disorder.

What did the researchers discuss about the findings:

The study emphasized the importance of multisensory and motor cognitive integration in training for children with coordination disorders. The researches also stated that individual case studies provide insights but there is need for larger scale studies to confirm.

What did the researchers recommend for future research:

Conduct larger scale, controlled studies to further validate the impact of exercise on cognitive and motor skills. They also want to investigate how different types of exercise interventions may benefit children with various neurodevelopmental disorders.

Article Title 2:

The effect of aquatic exercises on the physical and functional fitness of adults with Down Syndrome: A non-randomized controlled trial

Journal:

Journal of Intellectual Disability Research

Date of Publication:

2019

Purpose of the Research:

The purpose of the research was to find the effects of aquatic exercises on the physical and functional fitness of adults with Down Syndrome. The study wanted to determine if aquatic exercises could improve the individual's physical capabilities and overall fitness

Number of Subjects Total (tally all subjects):

44 participants, 22 were in the intervention group and 22 were in the control group

Number of Subjects by Demographic Traits (male, female, girls, boys, athletes, non-athletes, coaches, teachers, parents....):

There were 24 males and 20 females. All had Down Syndrome

How was the data collected (surveys, observations, focus groups, interviews...) What were the names of the surveys used if applicable:

Data was collected by conducting physical fitness assessments. They measured strength, flexibility, and endurance.

How long did the researchers collect the data:

It was a 12 trial, during this period the intervention group completes aquatic exercises.

Other information about how the data was obtained:

Participants in the intervention group participated in structured aquatic exercises, while the control group did their normal day activities. Pre and post intervention tests were conducted to measure changes in physical and functional fitness.

How was the data analyzed:

The data used statistical methods, the pre and post test results were compared between the intervention and control groups to assess the effectiveness of the aquatic exercises.

What were the findings/results:

The study discovered that adults with Down Syndrome who participated in aquatics showed significant improvements in their physical and functional fitness compared to those in the control group. They had improved strength, flexibility and endurance.

What did the researchers discuss about the findings:

They discussed that aquatics could be a valuable and feasible intervention for improving the physical health of adults with Down Syndrome.

What did the researchers recommend for future research:

Exploring long term effects of aquatics and examining whether different forms of exercise would yield more successful results. They also suggested randomized controlled trials to validate the findings.

Article Title 3:

Cognitively Enriched Physical Activity May Foster Motor Competence and Executive Function as Early as Preschool Age: A Pilot Trial

Journal:

Physical Education and Sport Pedagogy

Date of Publication:

2021

Purpose of the Research:

The purpose was to investigate whether cognitively enriched physical activity could enhance motor competence and executive function in preschool aged children. They wanted to examine if such activities could possibly influence children's motor skills and cognitive abilities earlier in life.

Number of Subjects Total (tally all subjects):

36 children

Number of Subjects by Demographic Traits (male, female, girls, boys, athletes, non-athletes, coaches, teachers, parents....):

There were 19 girls and 17 boys. They were all preschool aged children from 3-6 years old.

How was the data collected (surveys, observations, focus groups, interviews...) What were the names of the surveys used if applicable:

Data was collected through observations and physical assessments. The study measured motor competence and executive function. Gross and fine motor skills were assessed with

the Peabody Developmental Motor Scales 2nd edition. For core executive function, the Forward Word Span Test and Trial Making Test for young children was used. Intervention effects were explored with two-way Repeated Measures MANOVAs, followed by similar ANOVAs for each dependent variable

How long did the researchers collect the data:

12 weeks

Other information about how the data was obtained:

Gross and fine motor skills were assessed with the Peabody Developmental Motor Scales 2nd edition. For core executive function, the Forward Word Span Test and Trial Making Test for young children was used. Intervention effects were explored with two-way Repeated Measures MANOVAs, followed by similar ANOVAs for each dependent variable

How was the data analyzed:

Statistical methods were used to compare changes in motor competence and executive function before and after the intervention.

