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Martial art as a means for the improvement of life quality and social inclusion of children with autism spectrum disorder

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ABREVIATION

ASD Autism Spectrum Disorder

ATDP Attitude Toward Disabled Persons Scale

DSM-IV Diagnostic and Statistical of Mental Disorders IV edition

DSM-V Diagnostic and Statistical of Mental Disorders V edition

FIJLKAM Federazione Italiana Judo Lotta Karate e Arti Marziali

FISDIR Federazione Italiana Disabilita' Intelletivo Relazionali

GARS Gilliam Autism Rating Scale

ICD International Classification of Diseases

ICF International Classification of Function

OCD Obsessive-Compulsive Disorder

SRS Social Responsiveness Scale

SRS Cns Social awareness

SRS Cgs Social Cognition

SRS Cms Social communication

SRS MS Social Motivation

SRS MA Autistic Mannerism

TGMD-3 Test of Gross Motor Development – Third edition.

INTRODUCTION

Overview of the research

The reason for this research comes from my five-year experience at FIJLKAM (Federazione Italiana Judo Lotta Karate) as tutor of the National School. During the national training courses for coaches and through the comparison with them it emerged that there was a large number of ASD (Autism Spectrum Disorder) children in judo and karate gyms. On the basis of this survey, I began to reflect on the reason for this trend and therefore I studied in deep the scientific literature about all the literature on martial arts and autism spectrum. Both from the literature and from the comparison with specialists in the field (neuropsychiatrists, psychologists, pediatricians and psychotherapists). I had further confirmation that the increasing number of ASD children in martial arts is so high because it is the most suitable sport for them. From the analysis of the projects that FILKAM had carried out in schools, it emerged the European Erasmus Plus Project "Sport at School", in which karate was introduced in schools with a frequency of twice a week. In this project there was not a specific part adapts for ASD children. The application of this project showed an improvement in the behavior, school performance and attention levels of normal children. From this project I therefore thought to include also a part adapted for ASD children, supervised by a team of specialists (psychologists/psychotherapists and coaches with experience in autism).

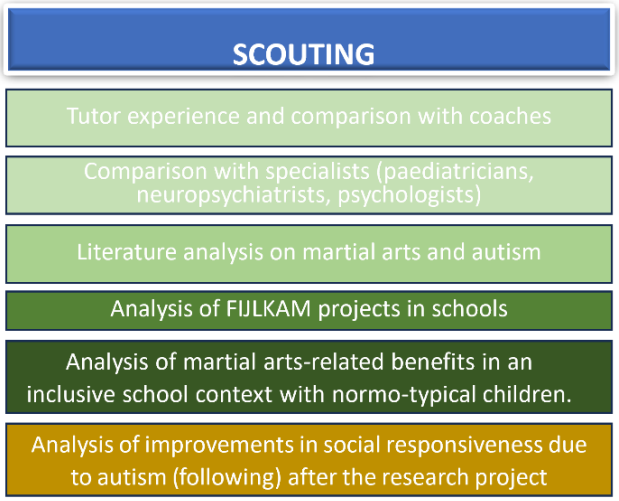

Figure 1 Scouting Phase

Problem statement

The benefits that martial arts such as judo and karate bring to ASD (Autism Spectrum Disorder) children are known in the literature, but there are no studies analyzing the benefits of inclusive work. In order to carry out effective inclusive work, it is necessary to have specialized

coaches who know how to manage an ASD child in an inclusive context. Most of the Italian sports federations do not have specific training courses in relational intellectual disabilities and this could be one of the reasons why many sports contexts do not have the specific skills to welcome ASD children in inclusive contexts. Another fundamental aspect in order to be able to carry out an effective work of social inclusion is to understand how children at school perceive disability and what strategies could be useful for promoting the inclusion process starting from this fact. In light of this, the Katautism research project wanted to analyze whether judo and karate performed in an inclusive school context can, through a staff of competent trainers and expert psychologists in autism, contribute to the inclusion process to improve the quality of life of the ASD subjects

Main Hypothesis

From this scouting phase (Fig.1) emerged the main hypothesis that combines the improvements associated with martial arts with an inclusive context within schools to analyze the benefits of integrated work with normo-typical children.The main hypothesis that by developing an adapted motor activity for ASD children based on martial arts (Judo and Karate) with normotypical children in an inclusive school context, this can contribute to the process of social inclusion of the children which will contribute to improving the quality of life of autistic children.

The objectives of the experimental research were to monitor the adaptations of 3 different areas, the level of autism and related impairments, social impairment and gross motor skills.

The criteria for selecting the classes involved in the project was that 1 autistic child of any degree of impairment should be present in each class.

The assessment methods that have been chosen for the research are specific to the areas of interest in the study. The Gilliam Autism Nation Scale (GARS) was used to assess the level of autism, the Social Responsivness Scale -Teacher (SRS) was used to assess the level of social impairment and the Test of Gross Motor Development was used for gross motor skills. - Third Edition (TGMD-3). The tests were administered at the beginning and at the end of the project by three different professional figures. The GARS by psychologists expert in autism present during the lessons, the SRS by class teachers while the TGMD-3 by PhD student Nicole Maussier

The intervention program foresaw that a group of children followed the judo program and a group the karate program.The intervention program included two sports disciplines, judo and karate. One of the characteristics of martial arts that makes them one of the most recommended sports for autistic people (Bremer, 2016) is predictability which has proven to be fundamental for the subject's emotional regulation.

Karate started from teaching the basics of karate, such as correct posture, breathing and movements fundamentals, up to teaching the first kata (pinan nidan). The importance of how to use these

techniques in a controlled and responsible way was explained.

Judo started from the didactic progression of falls in all its forms (backward, sideways forward), initially individual and then gradually moving on to projections in pairs with immobilization techniques on the ground. The activity took place twice a week (1 hour each session) for a total of 12 weeks. The individualized program for the autistic child resulted from the synergistic work of the specialized coaches and the expert psychologist in autism who was always present during the lessons.

PHASE OF RESEARCH		
1	THEORETICAL BACKGROUND	2020/2021
2	DISABILITY PERCEPTION ANALYSIS BUY CHILDREN AT SCHOOL	2021
3	AWARNESS AUTISM IN FIJLKAM COACH	2021
4	KATAUTISM PILOT PROJECT	2021
5	KATAUTISM NATIONAL PROJECT	2022
6	THESIS DISCUSSION	2023

Figure 2 Phase of the research

Figure 2 represents the phases of the research. I started by collecting literature on autism and inclusive sport. After the theoretical foundation I started the 1st study to analyze the perception of disability by children at school. In the following I did the 2nd FIJLKAM Coaches Autism Awareness Study. The 3rd study which represents the objective of my research concerns the operational phase in schools which started in 2021 with the pilot project and ended with the national project in 2022

The phases of the study

The first Phase in 2021 wanted to analyze the perception of disability by children at school. Having to bring the research project within a school, it was considered important to understand the perception that children have of disability and it was also asked how many of them had had experience with disabled children in sports contexts.

A second phase in 2022 of the project analyzed the awareness of autism by FIJLKAM technicians (Italian Judo, Fight, Karate and Martial Arts Federation). To work with autistic children in an inclusive context it was necessary to understand the awareness of autism on the part of the coaches. Through this survey, a specific training course was subsequently structured for FIJLKAM coaches in which 317 coaches participated.

The third phase (2021/2022) operational phase inside the school, included in 2021 the Pilot project in schools involving 5 autistic children and in 2022 the National project involving 20 ASD children in these studies. The ages included in both studies ranged from 6 to 10 years.

PART I
THEORETICAL BACKGROUND

Autism Spectrum Disorder (ASD) is a complex developmental disorder that occurs in about 1 in 68 children (Centers for Disease Control and Prevention - CDC, 2014) and results in a significant challenge with social skills, communication and behavior (American Psychiatric Association, 2013). Individuals with ASD typically exhibit a number of stereotypical behaviors or interests including compulsions and motor stereotypes such as clapping and body swinging (Bodwfish, 2000). Many studies have demonstrated the effectiveness of these motor interventions to improve outcomes for people with ASD, particularly if the interventions are intensive and introduced early in life (Corsello, 2005).

Further evidence-based forms of treatment are needed to help reduce the maladaptive behaviors associated with ASD and promote key positive behaviors at home, at school and in the community. The behavioral mental benefits of physical activity in people with typical developmental development are evident and proven (Penedo, 2005), but few data are available on benefits obtained in people, particularly children and young people, with ASD. The maladaptive, behaviors associated with ASD can sometimes be attributed to stress and anxiety (Myers, 2007). Since mental health can be improved through physical activity in individuals with typical development (Penedo, 2005), physical activity may help to improve mental health and behavior in individuals with ASD.

Reviews of the impact of physical activity in subjects with ASD (Langdon, 2012; Petrus, 2008; Sorensen, 2014) showed significant benefits: however, in none of the reviews was a comprehensive peer review research strategy used to assess its internal validity using the Scottish Intercollegiate Guidelines Network criteria (Harbour, 2001). Another review (Bremer, 2016) looks exclusively at the impact of exercise interventions on a range of behavioral symptoms, including stereotypical behaviors, and examines positive social behaviors, focusing only on younger and younger children, often excluded from other reviews.

A typical deficit in most people with autism spectrum disorders (ASD, APA 2013) is a profound difficulty in communication and language development.

Communication is essential for learning and for establishing relationships with others, so that deficits in communication skills do not set limits to opportunities for play and social integration (Prelock, 2011). There is also considerable evidence that communication deficits in children with autism are strongly related to executive disfunction (Russel, 1997) and altered social interaction (Kuhl, 2005). Therefore, interventions to improve communication in ASD are vital for success in both school curricula and functional and real adaptation (Prelock, 2011).

An increasing number of studies suggest numerous methods of treatment of communication to improve the deficit in individuals with autism. These strategies include not only imitation (McDuffie , 2005), play (Yoder,2006), joint attention (Charman, 1997), verbal behavior (Paul, 2005), language

teaching (Freeman, 1997) but also exercise-based intervention programs (Staples, 2011). Exercise-based treatment has been introduced as a new intervention for the treatment of subjects with ASD (Watters, 1980; Celiberti, 1997; Prupas,2001; Yilmaz I, 2004). Studies have demonstrated the beneficial effects of exercise and sports training through a wide variety of abilities in children with developmental disabilities (Hornyak, 2008), including children with autism spectrum disorders (Pitetti, 2007; Movahedi, 2013).

After practicing physical exercises, subjects with ASD showed profound improvements in social skills (Bass, 2009, Moveahedi, 2013), cognitive function (Anderson-Hanley, 2011), stereotypical behavior (Bumin, 2003; Bahrami, 2012), attention (Bass, 2009), self- harm behavior (Elliot, 1994), aggressiveness (Allison, 1991).

Baharami et all (2012) were among the first to examine the effects of karate exercise on communication deficits in children with ASD. The aim of the study was to determine whether teaching karate techniques to children with ASD would lead to significant reductions in their communication deficits. The main hypothesis was that children with autism participating in a 14-week karate training program would show an improvement in communication deficits compared to children with autism who were not included in the karate training program. It was also assumed that the improvements in communication deficits in ASD participants included in the training program would be maintained in a 1-month follow-up. The results of the study confirmed that karate training techniques lead to an improvement in communication deficit in children with ASD and that this improvement would also continue in a follow-up of 30 days of inactivity. The authors did not provide an interpretation of these exercise-based beneficial effects. Important new findings in psychology and neuroscience, however, it is assumed that there is a neurobiological mechanism underlying these benefits. One mechanism includes well-documented increases in brain-derived neurotrophic factor (BDNF) levels following periods of exercise (Cottman, 2002; Ang, 2007; Lang, 2010).

