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SPORT AT SCHOOL GUIDELINES

INTRODUCTION

The European Union Guidelines on Physical Activity (2008) highlight that the decline in physical activity and the concomitant increase of the time spent in sedentary behaviours observed among children in Europe represent an enormous threat.

In fact the EU Action Plan on Childhood Obesity 2014-2020, reports that the high level of overweight and obesity in children and young people is an area of particular concern. According to estimates from the WHO's Childhood Obesity Surveillance Initiative (COSI), around 1 in 3 children in the EU aged 6-9 years old were overweight or obese in 2010. This is a worrying increase on 2008, when estimates were 1 in 4.
Likewise, the WHO in the document "Prioritizing areas for action in the field of population-based prevention of childhood obesity: a set of tools for Member States to determine and identify priority areas for action", reports that "over the past three decades the prevalence of overweight and obesity has increased substantially. Globally, an estimated 170 million children (aged < 18 years) are estimated to be overweight, and in some countries the number of overweight children has trebled since 1980. The high prevalence of overweight and obesity has serious health consequences. Raised body mass index (BMI) is a major risk factor for diseases such as cardiovascular disease, type 2 diabetes and many cancers (including, colorectal cancer, kidney cancer and oesophageal cancer). These diseases, often referred to as noncommunicable diseases (NCDs), not only cause premature mortality but also long-term morbidity. In addition, overweight and obesity in children are associated with significant reductions in quality of life and a greater risk of teasing, bullying and social isolation.
Due to the rapid increase in obesity prevalence and the serious health consequences, obesity is commonly considered one of the most serious health challenges of the early 21st century".

The second EU Work Plan for Sport (2014-2017) gave priority to Health-Enhancing Physical Activity promotion and identified additional actions for the Member States (MS) and the Commission to promote HEPA. It mandated the Expert Group on HE (XG HEPA) to produce recommendations to encourage physical education in schools, including motor skills in early childhood, and to create valuable interactions with the sport sector, local authorities and the private sector.
It has been estimated that about 80% of school-age children only practice physical activity and sport in school Consequently, the Expert Group recognizes school as the major institution that can allow all children to achieve, both through formal curriculum (PE) and extra-curricular sport, the WHO (World Health Organization) Physical Activity recommendations (>60 min/day). As regards the PE curricular content the XG affirms that from birth and during early childhood, PE should include daily active play, enjoyable games (fun), dance, and sports aiming to develop core neuromotor skills, physical, psychological, and social attributes; it also must respect maturity phases and neuromotor/skills trainability. Furthermore, the XG recommends the establishment of cooperative framework between school and sport organisations in order to promote both curricular and extra-curricular activities.

THE PROJECT

ACTIVITIES

The project got under way in January 2016, with the aim of building a "common base" for Federations involved in the initiative. In the first year of activity a comparative analysis was conducted on national goals and the contents of Primary School syllabuses in the sphere of motor activities and the skills required of Coaches of National Federations in order to be able to work in schools. These studies also served to provide an effective structure for the training course aimed at coaches from the Federations involved. Training was organised in two sessions: one theoretical, with the presentation of multidisciplinary studies and researches on children's growth years (paediatrics, neurology, neurophysiology, auxology), educational needs and educational psychology, in order to explain the medical and scientific premises of the project "Movimente", which gave rise to the European initiative. The second session took place during the Karate EuroCamp: coaches took an active part in motor activities aimed at boys and girls aged from 6 to 8, following the progress of the motor protocol and directly trying out, under the expert guidance of FIJLKAM coaches, the exercises that would be tried out in schools. Work focused on the functions of balance, proprioceptive capabilities and the development of intelligence in movement.

As from September 2017 and throughout the school year 2017-2018, duly trained coaches, working in collaboration with school teachers, carried out trial activities in 4 Primary Schools from each participating country. Motor activities were performed in one class per school (pupils of 7-8 years old) in an "enriched environment". A control class was selected in each school in order to be able to compare the results obtained.

Two important external institutions – the University of Padua and the Complutense University of Madrid – were then asked to analyse the results obtained in terms of the enhancement of motor skills and the learning and social behaviour of boys and girls taking part in the trials.

Finally, another aim of the project was to create a network to ensure the project's sustainability in participating countries and encourage the involvement of other European Karate Federations interested in developing the project in their own countries.

In this regard, information and awareness-building initiatives were undertaken at a national and international level, including the creation of an ad hoc website.

These *Sport at School Guidelines* were produced with the aim of providing a tool that might be useful for the Federations involved, helping them to spread and implement the project in schools, and for other National Karate Federations interested in developing the project in their own countries.

MOTOR ACTIVITY, THE ENRICHED ENVIRONMENT AND EXECUTIVE FUNCTIONS

Carlo Calzone[1] - Rocco Di Santo[2]

Introduction

In the school years 2008-2009 / 2010-2011 a motor activity project was carried out by FIJLKAM in concert with the Dipartimento Interaziendale di Neuropsichiatria per l'Età Evolutiva (DINPEE) of the Basilicata Region and the 1st Teaching District of Matera "P. G. Minozzi".

In the project DINPEE assessed behavioural outcomes of the project, while the 1st Teaching District of Matera "P.G. Minozzi" focused on an appraisal of the impact of motor activities on pupils' attitudes, the general class climate and the improvement in learning and pupils' ability to concentrate.