What were the findings/results:

The study discovered that cognitively enriched physical activity was associated with improvements in both motor competence and executive function in the young children

What did the researchers discuss about the findings:

Cognitively enriched physical activity enhances motor and cognitive development in young children, Due to this, they believe it is an important area for early childhood education and

development programs. They also believe that longer intervention would have a long-lasting effect on the children's developmental trajectory

What did the researchers recommend for future research:

Larger sample sizes and randomized control trials

Article Title 4:

Early Movement Matters: Interplay of Physical Activity and Motor Skill Development in Infants with Down Syndrome

Journal:

Adapted Physical Activity Quarterly

Date of Publication:

2020

Purpose of the Research:

To examine the relationship between physical activity and motor skill developmental in infants with Down Syndrome. To determine if early movement interventions could improve the development of motor skills in people with Down Syndrome

Number of Subjects Total (tally all subjects):

36

Number of Subjects by Demographic Traits (male, female, girls, boys, athletes, non-athletes, coaches, teachers, parents....):

27 Typically developing children and 9 children with Down Syndrome. They were between 1 month and 18 months old.

How was the data collected (surveys, observations, focus groups, interviews...) What were the names of the surveys used if applicable:

Through observations of the infants during physical activity sessions and motor skill assessments. They observed the infant's ability to perform basic motor tasks like crawling, reaching, walking. They measured how physical activity influenced those skills.

How long did the researchers collect the data

Other information about how the data was obtained:

The research involved structured physical activity intervention designed for infants with Down Syndrome

How was the data analyzed:

Statistical methods to assess the relationship between physical activity and motor skill development. Correlation analysis and repeated measures analysis was used.

What were the findings/results:

There was a positive correlation between physical activity and motor skill development. significant differences between infants with and without DS arose first at 2 months for gross motor skills and 4 months for fine motor skills and remained significantly different at all later time points with infants with DS demonstrating fewer motor skills. Infants with DS in the high physical activity group achieved milestones early at a significant rate than those in the low physical activity group

What did the researchers discuss about the findings:

The discussed the importance of early movement and physical activity in the development of motor skills in infants with Down Syndrome.

What did the researchers recommend for future research:

Log term studies to asses the lasting effects. Expanding the study to larger samples of infants

Article Title 5:

Changes in Objectively Measured Physical Activity in Adolescents with Down Syndrome: The Up & Down Longitudinal Study

Journal:

Journal of Intellectual Disability Research

Date of Publication:

2017

Purpose of the Research:

To examine changes in objectively measured physical activity levels in adolescents with Down Syndrome. To provide insight into how physical activity patterns can change as adolescents with Down Syndrome grow and how it impacts their health and their development.

Number of Subjects Total (tally all subjects):

90 adolescents

Number of Subjects by Demographic Traits (male, female, girls, boys, athletes, non-athletes, coaches, teachers, parents....):

99 adolescents with Down Syndrome. 38 Females and 61 Males all aged 11 to 20 years old

How was the data collected (surveys, observations, focus groups, interviews...) What were the names of the surveys used if applicable:

Data was collected using objective physical activity measurements. Accelerometers and other wearable devices were used. The devices measured the adolescents daily physical activity, which provided a more accurate activity level.

How long did the researchers collect the data:

Longitudinal period, they did 1 year and 2 year changes

Other information about how the data was obtained:

The individuals wore accelerometers to track their physical activity levels on a 2 year period

How was the data analyzed:

Longitudinal statistical method, using repeated measures analysis

What were the findings/results:

Physical activity levels in the adolescents changed over time. There was a decrease in activity levels as they aged. They seems to become less active during their teenage years.

What did the researchers discuss about the findings:

They discussed the need for targeted interventions to help maintain and increase activity level during the adolescent years. They spoke about the challenges of promoting sustained physical activity in the population and the importance of developing tailored strategies.

What did the researchers recommend for future research:

Explore interventions to prevent or mitigate the decline in physical activity among adolescents with Down Syndrome

Article Title 6:

Association of Physical Activity with Fatness and Fitness in Adolescents with Down Syndrome: The Up and Down Study

Journal:

Research in Developmental Disabilities

Date of Publication:

2015

Purpose of the Research:

To discover the association between physical activity levels, body fat, and fitness in adolescents with Down Syndrome. How physical activity relates to fatness and overall fitness in this population.

Number of Subjects Total (tally all subjects):

200

Number of Subjects by Demographic Traits (male, female, girls, boys, athletes, non-athletes, coaches, teachers, parents....):

100 adolescents with Down Syndrome aged 11-20 years old. 37 females and 63 males. And a sex-matched sample of 100 adolescents without Down Syndrome.