A recent article (Berryman, 2010) reports a study carried out on the production of oxytocin (OT) during martial arts and on the benefits this brings to autistic and normotypical children.

The different activities of the organism are coordinated by a group of organs, endocrine glands, which form the endocrine system.

Indeed, it has been shown that interactions involving physical contact between parents and children increase the endogenous production of OT both in healthy infants (Feldman,2010) and in preschool children with autism spectrum disorders (Feldman 2014).

Several studies have reported therapeutic effects of oral, intravenous, and intranasal administration of OT in social dysfunction disorders, such as autism and schizophrenia, and have further suggested that exercise-induced elevations may be important in modulating changes.

cardiovascular and fluid homeostasis during and after exercise and may also moderate the stress-induced response (Davis,2014; Parker,2017)

The concept of sport inclusion is based on the fact that playing sport together with children with and without disabilities has mutual benefits for both groups of children (Block, 2007). Some research suggests that including children with even severe disabilities can be very successful (Block & Zeman, 1996; Klavina & Block, 2008; Obrusnikova, Block, & Valkova, 2003). Other studies suggest that inclusion in sports contexts could lead, if not carried out correctly and with the necessary skills, to consequent negative experiences for children with disabilities (Blinde & McCallister, 1998; Hutzler, et al 2002). The preparation of physical educators (Chandler & Greene, 1995; Meegan & MacPhail, 2006; Vickerman, 2009) and peers (Klavina & Block, 2008) as well as inclusion in physical education seem to be very critical (Block, 1999). There are 3 main factors that positively or negatively influence the success of inclusion in sport:

(1) the preparation of coaches

(2) the necessary supports and the environmental context

(3) the provision of partial inclusion in unique situations with children with more severe disabilities.

Several studies have emphasized that inclusion of children with disabilities can be successful (eg, Block & Zeman, 1996; Klavina & Block, 2008; Obrusnikova, Block, & Valkova, 2003; Vogler, Koranda, Romance, 2000). other studies have shown that inclusion in the sports context could be done in the wrong way, resulting in negative situations for children with disabilities (Blinde & Mc Callister, 1998; Goodwin & Watkinson, 2000; Hutzler, et al., 2002). Including students with disabilities in sports disciplines offers many social opportunities (for example, interactions with peers without disabilities, building new friendships and learning appropriate behaviors). In addition, peers without disabilities are empowered to understand, learn, and appreciate their peers with disabilities (Block, 2007). However, it is necessary in large classes to have extra support in order to carry out correct inclusion (LaMaster, 1998; Lienert. Sherrrill, & Myers, 2001). The optimal solution to carry out a successful inclusion is to provide support to the student with disabilities through qualified coaches or peer tutors (Block, 2007; Davis et al, 2007; Lieberman, 2007). Studies clearly show that peer tutors can be an effective method of supporting students with disabilities in general physical education, but providing them with support from trained coaches is essential (Klavina & Block , 2008; Liebermann et al., 2000.

Characteristics of autism

The word autism comes from the Greek αὐτός and indicates a "withdrawal towards the self". The term autism was coined in the early twentieth century by a psychiatrist, Eugen Bleuler, to describe the withdrawal of adults with schizophrenia . Originally, therefore, this term referred to a specific disorder of schizophrenia (a term also introduced by Bleuler). At the beginning of the 20th century behavioral disorders characterized by echolalia and stereotypies were considered forms of "dementia praecox with organic etiology". Similar cases came classified as “childhood schizophrenia”.

In 1943 the child neuropsychiatrist Leo Kanner described with the formula “childhood autism precocious” a small group of children united by a lack of relationship with the environment and the tendency to isolate themselves. Kanner noticed a general delay which, however, did not taint intelligence specifically, in this way he definitively separated autism from schizophrenia childhood, considering it a "congenital disorder of affective contact". In the article "Autistic disorders of affective contact" he described the peculiar characteristics of children object of his study. Concerning “autistic isolation” (Kanner, 1943): «The most evident, “pathognomic” fundamental disturbance is the incapacity of children to relate in the usual way to people and situations since first moments of life.

The “refrigerator mother” concept denies the organic basis of autism and is based on the theory that the inadequacy of the maternal figure determines the autistic condition.

In 1969 it was Kanner himself, during an assembly of the National Society for Autistic Children (now the Autism Society of America), to retract his theory, absolving his parents. In total autonomy in 1944 a Viennese pediatrician, Hans Asperger, adopted the term "psychopathy autistic" to describe children who did not have speech disorders but who they had greater motor and praxis difficulties than the Kanner children. He took an IQ in the norm. Asperger hypothesized a genetic basis.

The most recognized and shared schemes for diagnosis are those defined by the manual of international diagnostic DSM (Diagnostic and Statistical Manual of Mental Disorders) e by the International Classification of Diseases (ICD). The DSM is a symptomatic descriptive diagnosis tool for mental disorders compiled by the American Psychiatric Association. Symptoms constitute a continuum to which internal it is important to specify the severity levels. Over the years the manual has been continuously updated, revised and enriched following the discoveries science, psychology and psychiatry of the time. Currently the manual has come to his 5th edition.

Autism in the DSM-V

In 2013, the American Psychiatric Association released the fifth edition of its Handbook Diagnostic and Statistical of Mental Disorders (DSM-V). This edition has made changes for the diagnoses of Neurodevelopmental Disorders, in especially for autism. The label Autism Spectrum Disorders (ASD, Autism Spectrum Disorders) includes all subcategories of Pervasive Developmental Disorders.This choice was dictated by the difficulty of distinguishing the different disorders; but they have been introduced levels of severity in the various areas, individual differences and comorbidities and new differential diagnosis categories: Selective Mutism, Landau-Kleffner syndrome: form of epilepsy characterized by acquired aphasia, Hearing loss, Specific Language Disorders, Intellectual disability without autism, Stereotyped movement disorder, Attention Deficit/Hyperactivity Disorder, Obsessive-Compulsive Disorder, Schizophrenia, Reactive Attachment Disorder, Schizoid Personality Disorder, Avoidant Personality Disorder

Severity level	Social communication	Restricted, Repetitive Behaviors
LEVEL 3: "Very significant support is needed".	Severe deficits in verbal and nonverbal social communication skills cause severe impairments in functioning, very limited initiation of social interactions, and minimal reactions to social overtures from others.	Inflexibility of behavior, extreme difficulty coping with change, or other restricted/repetitive behaviors markedly interfere with all areas of functioning. Great discomfort/difficulty in changing the object of attention or action
LEVEL 2: "Significant support is needed"	Marked deficits in verbal and non-verbal social communication skills; visible social impairments even in the presence of support; limited initiation of social interactions; reduced or abnormal reactions to social overtures from others.	Inflexibility of behavior, difficulty coping with change, or other restricted/repetitive behaviors are frequent enough to be apparent to the casual observer and interfere with functioning in many contexts. Discomfort/difficulty changing focus or action.
LEVEL 1: "Support is needed".	Without support, social communication deficits cause significant impairments. Difficulty initiating social interactions and clear examples of atypical or unsuccessful responses to social overtures from others. The individual may show little interest in social interactions.	Inflexibility of behavior causes significant interference with functioning in one or more contexts. Difficulty switching from one activity to another. Problems in organization and planning hinder independence.

Figure 3 Diagnostic criteria DSM-V

Figure 3 shows the DSM-V diagnostic criteria divided by level in relation to social communication and restricted, repetitive behaviors.

PART II

METHODOLOGY

CHAPTER 2

2.1 Aims of the research

Beneficial analysis of martial arts in an inclusive school context bring to ads children in the Pilot Project Katautism (2021) and in the National Project Katautism (2022)

The Katautism project will be carried out in schools and will last 3 months. The children involved will be aged between 6 and 9 years. The intervention within the schools will be twice a week and each session will last 1 hour. 5 classes were involved in the Katautism Pilot Project and 20 classes were involved in the National Katautism Project. Each class participating in the project must have 1 autistic child. The selection of schools will be entrusted to the sports clubs involved by FIJLKAM in the research project. The methodology used included a common part focused on the importance of the enriched environment in the motor proposal used by FIJLKAM

The use of executive functions is fundamental for all types of problem-solving, for both complicated and abstract problems, such as mathematics, and for the acquisition of social skills (Fig.4). Understanding other people (metacognition) for example is one such case, since a sensitivity to other people's objectives, emotions or wishes requires a detachment of attention focusing on one's own mental state.

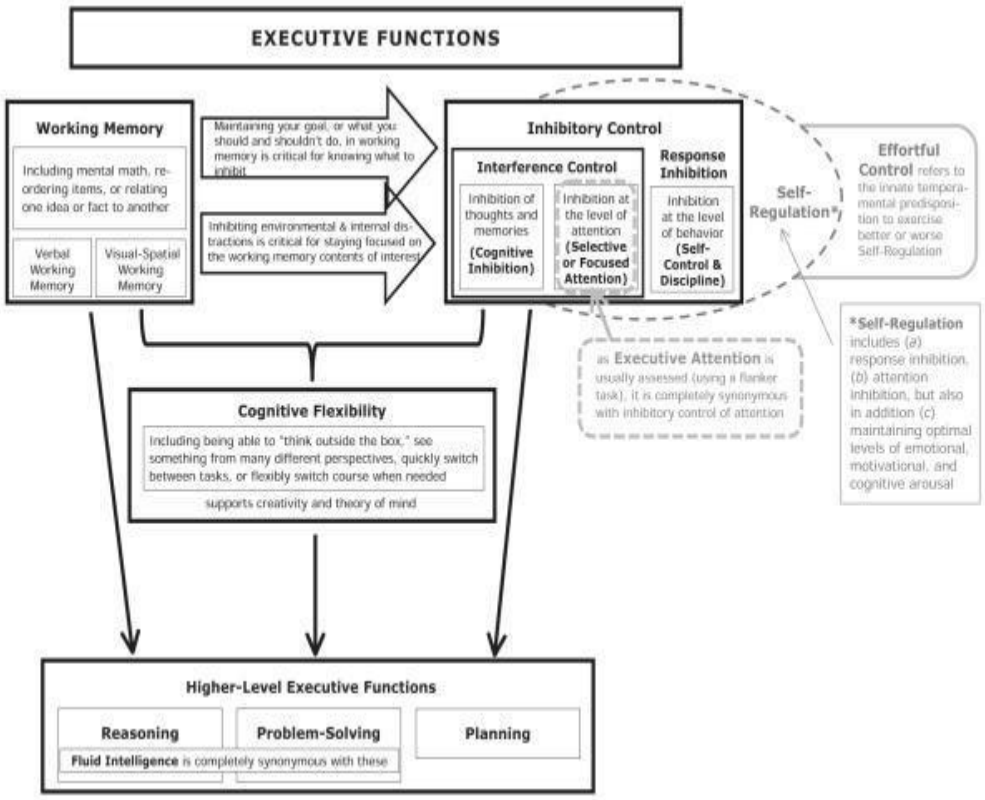

Figure 4 Executive function and problem solving

Will be added a specific part for karate and a specific part for judo. The exercises will be

adapted to ASD children that had not been introduced before. The adapted part will be produced through a cross work of experienced coaches, psychologist's expert in autism, experts in augmentative communication, neuropsychiatrists and pediatricians. In katautism pilot project a part of the classes (3) will carry out the sport at school+judo program and a part (2) the sport at school+ karate program. In Katautism National project a part of the classes (10) will carry out the sport at school+judo program and a part (10) the sport at school+ karate program.