How was the data collected (surveys, observations, focus groups, interviews…) What were the names of the surveys used if applicable:

The ALPHA health-related fitness battery for adolescents was used to assess fatness and fitness. Physical Activity was measured by accelerometry. Body fat was measured using a skinfold thickness test. Muscular fitness was measured using handgrip strength and the standing long jump test. Motor fitness was measured using the 4 x 10m shuttle run test of speed of movement, agility and coordination. A questionnaire based on the Adaptive Behaviour School Scale assessments was used to assess the functional profiles of the adolescents with Down Syndrome.

How long did the researchers collect the data

Other information about how the data was obtained:

Training sessions took place where the participants wore accelerometers and did various fitness tests. The same test were then repeated throughout the study period.

How was the data analyzed:

Correlation analysis was used to examine the relationships in physical activity levels, body fat, and fitness between Down Syndrome and non-Down Syndrome individuals.

What were the findings/results:

Levels of physical activity were not associated with fatness. Engagement in particularly vigorous physical activity is associated with better levels of fitness. And meeting the physical activity guidelines might not be enough to build fitness in the Down Syndrome population

What did the researchers discuss about the findings:

They noted that physical activity can play a crucial role in improving both body composition and fitness in adolescents with Down Syndrome. Maintaining physical activity could help mitigate the risks of obesity and improve overall health in the Down Syndrome population.

What did the researchers recommend for future research:

Exploring the optimal intensity and duration for improving health outcomes in this population

Article Title 7:

The Effect of the Adapted Soccer Programme on Motor Learning and Psychosocial Behaviour in Adolescents with Down Syndrome

Journal:

Journal of Intellectual Disability Research

Date of Publication:

2021

Purpose of the Research:

To investigate the impact of an adapted soccer program on motor learning and psychosocial behavior in adolescents with Down Syndrome. To determine whether a program could improve motor skills and positively improve the social; and psychological behavior of adolescents.

Number of Subjects Total (tally all subjects):

25

Number of Subjects by Demographic Traits (male, female, girls, boys, athletes, non-athletes, coaches, teachers, parents....):

25 adolescents with Down Syndrome

How was the data collected (surveys, observations, focus groups, interviews...) What were the names of the surveys used if applicable:

Observations and psychosocial surveys were used to measure behavior changes. Motor learning assessments were used to measure skill development.

How long did the researchers collect the data

16 weeks

Other information about how the data was obtained

Adolescents were randomized into two groups. Those placed in the exercise group carried out a special soccer program twice a week for 16 weeks, while adolescents in the control group continued their usual day to day.

How was the data analyzed:

Mixed ANOVA

What were the findings/results

The exercise group had significant improvements in one of three motor variables and in all psychosocial variables. The soccer program was more beneficial for psychosocial characteristics than on motor learning of adolescents with Down Syndrome.

What did the researchers discuss about the findings:

They discussed the importance of physical activity programs in the development in motor skills and psychosocial behavior.

What did the researchers recommend for future research

Exploring if other sports would be beneficial and help achieve if not more than the same benefits. Also exploring how variations in intensity or duration can impact the outcomes

Article Title 8:

Wii-Based exercise Program to Improve Physical Fitness, Motor Proficiency, and Functional Mobility in Adults with Down Syyndrome

Journal

Journal of Intellectual Disability Research

Date of Publication

2017

Purpose of the Research

To evaluate the effectiveness of a wii-based exercise program on improving physical fitness, motor proficiency, and functional mobility in adults with Down Syndrome. To determine if the interactive, technology driven approach could enhance physical and functional abilities in the Down Syndrome population

Number of Subjects Total (tally all subjects)

27

Number of Subjects by Demographic Traits (male, female, girls, boys, athletes, non-athletes, coaches, teachers, parents....)

27 adults with Down Syndrome

How was the data collected (surveys, observations, focus groups, interviews...) What were the names of the surveys used if applicable

Observations, Fitness assessments, and functional mobility tests.

How long did the researchers collect the data

2 months

Other information about how the data was obtained

27 adults with Down Syndrome were randomly allocated to an experimental group or a control group. Participants in the experimental group completed a 2 month wii based exercise program with three 1 hour sessions per week. It included training games for aerobic endurance, balance and isometric strength. They then completed assessments regarding to anthropometric measures, physical fitness, functional mobility and motor proficiency.