The staff was composed for each classroom buy:

1 Project Manager (PHD student Nicole Maussier)

2 Tutor coaches with experience in ASD

2 Assistant Coaches with experience in ASD

2 Psychologist/psychotherapist with experience in ASD

All coaches and psychologists have followed a specific 40-hour training course focused on autism, autism and sport and on the objectives of the project. Before the operational phase, online meetings were organized in the schools with the parents of all classes, individual meetings with the parents of autistic children and meetings with the teachers of the classes involved. The project involves the use of specific tools for the adapted lesson. To ensure predictability for autistic children, images of augmentative communication have been used to facilitate understanding of the sequence and duration of individual activities.

The images of the augmentative communication were given to the coaches and psychologists together with a visual weekly agenda to be attached in the classroom which allowed the autistic child and his classmates to understand on which day of the week the activity took place.

The research project will analyze three dimensions (Fig.5):

a) The benefits that martial arts in an inclusive school context bring to ASD children
b) The improvements in social responsiveness compromise linked to autism.
c) Analysis of gross motor development.

The main objective of the project is to analyze the benefits of two types of martial arts Judo and Karate in an inclusive school context and how this effects the improvement of the quality of life in autistic children and their families. The integrated school context will be an additional element that will ensure proper social inclusion and will allow to analyze the benefits that this integrated activity will bring to autistic and normal children. The teaching methodology will be adapted to the

needs of autistic children through the cross comparison of specialists and coaches of judo and karate with experience in ASD.

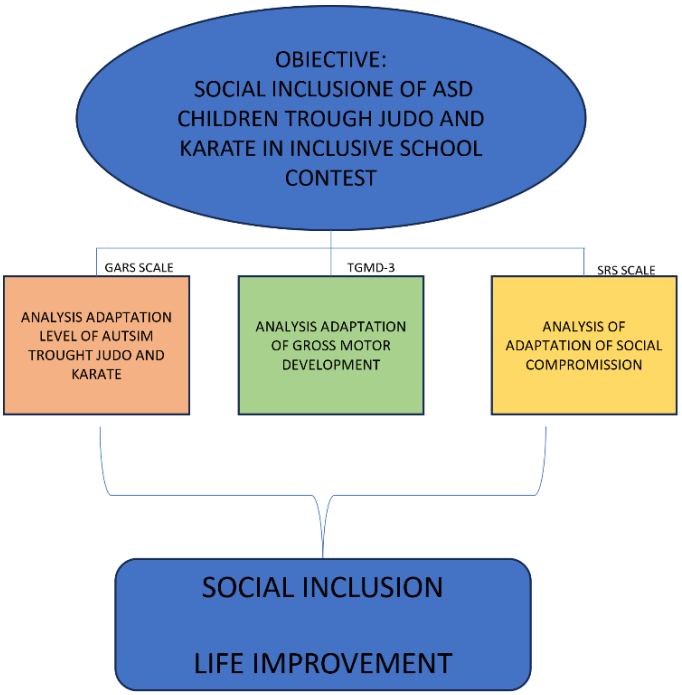

Figure 5 Design of the research

The research hypothesis is that doing judo and karate at school can help them improve gross motor skills, reduce problem behaviors and facilitate them in social relationships. This improves the quality of life of autistic children and their families.

From a multidisciplinary point of view, for the evaluation of the three areas the tests were administered by specialists in the sector

The GARS will be administered by the psychologist expert in autism,

SRS by the child's school teacher with the psychologist's car for understanding the questions and the TGMD-3 by an expert in motor sciences and adapted activity (PhD student Nicole Maussier).

2.2 Gilliam Autism Rating Scale (GARS)

The evaluation method that will be used for the analysis of the benefits of autistic children will be the GARS (Gilliam Autism Rating Scale) and will be administered in the operational phase within schools at the beginning, and end of the project (October/December 2022, October/December 2023).

The "Gilliam Autism Rating Scale" is a checklist developed to be used by professionals,

educators and rehabilitators both to identify autism and to assess the severity of its symptoms for individuals aged between 3 and 22 years. The items of which the Gillian Autism Rating Scale (GARS) is composed are based on DSM V and are grouped in 4 subtests that describe specific, observable and measurable behaviors:

1) Subtest for **Stereotyped Behaviors** describing stereotypes, motor disorders and other possible unconventional behaviors;
2) Subtest for **Communication** that allows the evaluation of verbal and non-verbal communicative behavior;
3) Subtest for **Social Interaction** that evaluates the subject's ability to interact in an appropriate way with people, situations and objects;
4) Subtest for **Developmental Disorders** which includes questions about the development of the first three years of the subject.

2.3 Social Responsiveness Scale (SRS)

Analysis of the improvements in social responsiveness compromise linked to autism.

The assessment method used will be the SRS - Social Responsiveness Scale which is used to measure the degree of social impairment associated with autism spectrum disorders. The SRS is a questionnaire composed of 65 items that evaluates the reciprocal social behavior, communication and repetitive and stereotypical behaviors characteristic of Autistic Spectrum Disorders. The focus is the behavior of children or adolescents aged between 4 and 18 years. It may be compiled by a teacher, parent or other person who cares for the subject and who is familiar with his/her current behavior and developmental history. The items are the same for teachers or parents, but the score profiles are specific to each group. A total score gives a measure of the severity of the social deficit and allows comparisons between different settings and assessors.

In addition, there are five subscales which, although not used for screening or diagnosis, are useful in implementing and evaluating treatment programs.

1) Social awareness: ability to capture social signals (sensory aspects of mutual social behavior);
2) Social cognition: ability to interpret social signals once they have been perceived (cognitive interpretation of aspects of mutual social behavior);
3) Social communication: includes expressive social communication;
4) Social motivation: indicates the point to which a subject is generally motivated to engage in social-interpersonal behavior (social anxiety, inhibition and empathic orientation);

5) Autistic Mannerisms: include stereotypical behavior or highly narrow interest's characteristic of autism

2.4 Test of Gross Motor Development – Third Edition with visual support TGMD-3

Analysis of gross motor development

The test that will be used to monitor the development of gross *motor skills will be TGMD-3 (Test of Gross Motor Development – Third edition) with visual support.*

The Test of Gross Motor Development was originally developed in the United State for typically developing (TD) children, but it has been translated and validated in different countries for children with and without disability.

Casey M. et all. in the article "The Effect of Visual Supports on Performance of the TGMD-3 for Children with Autism Spectrum Disorder" demonstrated the importance of using visual support in administering the TGMD-3 test for autistic children

Purpose: Combines fun activities with a reliable and valid procedure that gives meaningful results in identifying children with gross motor problems

Ages: 3-11 years

Administration Time: 15 to 20 minutes

The TGMD-3, a major revision of The Test of Gross Motor Development, is a norm-referenced measure of common gross motor skills that can be used by kinesiologists, general and special educators, psychologists, and physical therapists. The TGMD-3 assists in identifying children 3-11 who are significantly behind their peers in gross motor skill development and who should be eligible for special education services in physical education.

The TGMD-3 (Fig.4) is made up of 13 skills (six for each subtest):

Locomotor*:*

Run the ability to advance, gallop, hop, skip, horizontal jump, slide

This subtest measures the following gross motor skills that require fluid, coordinated movements of the body as the child moves in one direction or another:

Ball skills subtest*:* Two hand strike of a stationary ball, one hand forehand strike of self-bounced ball, one hand stationary dribble, two hand catch, kick a stationary ball, overhand throw, and under hand throw.

2 repetitions are performed for each motor act:

Detailed descriptions and illustrations of the gross motor skills and a simplified scoring system allow you to administer the TGMD-3 quickly and easily in 15 to 20 minutes. The TGMD-3 *combines fun activities* with a reliable and valid procedure that gives meaningful results in identifying children with gross motor problems. You can use the results of this assessment to develop instructional

programs, monitor progress, evaluate treatment, and conduct further research in gross motor development.

Figure 6 TGMD-3 with visual support

Figure 6 describes the tests of the two subscales of the TGMD-3 with visual support

Figure 7 Test Material needed for administering the TGMD-3

In figure 7 we can see the material needed to analyze the exercises of the two subscales of the TGMD-3

2.5 Validation of the research, relevance of the study

The complexity linked to the different aspect that characterize autism has not allowed to study a specific intervention protocol for teaching in an integrated school context of martial arts with autistic children. The positive effects that sport has on autistic subjects have been widely demonstrated in the literature. *There are no studies on the benefits that sport in inclusive school contexts can have on autistic subjects*. Often in school contexts there can be problems of social inclusion for a difficulty interacting with ASD children. Sport can be an excellent tool for social inclusion at school and in gyms but it is necessary to have a very clear intervention protocol that is followed by specialized personnel. In Sport Federation there are not many specific training courses

in relational intellectual disabilities such as autism.

This lack of specific training could preclude sports accessibility for autistic subjects. In this research, a specific training course was organized by PhD student Nicole Maussier for the project staff and a course on relational intellectual disabilities for FIJLKAM coaches to which 317 coaches enrolled. The training course envisaged the participation of neuroscience experts, pediatricians, psychologist's expert in autism, experts in suitable motor sciences, university professors of sports ethics, adapted activity and augmentative communication. In this This research aims to investigate the benefits of judo and karate in inclusive school contexts to offer a new way of inclusion through sport, this would guarantee a better quality of life for autistic children and their families

2.6 Design of the research

The benefits of martial arts for autistic children have been widely demonstrated in several scientific studies previously mentioned (Langhdon KD, 2012; Petrus G, 2008; Sorensen c; 2014). An in-depth analysis to try to create a specific methodology for autistic children in an integrated normo-typical environment has not yet been studied.

In order to work in an inclusive school context, it is important to analyze children's perception of disability in order to understand which strategies can influence to change it. In the project Simone's adventure, which aims to raise children's awareness of the issue of disability, coordinated by PhD student Nicole Maussier, we wanted to analyze the **perception of disability by children**. In order to teach autistic children in an inclusive context, it is necessary to have specialized staff. PhD student Nicole Maussier administered a questionnaire to FIJLKAM technicians to assess **awareness of autism**. Following this, the PhD student organized the first course for FIJLKAM to specialize technicians in relational intellectual disabilities. Subsequently, the **KATAUTISM pilot project** conceived and coordinated by PhD student Nicole Maussier was proposed, which involved 5 elementary classes for a total of 5 autistic children, one for each class. In the **Katautism National** 2022/2023 project 20 autistic children were analyzed.

PART II
RESEARCH STUDIES

CHAPTER 3 STUDY N°1

Analysis of the perception of disability by children in primary and secondary school **("L'avventura di Simone" FIJLKAM project 2021)**

3.1 Introduction

The study aims focus on the importance of inclusive sports activities and how much this can contribute to promoting positive attitudes and behaviors towards people with and without disabilities. It is important to decline the concept of sports accessibility, emphasizing the importance of understanding how children perceive disability in school settings and what some critical issues may be related to, in order to establish a specific intervention plan.

3.2 Materials and Methods

The administered test is the Attitudes toward Disable People Scale (ATDP) in which the respondent has to express his or her degree of agreement with the statements on a scale from 1 = strongly disagree to 6 = strongly agree. The original dataset consists of 392 units. First of all, a data cleaning procedure was carried out to remove cases containing anomalous or inconsistent values in relation to the variables of interest. At the end of the process a working dataset was obtained containing 372 valid cases with 119 students of the Alfieri school, 178 of the Ovidio school and 75 enrolled in Pablo Neruda. The 11 cases removed belonged to the same class and had answered identically to every single question, therefore, suspecting that their answers had not been given sincerely and autonomously, they were not considered. A univariate descriptive analysis of the variables was then carried out by calculating the indices of centrality and variability for the quantitative variables and frequency tables for the qualitative variables. For each answer provided, a score was assigned according to the following rule:

- 1 = +3
- 2 = +2
- 3 = +1
- 4 = -1
- 5 = -2
- 6 = -3

By adding all the scores and adding 60, a final score was obtained for each student on a scale from 0 to 120 where the latter value represents a more positive attitude towards people with disabilities. A relatively low score on the ATDP indicates that the respondent perceived people with disabilities as

different from those without disabilities. A high score indicates that the respondent perceives people with disabilities as similar to people with disabilities (Yuker, (1970).

An independent samples t-test was performed to verify if there is a statistically significant difference in the mean of the variable Score in the two subgroups of the variable Sporting experience with people with disabilities and an independent samples t-test to compare the mean of the Score in two subgroups made up of elementary school students and middle school students. The null hypothesis of the independent-samples t-test is that the means are equal in the two groups while the alternative hypothesis is that the means differ significantly in the population. We will reject the null hypothesis of equal means, concluding that the means are significantly different, if the p-value is less than 0,05. Before the t-test, the Levene test is performed to test the null hypothesis of equal variances in the two subgroups. If this assumption is violated ($p<0.05$), the robust t-test is performed.

An ANOVA t-test was performed to verify if there is a statistically significant difference in the mean of the score variable in the subgroups identified by the age variable. The age variable was deduced from the class to which students from age 8 for the third grade up to 12 for the seventh grade belong. The ANOVA test is used to test the equality of means across multiple groups. The null hypothesis underlying this test is that all the means identified by age are equal to each other, compared with the alternative hypothesis, i.e. that there is at least one pair of means that are different from each other.
Before implementing the test, it is necessary to verify, with the Levene test, the hypothesis of homogeneity of the variability of the groups (i.e., that all the variances of the groups are equal to each other), which is the basis of the ANOVA test. IBM SPSS Statistics version 28 software was used for the statistical analysis of the data.

3.4 Results and discussion

The 372 students interviewed have the following characteristics in relation to the variables of interest of the 342 students who answered the question, 62.6% have never had a sporting experience with disabled people (Tab 1).

Table 1 Descriptive statistic question questionary You have had sporting experiences with disabled people

You have had sporting experiences with disabled people

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	214	57,5	62,6	62,6
	yes	128	34,4	37,4	100,0
	Total	342	91,9	100,0	
Missing		30	8,1		
Total		372	100,0		

From this result it is important to reflect on why 62.6% of children have not had sporting experience with disabled children in inclusive contexts and to hypothesize what the causes may be and propose intervention strategies

The statement with which, on average, the students most agreed was "You have to be careful what you say when you are with disabled people" while the one with which they most disagreed was "People with physical disabilities they are not as intelligent as.

It is important to reflect on these two statements. The first underlines that with children it is necessary to structure projects that aim to raise awareness on the theme of disability and it is hypothesized that this fear could arise from a lack of knowledge of disability', while the second affirmation underlines the good predisposition of children in towards disabled people.

*Table 2 Multiple Comparisons *. The mean difference is significant at the 0.05 level*

Dependent Variable: score						
LSD						
		Mean Difference			95% Confidence Interval	
(I) age	(J) age	(I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
8,00	9,00	-8,67286*	2,53108	<,001	-13,6501	-3,6956
	10,00	-7,50834*	3,13422	,017	-13,6716	-1,3451
	11,00	-6,47780*	2,47927	,009	-11,3532	-1,6025
	12,00	-6,17544*	2,86697	,032	-11,8132	-,5377
9,00	8,00	8,67286*	2,53108	<,001	3,6956	13,6501
	10,00	1,16451	2,83023	,681	-4,4010	6,7300
	11,00	2,19506	2,08174	,292	-1,8986	6,2887
	12,00	2,49742	2,53108	,324	-2,4798	7,4747
10,00	8,00	7,50834*	3,13422	,017	1,3451	13,6716
	9,00	-1,16451	2,83023	,681	-6,7300	4,4010
	11,00	1,03054	2,78398	,711	-4,4440	6,5051
	12,00	1,33291	3,13422	,671	-4,8304	7,4962
11,00	8,00	6,47780*	2,47927	,009	1,6025	11,3532
	9,00	-2,19506	2,08174	,292	-6,2887	1,8986
	10,00	-1,03054	2,78398	,711	-6,5051	4,4440
	12,00	,30236	2,47927	,903	-4,5730	5,1777
12,00	8,00	6,17544*	2,86697	,032	,5377	11,8132
	9,00	-2,49742	2,53108	,324	-7,4747	2,4798
	10,00	-1,33291	3,13422	,671	-7,4962	4,8304
	11,00	-,30236	2,47927	,903	-5,1777	4,5730

Statistically significant differences ($p<0.001$) are observed between the averages of the total scores between 8-year-olds and 9-year-olds (Table 2).

This data makes us understand that the moment in which children have a higher perception of disability is between the ages of 8 and 9. Starting from this data, it could be useful to propose awareness-raising projects on the subject of disability within schools starting from 6 years, first elementary classroom.

Statistically significant differences ($p<0.05$) are observed between the means of the following pairs of groups (Tab.2)

- 8 age – 10 age
- 8 age – 11 age
- 8 age – 12 age

Table 3 Summary table "You have had sporting experiences with disabled people

		AVARAGE SCORE		P-VALUE				
You have had sporting experiences with disabled people								
	yes	86,5234	(14,55046)			0.472		
	no	85,3084	(15,42111)					
School grade								
Primary school		85,0150	(14,79049)			0.797		
Secondary school		85,4302	(16,27903)					
age				Vs 8	Vs 9	Vs 10	Vs 11	Vs 12
	8,00	79,0526	(16,61048)	-	<0,001	0,017	0,009	0,032
	9,00	87,7255	(13,68251)	<0,001	-	0,681	0,292	0,324
	10,00	86,5610	(12,55000)	0,017	0,681	-	0,711	0,671
	11,00	85,5304	(17,02595)	0,009	0,292	0,711	-	0,903
	12,00	85,2281	(14,79988)	0,032	0,324	0,671	0,903	-

The data analysis (Tab.3) showed that 62.6% of the children interviewed had no experience in sports with disabled children. This highlights some gaps that could be attributable to different variables. For the inclusion of disabled children in school and sports it is important to plan awareness and information programs to avoid their isolation.

Sport has been shown to be an excellent vehicle for the inclusion of disabled children, it would be useful to investigate whether the percentage that emerged in this study could be influenced by a lack of specific training by the technical teachers of the sports federations. It is therefore considered appropriate to evaluate in the future how specific technical training can influence the participation of

disabled children in sports.

Dividing the students by age, statistically significant differences in the average scores are observed. In particular, the score in the group of 8-year-old students is significantly lower than that of all other ages, i.e. 8-year-old children perceive more the diversity between people with disabilities and those without, than older children.

In the 9/10 age group, children acquire the ability to process information and understand that being different does not necessarily mean being worse.

It would be useful in the future to study whether the perception of disability could undergo modifications starting from the first years of school through specific programs aimed at inclusion based on sporting activity.

CHAPTER 4 STUDY 2°

Awareness Autism in FIJLKAM coaches (2021)

4.1 Introduction

Children with specific special needs, such as children with autism spectrum disorder, in sports are very often excluded from integrated contexts in many parts of the world. Little is known about this phenomenon but it is hypothesized that the lack of specific training may have a fundamental role in making sporting practice accessible. It has been shown that martial arts disciplines are among the sports that produce the greatest positive adaptations from a behavioral, communicative and relational point of view. A cross-sectional study was then conducted to assess the awareness of the Technical Teachers of FIJLKAM (Italian Federation of Judo Fight Karate and Martial Arts) on autism spectrum disorder in Italy. A total of 362 FIJLKAM technical teachers completed an anonymous questionnaire on a voluntary basis to assess the degree of awareness of autism. Misconceptions have been found by many FIJLKAM Technical Teachers about autism spectrum disorder. We suppose that this lack was rooted in socio-cultural models and in the objective lack of specific training. In order to make the sporting practice of martial arts accessible, continuous specific training courses and research projects should be proposed that aim to clarify how to deal with and manage subjects with autism spectrum disorder in sports.

4.2 **The Aims of the study**

This increase in children with special needs was also found in the During the FIJLKAM National Courses for Technical Teachers, many coaches reported an increase in the influx of autistic children in judo, wrestling and karate gyms. This led to various difficulties on the part of Coaches for

management and integration of these children due to poor specific training It therefore becomes imperative to explore the awareness and attitude of FIJLKAM Technical Teachers towards children with special needs.

The hypothesis of this study was that the reduced accessibility to inclusive sports contexts could be compromised by a lack of awareness on the part of autism coaches. The specific skills allow us to understand autistic subjects and to offer them adapted activities through specific tools that allow them to carry out adapted sports activities.

Some studies have indicated that teacher knowledge about autism is not equivalent to that of mental health professionals" (Helps 1999).

4.3 Material and Methods

This study conducted on FIJLKAM Technical Teachers who have received the qualification of Master. The qualifications of Fijlkam Technical Teachers are divided into 4 levels which follow the national system of national sports qualifications (SNAQ). The qualification of Master represents the 4th level, therefore the maximum of the graduation. The study was conducted in July 2021. The questionnaire was distributed to technical teachers by a research assistant who explained the importance of the study and motivated the participants by obtaining a high response of marks.

The analyzed dataset presents 362 observations and 38 variables. From the 362 statistical units, some socio-demographic characteristics are detected, such as gender, age groups (ages considered from 20 to 69 years divided into 5 age groups) and years of teaching (three teaching groups 0-4 years, 5-9 years and 10 years and older). The variables of the dataset are detected on a Likert-type scale with a score from 1 (completely disagree) to 5 (completely agree). In the first place, the descriptive statistics for the examined variables will be analyzed: since the variables are of a qualitative type, the frequency tables are considered. Secondly, statistical tests will be performed to assess whether, among the variables considered (those relating to the battery of questions in the questionnaire) and the variables relating to the socio-demographic characteristics of the sample (sex, age group and years of teaching), there is some statistical association or difference in the mean of the scale scores.

The statistical tests used are:

- The t-test with independent samples, which involves the use of a dichotomous variable (gender) and a quantitative variable.

- The ANOVA test, which involves the use of a polytomous variable (age groups and years of teaching) and a quantitative variable.

- The Chi-square test, which involves the use of categorical variables and / or dichotomous variables

- A significance level of 0.05 will be used throughout the analysis. The software used for the

analysis is IBM SPSS Statistics version 25.

- The questionnaire was designed to analyze awareness about the etiology, signs and symptoms of autism, as well as articles on socio-demographic factors and educational needs of children with ASD by FIJLKAM Technical Teachers. The tool and criteria for knowledge and attitude towards autism have been defined and developed as reported elsewhere (Al-Sharbati et al., 2012;. The questionnaire was taken from a published article of Al-Sharbati et all, where the validity questionnaire was assessed by comparing the information obtained through self-filled questionnaire versus questionnaire filled during the interview. The information gathered during the interview was considered the standard for comparison. Construct validity was assessed using Spearman correlations over an overall number of correct answers related to concept of awareness ($r = 0.80$, $p < 0.01$) which showed highly significant correlation, supporting the very good construct validity. Interrater reliability was established among interviewers to standards of 90% agreement on questions related to etiology, signs and symptoms, and social–demographic correlates of autism ~~(~~. The overall percentage agreement between the raters on the selected parameters (test–retest reliability) was found to be 87% (kappa = 0.82).