How was the data analyzed

Mixed ANOVA

What were the findings/results

The wii-based exercise program had significant improvement in physical fitness, motor proficiency, and functional mobility in the adults. They showed improvement in balance, strength, and functional abilities.

What did the researchers discuss about the findings

The potential of using technology based exercise programs such as the wii, as an engaging and effective tool for improving physical health and motor skills. The highlighted the accessibility of the wii and its potential to provide a fun motivating way to engage in physical activity

What did the researchers recommend for future research

More studies on technology based exercise

Article Title 9:

The Value of Swimming and Aquatical Exercises in the Development of Down Syndrome Children's Body Schema

Journal

Bulletin of the Transilvania University of Brasov. Series IX: Sciences of Human Kinetics

Date of Publication

2023

Purpose of the Research

To examine the effects of swimming and aquatic exercises on the development of body schema in children with Down Syndrome. To explore how physical activity can improve a child's perception and awareness of their body in space.

Number of Subjects Total (tally all subjects)

15

Number of Subjects by Demographic Traits (male, female, girls, boys, athletes, non-athletes, coaches, teachers, parents....)

15 children with Down Syndrome. 7 boys and 8 girls

How was the data collected (surveys, observations, focus groups, interviews...) What were the names of the surveys used if applicable

The body schema investigation test and the non parametric Wilcoxon Signed-Rank Test

How long did the researchers collect the data

12 weeks

Other information about how the data was obtained

The data was collected through pre and post intervention testing. Children had swimming and aquatic exercises twice a week for 12 weeks. Their body schema and motor abilities were assessed before and after the intervention to track how they changed.

How was the data analyzed

Non parametric Wilcoxon test for paired-samples

What were the findings/results

Swimming contributed to the development of body schema in the children. They showed improvements in spatial awareness, motor coordination, and body perception

What did the researchers discuss about the findings

They discussed how the water-based activities provided a unique environment for improving physical coordination and spatial awareness, which tends to be a challenge for children with Down Syndrome

What did the researchers recommend for future research

Exploring how hydrotherapy or structure aquatic games could change or improve these outcomes

Article Title 10:

Physical Activity, Perceptual Motor Performance, and Academic Learning in 9- to 16-year-Old School Children

Journal

International Journal of Sport Psychology

Date of Publication

2011

Purpose of the Research

To explore the relationship between physical activity, perceptual motor skills, and academic performance in children aged 9 to 16. To see how physical fitness and motor performance affect cognitive abilities and school learning outcomes in children

Number of Subjects Total (tally all subjects)

487

Number of Subjects by Demographic Traits (male, female, girls, boys, athletes, non-athletes, coaches, teachers, parents....)

249 girls and 238 boys from 6 public centers of primary and secondary schools in Spain. All aged 9 to 16

How was the data collected (surveys, observations, focus groups, interviews...) What were the names of the surveys used if applicable

Surveys and observational assessments of physical activity levels, motor performance, and academic learning.

The Tower of Cubes test, The Target-Throwing, the Oral Skills (OS) test, and the Math Skills (MS) test.

How long did the researchers collect the data

Other information about how the data was obtained

At the start of the study, a closed-question, clinical history questionnaire was administered to every participant. The questionnaire contained specific questions aimed at identifying the extra-curricular physical activity that the children engaged in beyond the compulsory

activity included in their physical educational curriculum (2 hours per week). The questionnaire was modified from the IPAQ (2005) to determine the amount of physical activity (PA) carried out by everyone. Based on the results obtained, and within each age-group, the sample was divided into two groups.

How was the data analyzed

In order to check for the normal distribution of all dependent variables, a Kol- mogorov-Smirnov test was used. A test for homoscedasticity (Levene's test) was also carried out on all variables.

What were the findings/results

Physical activity and motor skills were associated with academic performance. Those who were more physically active and had better perceptual motor skills tended to perform better in academic subjects. There is less of a correlation in the 13-16 year olds.

What did the researchers discuss about the findings

Physical activity might enhance cognitive functions, like memory, attention, and motor coordination.

What did the researchers recommend for future research

What types of physical activity has the most impact on academic performance.