Therefore, the global psychometric assessment of the questionnaire indicated that the overall reliability and validity were both high. The information gathered during the interview was considered the standard of comparison.

Construct validity was evaluated using Spearman correlations on a total number of correct answers related to the concept of awareness ($r = 0.80$, $p <0.01$) which showed a highly significant correlation, supporting the excellent validity of the construct. Inter-rater reliability was established among standard interviewers of 90% agreeing on issues related to the etiology, signs and symptoms, and socio-demographic correlates of autism.

The overall percentage agreement among the evaluators on the selected parameters (test – retest reliability) was found to be 87% (kappa = 0.82). Therefore, the overall psychometric assessment of the questionnaire indicated that overall reliability and validity were both high (Al-Sharbati,2015) . The translation into Italian was carried out by a bilingual professional who was independent from the research team. To improve its conceptual content a standard back-and-forth procedure was made to translate the English version into Italian and vice versa.

4.4 Results and discussion

Descriptive statistics for the variables analyzed in the dataset are presented below.

Table 4 Descriptive statistic Years of training

Years of training					
		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	0-4	20	5,5	5,5	5,5
	5-9	71	19,6	19,6	25,1
	10 or more	271	74,9	74,9	100,0
	Total	362	100,0	100,0	

We also note that 271 people have been teaching/coaching for over 10 years (Tab. 4). In this study the majority of participants had more than 10 years of experience as coaches and this allows us to have a broad data on the possibility of the presence of ASD children in gyms The Frequency tables relating to the questions in the questionnaire are shown below.

Table 5 Question questionary "Have you heard autism"

Have you heard of autism?					
		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	No	4	1,1	1,1	1,1
	Yes	358	98,9	98,9	100,0
	Total	362	100,0	100,0	

Of 362 coaches surveyed 358 have heard of autism. This data tells us that a topic heard by the coaches, but let's proceed with the individual questions concerning different aspects related to autism to understand if having heard of autism corresponds to having awareness of it.

Table 6 Question questionary "Have you had contact with an autistic child?"

Have you had contact with an autistic child?					
		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	No	90	24,9	24,9	24,9
	Yes	272	75,1	75,1	100,0
	Total	362	100,0	100,0	

Of 362 coaches to the question Have you had contact with an autistic child?" 272 answered yes (Tab.6). So let's proceed with the next questions to understand if this contact is through their coaching activity.

Table 7 Question questionary "If you have been through your profession?"

If you have been through your profession?					
		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	No	158	43,6	43,6	43,6
	Yes	204	56,4	56,4	100,0
	Total	362	100,0	100,0	

Of the 272 who answered in the affirmative, 204 answered yes to the question If you have been through your profession? We can therefore say that of the 362 coaches, 204 had a share through their coaching profession. This data tells us that 56.4% of coaches (Tab.7) have had contact with autistic subjects through their coaching profession. It is an interesting data that makes us underline that the influx of autistic children in martial arts gyms is increasing. When asked Can you easily identify an autistic child, 53% said yes and 47% said no.

The ANOVA test is statistically significant at the 0.05 level for the items "Autism appears in the first years of life", "The autistic child needs special education", "Autism frequently affects children from families with higher education" and is statistically significant at a level of 0.1 for the items "The autistic child can improve a lot if diagnosed early" and "Autism commonly affects children from high-income families": therefore yes rejects the null hypothesis of equality between the means of the groups and it can be stated that there is at least one pair of variables whose means are statistically different.

Below is a line graph (Fig.7) representing the mean score of the statistically significant items for the variable years of teaching.

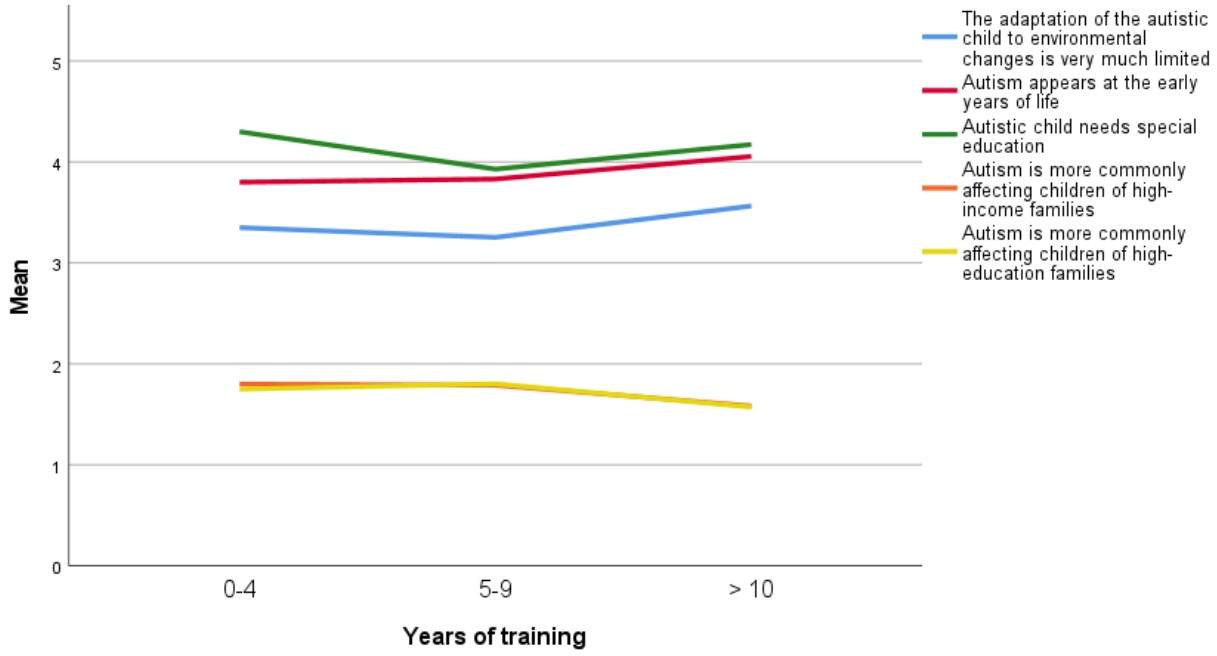

Figure 7 Mean score of the statistically significant items for the variable years of teaching

From the graph we note that the trend for the items "Autism is more commonly affecting children of high-income families" and "Autism is more commonly affecting children of high-education families" is almost similar (Mean global score about 2). The category with the lowest score for both items is the 10 or more category. For the other three items considered, the scores differ both in Mean and in the subcategories. The lowest scores are recorded in the 5–9-year teaching class.

One-way Anova Tests (item-age ranges) subsequently, other ANOVA tests will be performed, crossing the items with the age range variable

Also in this case, most of the ANOVA tests are NOT significant ($p>0.05$): therefore, the null hypothesis of equality between the means of the groups is accepted.

As noted previously, also in this case there are items that are statistically significant at both the 0.05 and 0.1 levels. The ANOVA test is statistically significant at the 0.05 level for the items “Some dietary habit or types of food can lead to autism”, “The autistic child does not enjoy the presence of others ”, “There is no or limited speech development in the autistic child” , “The autistic child is over talkative”, “Autism appears at the early years of life”, “Autistic child needs special education” and is statistically significant at the 0.1 level for the item “The adaptation of the autistic child to environmental changes is very much limited” : therefore, in these cases, the null hypothesis

of equality between the means of the groups is rejected and it can be stated that there is at least one pair among the modalities of the variable age ranges whose means are statistically different.

Chi square (dichotomous-gender items)

To test the association, the chi-square test will then be used on each contingency table analyzed, which is based on the following set of hypotheses:

- Null hypothesis: independence of the variables under consideration
- Alternative hypothesis: the two variables under examination are not independent and there is a statistically significant association

If the test is significant ($p<0.05$), the null hypothesis of independence between the variables is rejected and it can be concluded that there is a statistically significant form of association between the variables under examination. Otherwise, if ($p>0.05$) the null hypothesis of independence between the variables is accepted, concluding that there is no statistically significant association.

In this case (Tab.8) we are going to carry out a chi-squared test between the dichotomous items of the questionnaire and the gender variable.

Table 8 chi-squared test between the dichotomous items of the questionnaire and the gender variable.

Item	% Yes females	% Yes males	p-value
You've heard of autism	100%	98,7%	0,385
Have you had contact with an autistic child?	71,9%	75,7%	0,541
If yes, was it through your profession?	63,2%	55,1%	0,259
Can you easily identify an autistic child?	49,1%	53,8%	0,519
You have an idea about the prevalence of autism	31,6%	31,1%	0,949

The chi-squared test is not statistically significant ($p>0.05$) for all the items considered: therefore, the null hypothesis of independence between the variables is accepted and it can be stated that the items considered and gender are not significantly associated.

Chi-square Test (dichotomous items-years of teaching)

We now carry out the Chi-square test between the items of the questionnaire and the variable years of teaching (Tab.9).

The chi-square test is NOT significant ($p>0.05$) for the item "have you heard of autism": therefore, in this case, the null hypothesis of independence between the variables is accepted and it can be stated that the item considered and gender are not significantly associated.

Table 9 Chi-square test between the items of the questionnaire and the variable years of teaching

Item	% Yes 0-4 anni	% Yes 5-9 anni	% Yes 10 anni e più	p-value
You've heard of autism	100%	97,2%	99,3%	0,292
Have you had contact with an autistic child?	40%	62,2%	80,1%	<0,001 (V di Cramer= 0,234 weak association)
If yes, was it through your profession?	20%	46,5%	61,6%	<0,001 (V di Cramer= 0,214 weak association)
Can you easily identify an autistic child?	35%	42,3%	57,2%	0,020 (V di Cramer= 0,147 weak association)
You have an idea about the prevalence of autism	40%	16,9%	34,3%	0,013 (V di Cramer= 0,155 weak association)

For the remaining four items, the chi-squared test is statistically significant ($p<0.05$). Therefore, the null hypothesis of independence between the variables is rejected and it can be stated that there is a statistically significant association between the variables.

Chi square (item dichotomous-age range)

In this case we are going to carry out a chi-squared test between the dichotomous items of the questionnaire and the variable age group (Tab.10).

Table 10 chi-squared test between the dichotomous items of the questionnaire and the variable age group

Item	% Yes 20-29 age	% Yes 30-39 age	% Yes 40-49 age	% Yes 50-59 age	% Yes 60-69 age	p-value
You've heard of autism	95%	97,9%	100%	100%	96,4%	0,058
Have you had contact with an autistic child?	4,8%	12,9%	37,1%	31,6%	13,6%	0,326
If yes, was it through your profession?	50%	53,2%	64,3%	54,4%	47,3%	0,217
Can you easily identify an autistic child?	50%	46,8%	54,8%	54,4%	52,7%	0,903
You have an idea about the prevalence of autism	45%	27,7%	34,9%	28,1%	27,3%	0,437

For the item "have you heard of autism", this is statistically significant at the 0.1 level, therefore the age range variable and the item are statistically associated.

The chi-square test, on the other hand, for the other four items, is not significant ($p>0.05$): therefore, the null hypothesis of independence between the variables is accepted and it can be stated that the items considered and gender are not significantly associated.

Chi-square test (years of teaching-age group)

A Chi-square test is now performed between the variable years of teaching and age ranges.

In this contingency table we can see the contigenty we have in the sample analyzed between the variables years of training and the age group.

We can note that the contingency table shows us that the higher the years of teaching, the higher the age group will be.

The chi-squared test between the variable years of education and age ranges (Tab.10) is statistically significant ($p<0.05$) therefore the null hypothesis of independence between the variables is rejected and it can be stated that there is a statistically significant association between the variables considered.

Analyzing the respective V of Cramer this turns out to be equal to 0.349. We therefore affirm that between the variable years of teaching and age groups there is an association of moderate intensity.

The present study showed that Fijlkam technicians have a low awareness of some aspects related to the car. Most of the coaches had contact with autistic children through the coaching profession (56.4%): it is therefore necessary to make inclusive sporting contexts accessible to plan specific training courses for FIjlkam coaches.

These data led PhD student Nicole Maussier to organize a specific training course on relational intellectual disabilities for FIJLKAM coaches which was attended by 317 coaches. This training course allowed the technicians to deepen some topics concerning the knowledge and management of autistic children in inclusive contexts.

This is consequently making the FIJLKAM disciplines more accessible to ASD subjects

CHAPTER 5 STUDY N° 3

Katautism pilot project (2021/2022)

Katautism national project (2022/2023)

5.1 Introduction

Judo practice has shown positive results in short-term programs, with improvements of repetitive behaviors, social interaction and communication (Morales et al., 2022).

One of the most interesting studies regarding karate for ASD subjects was the one conducted by Fatimah Bahrami in 2016. The objective was to determine whether teaching karate techniques to children with ASD led to significant reductions in their communication deficits. The main hypothesis was that children with autism who participated in a 14-week karate techniques training program would demonstrate improvement in communication deficits compared to children with autism who did not engage in karate techniques training. . The results of the present investigation will provide empirical evidence on the use of karate training techniques to improve communication deficits in children with ASD.

The results demonstrated that Karate training improved the communication deficits of children diagnosed with ASD. The results also indicated that after 30 days of no practice, the communication deficit in the exercise group remained significantly decreased compared to time postintervention.

Based on this theoretical foundation, we can see that very few studies have analyzed the benefits of karate and judo in inclusive contexts because, as previously reported, most of the sports learning contexts for ASD subjects are made up of only heterogeneous groups. The KATAUTISM research project (pilot and national) aims to analyze the benefits of judo and karate in the social inclusive context and how much this can contribute to the process of social inclusion and therefore to the improvement of the quality of life.

5.1 The aims of the study

The KATAUTISM project won the call for Sport and Health and was fully funded for a total of €36,000 for Katautism pilot project and €263000 for Katautism National project. In the **pilot project they were involved 5 classrooms, in the national project 20 classroom were involved in the following study** and was proposed to the school totally free of charge. The tatami and a technical fit were supplied to the school to structure the enriched environment

The Katautism project aims was the inclusion of autistic children through the practice of judo and karate in schools. In this study I wanted to analyze the adaptations of autistic children by analyzing

three different areas, the level of autism, social impairment and gross motor skills. In this study we wanted to investigate whether for the parents this activity contributed to the well-being of the child and the family.

The hypothesis of this research is that the practice of judo and karate at school could bring benefits to ASD subjects for social inclusion by improving the relational behavioral and motor aspect in all ASD level.

5.2 Material and Methods

In this project, conceived, written and coordinated by PhD student Nicole Maussier, the selected class-rooms are divided in 2 groups: 1 follow the Katautism Judo Program and 1 follow the Katautism karate program. The autistic children carried out inclusive activities with their classmates together with their classmates. The age of the participants is included between 6 to 10 years, each class-rooms must have 1 autistic child. In this research we study 5 ASD children in pilot project and 20 ASD Children in national project. The project lasted, for both project, 12 weeks with a frequency of twice a week and each session lasted 1 hour. The project used an adapted methodology with specific tools. To ensure predictability for autistic children, images of augmentative communication have been used to facilitate understanding of the sequence and duration of individual activities. The images of the augmentative communication were given to the coaches and psychologists together with a visual weekly agenda to be attached in the classroom which allowed the autistic child and his classmates to understand on which day of the week the activity took place. All the staff have followed a specific training course of 40 hours where topics concerning autism were treated by psychologists, neuroscience experts, adapted motor activity experts and pediatricians. The topic of the lessons were on the objective es of the Project, on the methodology and specific tools to be used and on the reading and management of children with the autistic spectrum in inclusive school contest.

Before starting the project, meetings were organized with the parents of all the children and the teachers of the classes to clearly explain the objectives of the project and to clarify any doubts. In addition, individual meetings were held with the parents of autistic children with the Phd student Nicole Maussier and the psychologists and coaches of the staff to gather information on the child and clarify the objectives of the project

The psychologist was an observational figure supporting the coaches during all lessons. The project analyzed the changes in the three specific areas of ASD children: to identify autism and assess the severity of symptoms with GARS (Gilliam Autism Ration Scale), to measure the degree of social impairment associated with autism spectrum disorders with SRS (Social Responsiveness Scale) and the

gross motor area with the TGMD -3. The scientifically validated tests were administered at the beginning and end of the project. The Gars was compiled by the psychologist expert in autism always present during the judo lessons and the part dedicated to developmental disorders by parents. The SRS was completed by the child's class teacher with the support of the coordinator and the psychologist for the compilation, The TGMD-3 was administered by the project coordinator expert in sport sciences. The tests were developed with a multidisciplinary approach to have different perspectives from the experts.

The intervention program

The first step for the coaches and psychologist was to evaluate the group of children to establish pre-medium and long-term goals.

During the lessons, different teaching strategies were used to involve and stimulate all children, taking into account their different needs and characteristics

included two sports disciplines, judo and karate. One of the characteristics of martial arts that makes them one of the most recommended sports for autistic people (Bremer, 2016) is predictability which has proven to be fundamental for the subject's emotional regulation.

Karate started from teaching the basics of karate, such as correct posture, breathing and movements fundamentals, up to teaching the first kata (pinan nidan). The importance of how to use these techniques in a controlled and responsible way was explained.

Judo started from the didactic progression of falls in all its forms (backward, sideways forward), initially individual and then gradually moving on to projections in pairs with immobilization techniques on the ground.

In order to be able to participate in the research project, each class had to have an autistic child (ASD) and the age groups involved had to be from 6 to 10 years.

One group of classes did the judo program and the other group the karate program. The active session took place twice a week and each session lasted 1 hour. The activity took place during school hours and had a total duration of 12 weeks. In the pilot project 5 autistic children were analyzed while in the national project study 20 ASD children were analysed.

Tests to assess autism level adjustments (GARS), social impairment (SRS) and gross omotor skills (TGMD-3) were administered at the beginning and at the end of the project.

The staff for each discipline consisted of 2 specialized coaches and 1 psychologist expert in autism who played an observational role. At the end of each lesson he met with the coaches to support them in the management and emotional reading of the autistic child. The choice of the observational role by the psychologists was made because it was essential that for the autistic child the reference in

the gym were always the coaches

Throughout the project period, periodic monitoring of the skills was carried out by the coaches and the psychologist competencies and abilities of the children, both through observations and through feedback from the teachers and the children themselves.

All the coaches highlighted the improvements in the acquisition of techniques by the whole group, even the autistic children.

Both disciplines used an enriched environment. The project takes the name of KATAUTISM because on the basis of the technical skills acquired at the end of the project the children performed an adapted KATA which took the name of KATAUTISM. Psychologists experienced in autism have had an observational role. They had to be present for all lessons at all times and had to observe the session after which they were supposed to give feedback to the coaches. Through this synergistic work it was possible to individualize the path of the autistic child and of the entire class group.

The first observations revealed by coaches in the pilot project and in the national project that from the third lesson the improvements of autistic children were evident. Even the most severely autistic children have begun to mimic the movements of their classmates.

Interviews were carried out with the parents of autistic children to assess their perception of the progress of the project, which turned out to be positive. Parents of autistic children have repeatedly asked for the possibility to continue the project because their children asked them to.

5.5 Result and discussion (Katautism pilot project n=5 and Katautism National project n=20)

Following the inclusive practice of judo and karate in the school setting, subjects showed a significant decrease in self-injurious and hetero-injurious problem behaviors, increased emotional regulation, and improvement in gross motor area. In a recent study (Morales J., 2022) after 6 months of adapted judo program improved motor skills and psychosocial behaviors of children with ASD.

The conclusion of the study is that there is a close relationship between motor skills and psychosocial behaviors, as children with higher severity of autism-related behaviors were more likely to show poorer motor skills. It is also important to highlight other studies of other martial arts that have demonstrated significant adaptations in reducing stereotypic behaviors in ASDs and improving social interactions (Bahrami et al., 2012; Movahedi et al., 2013;). There are studies that have shown that children with ASD have greater difficulties in motor development than their peers (Miyahara, 2013). They also found a relationship between gross and fine motor skills and ASD severity (MacDonald et al., 2014). Specifically, they observed that more severe cases of ASD were associated with lower fine and gross motor skills. It is important to underline the gross motor improvements found in this study and how much these are accompanied by behavioral and relational improvements.

In support of this finding, some researchers have found links between motor problems and the development of language and cognitive skills (Bedford et al., 2016) and adaptive behavior (MacDonald et al., 2013), as well as between motor development and social skill.

The study links to studies by other authors. Greater emotional regulation and improvement in the gross motor area has been demonstrated. These improvements had a significant impact on the subject's social inclusion process, confirming the initial hypothesis of the study.

The classmates showed a gradual predisposition to relate to the partner and to practice judo and karate together. One of the characteristics of martial arts that makes them one of the most recommended sports for autistic people (Bremer, 2016) is predictability which has proven to be fundamental for the subject's emotional regulation.

Table 11 Summary of KATAUTISM pilot project (n=5 ASD children)

KATAUTISM PILOT PROJECT n=5 ASD CHILDREN					
GARS PILOT PROJECT	**MEAN PRE**	**MEAN POST**	**DELTA**	**P-VALUE (Paired t-test post vs pre)**	**VARIATION %**
GARS Stereotyped Behaviors	10,4	8,4	-2	0,003	-18,92
GARS Comunication	10,2	9	-1,2	0,033	-13,21
GARS Social Interaction	9,4	7,4	-2	0,003	-21,66
GARS Development disorder	7,8	7,8	0		0
GARS Total	37,8	32,6	-5,2	<0,001	-13,95
GARS Quotient	96,2	87,6	-8,6	0,002	-8,86
SRS PILOT PROJECT	**MEAN PRE**	**MEAN POST**	**DELTA**	**P-VALUE (Paired t-test post vs pre)**	**VARIATION %**
SRS CnS (Social Awarness)	77,2	71,2	-6	0,011	-8,02
SRS CgS (Social Cognition)	86,6	80,6	-6	0,005	-6,85
SRS CmS (Social Comunication)	79,2	74,2	-5	0,02	-6,47
SRS MS (Social Motivation)	82	73,6	-8,4	0,003	-10,94
SRS MA (Autistic Mannerism)	94,2	83,6	-10,6	0,004	-11,53
SRS TOT T Score	88	80,2	-7,8	<0,001	-9,14
TGMD-3 PILOT PROJECT	**MEAN PRE**	**MEAN POST**	**DELTA**	**P-VALUE (Paired t-test post vs pre)**	**VARIATION %**
TGMD3 Locomotor scaled	3,6	10	6,4	<0,001	347,17
TGMD3 Ball scaled	2,2	7,8	6,4	0,03	251,67
TGMD3 PRE Total scaled	5,8	17,8	12	0,001	289,83
TGMD3 GMI	58,2	93	34,8	0,001	59,42

Table 11 summarizes the improvements that there have been on average in percentage terms in the three areas that have been analyzed in Pilot research (n=5). We can see that all the areas

analyzed have had a significant improvement. In this study we can confirm that to improve the availability of the subjects it was fundamental in the adapted methodology to always guarantee the predictability of the proposed activity and the understanding of the execution of the exercise through specific tools, which gave a clear definition of the activity, its progression, and its duration.

These positive adaptations have contributed significantly to the process of acquiring and incorporating judo and karate techniques. At the end of the project, all subjects did the exercises with their classmates. The improvements were also confirmed by the psychologist expert in autism who is always present at the lessons..

Having found these significant improvements in all study areas of ASD children, we continued the research with a study that involved n=20 ASD children to verify if what emerged in the pilot study could be reconfirmed.

Table 12 Summary of 20 ASD children

KATAUTISM NATIONAL PROJECT 20 ASD CHILDREN					
GARS KATAUTISM NATIONAL PROJECT	**MEAN PRE**	**MEAN POST**	**DELTA**	**P-VALUE (Paired t-test post vs pre)**	**VARIATION %**
GARS Stereotyped Behaviors	11,1	9,25	-1,85	<0,001	-16,22
GARS Comunication	9,25	8,25	-1	0,011	-10,47
GARS Social Interaction	9	7,55	-1,45	0,049	-12,78
GARS Development disorder	9	9	0		0
GARS Total	37,9	33,6	-4,3	0,006	-10,84
GARS Quotient	97	89	-7,25	0,006	-7,19
SRS KATAUTISM NATIONAL PROJECT	**MEAN PRE**	**MEAN POST**	**DELTA**	**P-VALUE (Paired t-test post vs pre)**	**VARIATION %**
SRS CnS (Social Awarness)	70,45	66,35	-4,1	0,019	-5,32
SRS CgS (Social Cognition)	79,2	77,3	-1,9	0,049	-2,16
SRS CmS (Social Comunication)	75,8	74,1	-1,7	0,113	-2,22
SRS MS (Social Motivation)	74,45	70	-4,45	0,005	-5,73
SRS MA (Autistic Mannerism)	86,9	83,25	-3,65	0,039	-3,71
SRS TOT T Score	81,25	78	-3,25	0,019	-3,75
TGMD-3 NATIOANAL PROJECT	**MEAN PRE**	**MEAN POST**	**DELTA**	**P-VALUE (Paired t-test post vs pre)**	**VARIATION %**
TGMD3 Locomotor scaled	2,9	8,7	5,8	<0,001	304,55
TGMD3 Ball scaled	2,4	8,65	6,25	<0,001	362,75
TGMD3 PRE Total scaled	5,3	17,35	12,05	<0,001	305,26
TGMD3 GMI	56,8	91,95	35,15	<0,001	62,42

In the table 12 we compare the results of the pilot project with the national one. We can therefore confirm that the improvements have been significant in all areas analyzed during the research.

It is confirmed in both studies that the **GARS** subscales that have had a greater variation % improvement are that of stereotyped behaviors and social interaction, this tells us that the hypothesis of the study has been confirmed as a reduction of stereotyped behaviors by the ASD child resulted in a greater predisposition in social interaction.

By comparing the area analyzed for social commitment through the **SRS**, the subscale that has had a more marked improvement in both studies is that relating to social motivation, also through this test compared between the pilot and national projects, we can conclude that the judo and karate activity has pushed the children to a greater social predisposition thus improving social inclusion.

The area that improved most markedly is that related to gross motor skills in both studies. We can see that in the pilot project it improves **TGMD-3** GMI in percentage change in the pilot project by 59.42% while in the national project by 62.42%.

This data confirms that motor activity in inclusive contexts can make significant improvements in gross motor skills which are fundamental for the path of autonomy of ASD children, thus contributing to an improvement in the quality of life of ASD children and their families.
In Table 13 shows the guide for interpreting the results relating to GARS where the levels of autism probability are indicated

Table 13 Guide to data interpretation GARS

GUIDE TO DATA INTERPRETATION GARS			
Standard score subtest	**Quotient autism**	**Degree of severity**	**Autism probability**
17--19	131+		very high
15--16	121--130		hig
13--14	111--120		above the average
8--12	90--110		average below
6--7	80--89		average
4--5	70--79		low
1--3	?69		very low

Below in the figures 8 the summary improvement of the individual **subscales GARS (n=5)** pre (T0) and the individual subscales GARS post (T1).

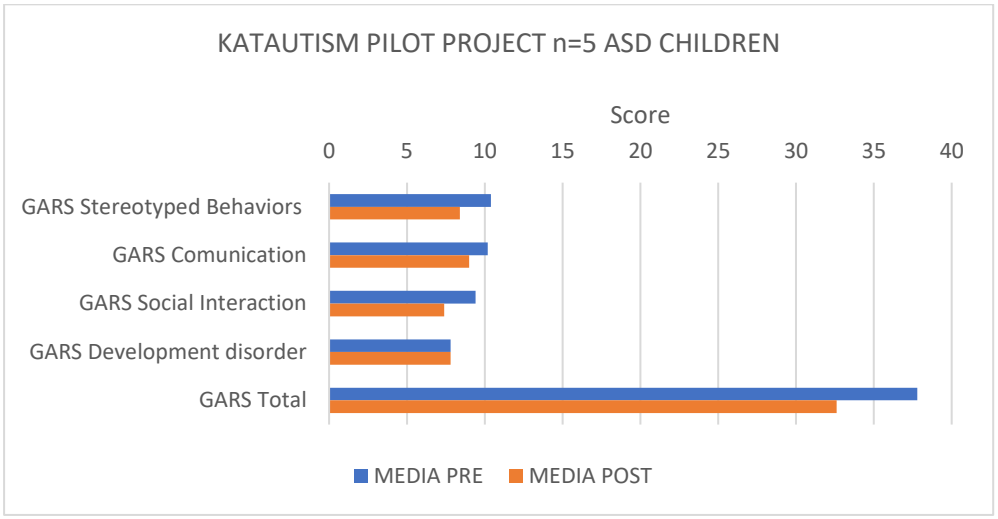

Figure 8 Summary Gars Subscale and total of n=5 ASD children

In the figure 9 we can see the summery improvement of the individual **subscales GARS (n=20)** pre (T0) and the individual subscales GARS post (T1).

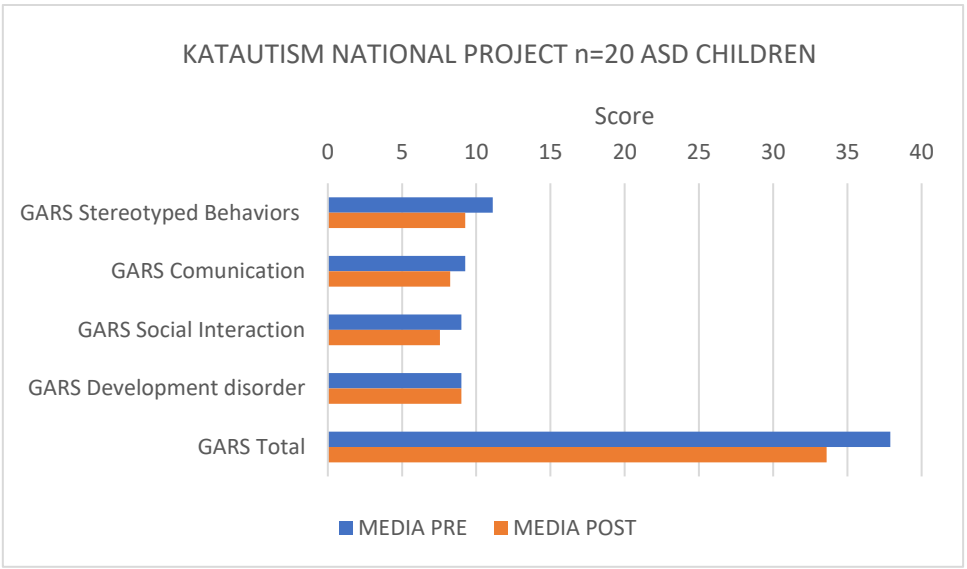

Figure 9 Summary GARS subscale and total of 20 ASD children

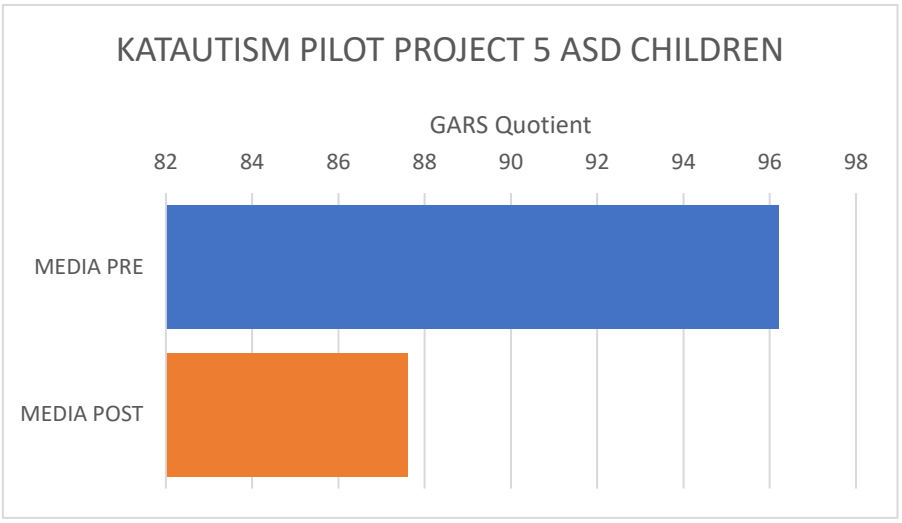

Figure 10 Summary Gars quotient of n=5 ASD children

Figure 10 shows the average **Gars Quotient** in the pre (T0) and post (T1) national project **(n=5)**

We can see the significant improvement in the average Gars quotient,

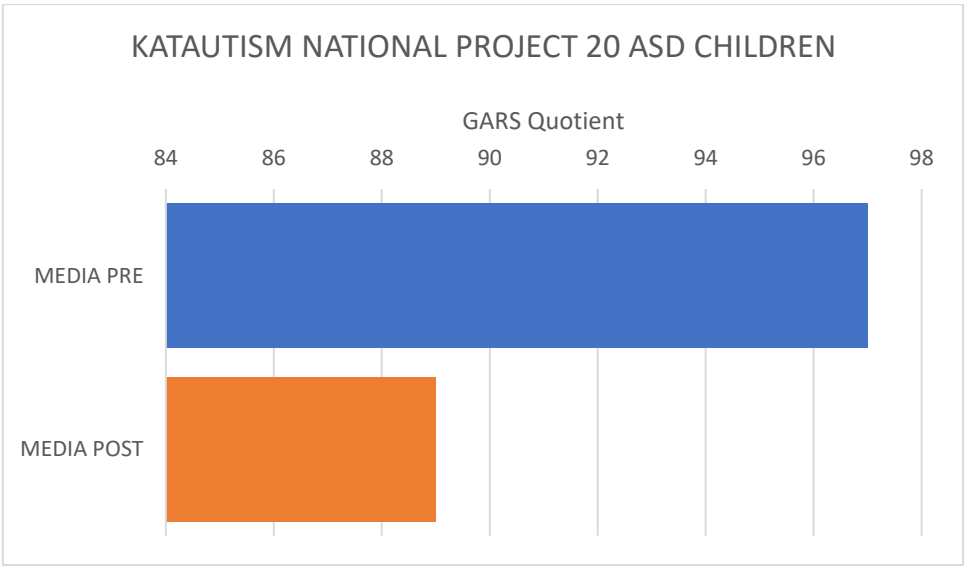

Figure 11 Summary GARS quotient of 20 ASD children

Figure 11 shows the average **Gars Quotient** in the pre (T0) and post (T1) national project **(n=20)**

We can see the significant improvement in the average Gars quotient,

Table 108 gives a description of how the results relating to the SRS with the relative levels of social composition should be interpreted.

This table will help us understand the data relating to the T0 and T1 results and how they are distributed.

Table 2 Data interpretation SRS

SCORE	SCALE DESCRIPTION
60-75	60 to 75 (range mild to moderate): Scores in this range indicate a deficit in reciprocal social behavior that is clinically significant and interferes with daily social interactions to a slight to moderate degree. Scores in this range are typical for individuals with high-functioning or mild autism spectrum disorder, such as PDD-NOS and Asperger's Disorder.
>76	76 or more (severe range): Scores in this range are strongly associated with a clinical diagnosis of Autistic Disorder, Asperger's Disorder, or more severe cases of PDD-NOS. This suggests a serious interference in daily social interactions

In the figure 12 we can see the summary improvement of the individual **subscales SRS (n=5)** pre (T0) and the individual subscales SRS post (T1)

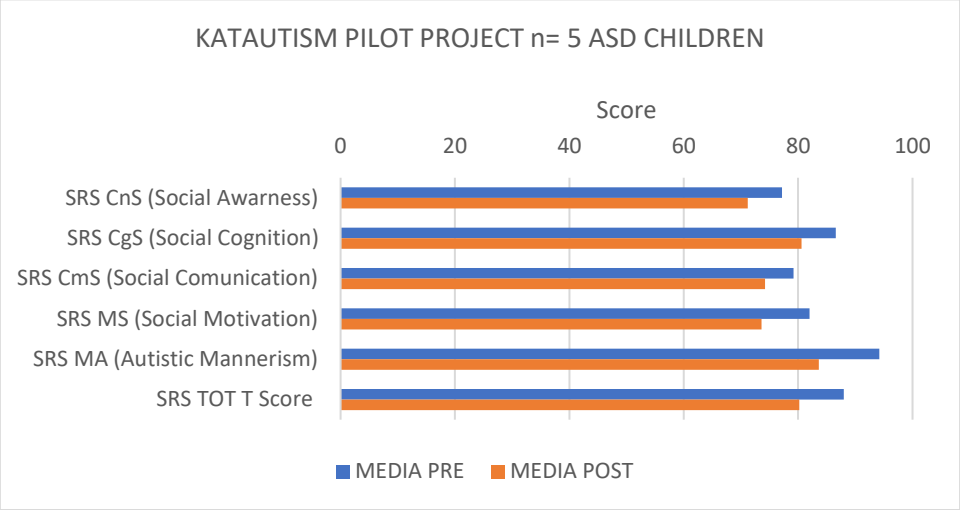

Figure 12 Summary SRS of n= 5 ASD children

In the figure 13 we can see the summary improvement of the individual **subscales SRS (n=20)** pre (T0) and the individual subscales SRS post (T1)

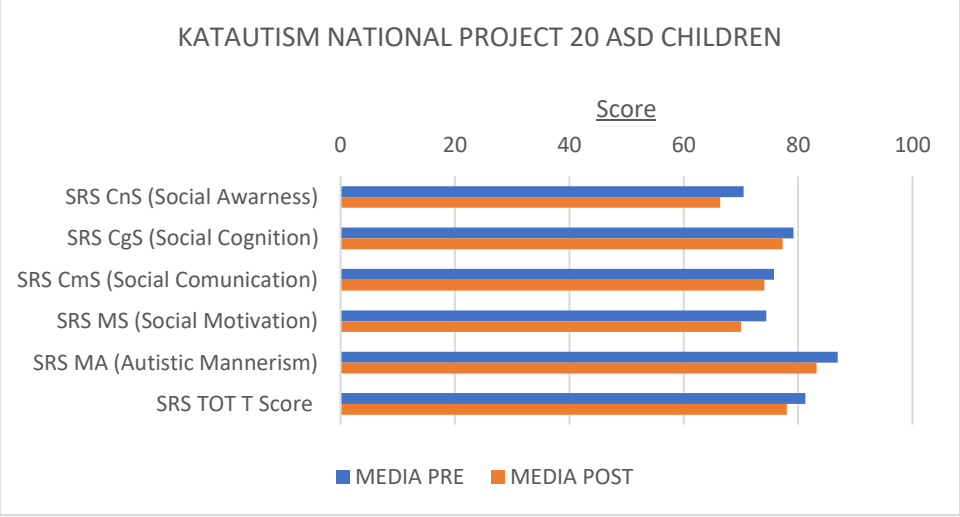

Figure 13 Summary SRS of 20 ASD children

We can therefore state that in the pilot study n=5 the initial hypothesis of the research was confirmed that the practice of judo and karate in schools could help, through the improvement of gross motor skills, ASD children in improving in the areas compromised by spectrum disorder autistic with consequent improvement of the predisposition to social relationships and therefore of social inclusion.

Based on the data analyzed in the national project n=20 we can confirm the initial hypothesis that judo and karate can be a useful tool for the social inclusion of ASD children

In table 109 we can see the guide for the interpretation of data relating to **TGMD-3** where descriptive terms are divided according to the score.

Table 3 Guide to data interpretation TGMD-3

GUIDE TO DATA INTERPRETATION TGMD-3		
Scale score	**Descriptive term**	**Index score**
1--3	Impaired or delayed	<70
4--5	Borderline inpaired or delayed	70--79
6--7	Below averege	80--89
8--12	Avarege	90--109
13--14	Above averege	110--119
15--16	Superior	120--129
17--20	Gifted or very advanced	>129

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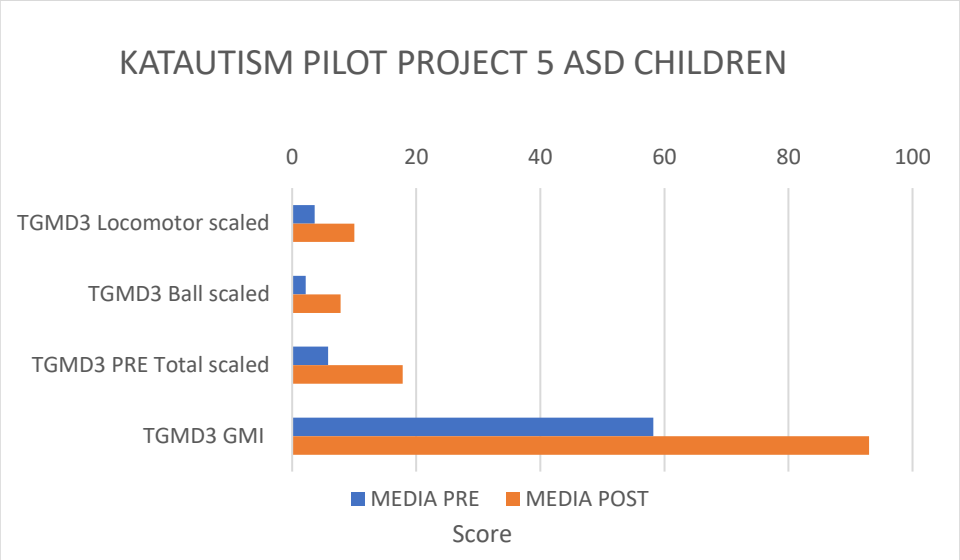

Figure 143 Summary TGMD-3 of 5 ASD children

In the figure 14 we can see the summary improvement of the individual **subscales TGMD-3 (n=5)** pre (T0) and the individual subscales TGMD-3 post (T1)

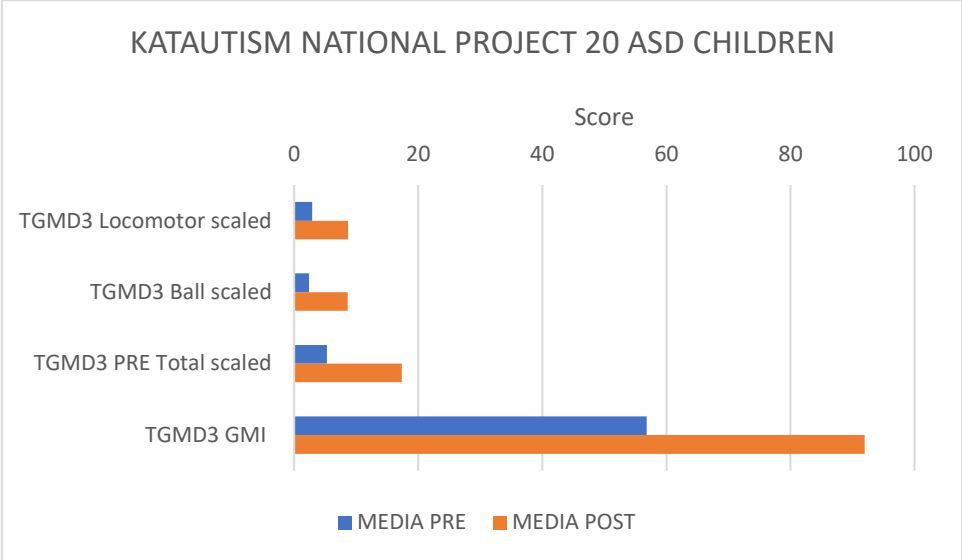

Figure 15 Summary TGMD-3 of 20 ASD children

In the figure 15 we can see the summary improvement of the individual **subscales TGMD-3 (n=20)** pre (T0) and the individual subscales TGMD-3 post (T1)

We can see that the **significant improvements** in all three areas analyzed in pilot project (n=5) and confirmed in the national project (n=20).

The results that had a greater percentage increase were confirmed to be;

- stereotyped behaviors
- social interaction
- social awareness
- social motivation.

All of these significant improvements are accompanied by improvements in gross motor skills. We can conclude that the activity of judo and karate has favored the inclusion of ASD subjects within the class because through its practice the autistic mannerisms, the hetero and self-aggressive behaviors, the emotional regulation and the degree of tolerance with respect to the times than expected, which strongly compromised the subject's social inclusion.

The importance of specific training and coordination should be underlined which has allowed the technicians, through the support of psychologists expert in autism, to recognize needs and provide the right motor proposals adapted to the inclusive context, in compliance with the gradualness in teaching.

We can say that in the pilot project the initial hypothesis was confirmed that the activity of judo and karate in inclusive school contexts helped ASD children in the process of social inclusion. The motor proposal of judo and karate has contributed to modifying positively and significantly in

all n=5 ASD children behavioral aspects linked to autism and aspects linked to social impairment.

It is also noted how much the motor aspect has been the area that has undergone the most evident positive adaptations. This indicates to us that inclusive motor activity is possible if conducted by specialized coaches supported by professionals in the sector. The inclusive work of ASD children has also brought benefits to the classes involved in the project. The classmates felt part of a single project that united everyone in the fun of practicing judo or karate. In all classes, coaches, teachers and psychologists observed that when the ASD child was able to perform a proposed technique or exercise, this was a source of joy for the whole class.

It should be emphasized how important it is for all children including ASD that positive reinforcement of deliveries is much stronger than positive reinforcement from an adult. This union that was created between classmates was certainly important for the success of the project. It should be emphasized that to create a serene context it is necessary to have coaches who know how to manage the group and the needs of the ASD child.

We can therefore state that the initial hypothesis of the research was confirmed also in the national project, the practice of judo and karate in schools helps autistic children in the process of inclusion favor, we can say that ***Martial art as a means for the improvement of life quality and social inclusion of children with autism spectrum disorder.***

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