Results were presented in the conference held in Matera: "Physical activity as a modulator of behaviour" (2009), and were reported in the national conference held in Parma (19-20 February 2010) "Movement, sport and learning at school", attended by Prof. Rizzolatti of the University of Parma and Prof. Chiarelli of the University of Florence.

Teachers observed, in particular, positive behavioural changes as well as improvements in concentration and in academic performance.

The theory

This unexpected result forced us to search for a hypothesis that might explain the connection between motor activity and an improvement in cognitive performance.

An initial explanation came from the enriched environment model observed in animal testing.

The enriched environment was first defined by Rosenzweig et al. (1978) as a set of complex stimuli, both inanimate and social. Most of the effects observed in "enriched" animals are similar to those seen in animals subjected to intense physical exercise (Cotman and Berchtold, 2002). Physical activity enhances cognitive functions (Fordyce and Farrar, 1991; Kramer et al. 1999; Churchill et al., 2002).

Motor activity proposed at school showed many similarities to the enriched environment described in literature, being a set of complex visual, cognitive, motor, somatosensory and social stimuli backed up by motivation, attention and interest.

Biological changes occurred to animals placed in an enriched environment: the formation of more dendritic spines, more synapses and a greater cortical thickness, while behavioural changes included greater attention, improved memory and reduced aggressive tendencies.

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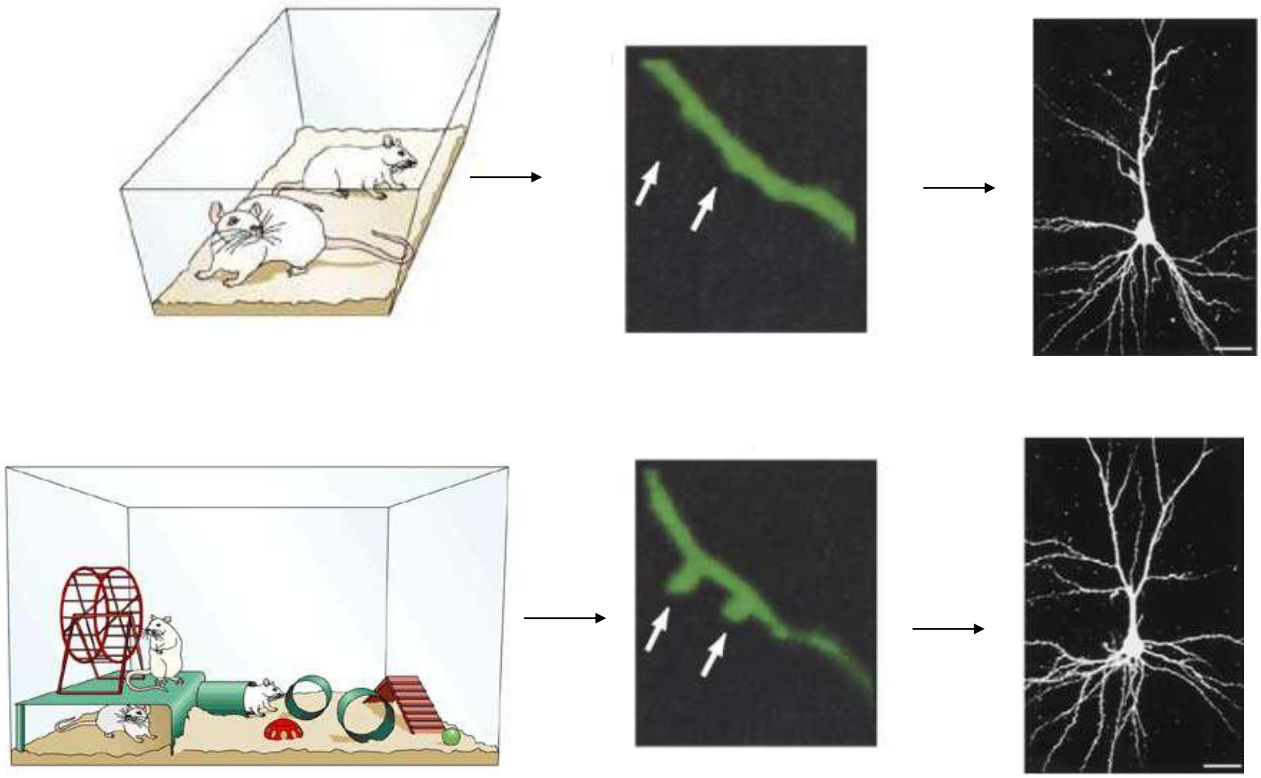
Figure 1. Differences between a non-enriched environment and enriched environment and neuronal stimulation.



The behavioural changes observed led us to hypothesise that in the same way as the enriched environment, motor activity strengthens and reorganises executive functions in individuals finding themselves in similar situations.

Executive Functions (EF) are defined as the abilities needed to programme, enact and successfully complete an action tending towards a specific purpose. EFs are a complex cognitive construct that can be broken down into many independent but interacting sub-parts.

They are basically a complex set of mental modules that regulate processes for the planning, control and coordination of the cognitive system and govern the activation and modulation of patterns and processes. These include:

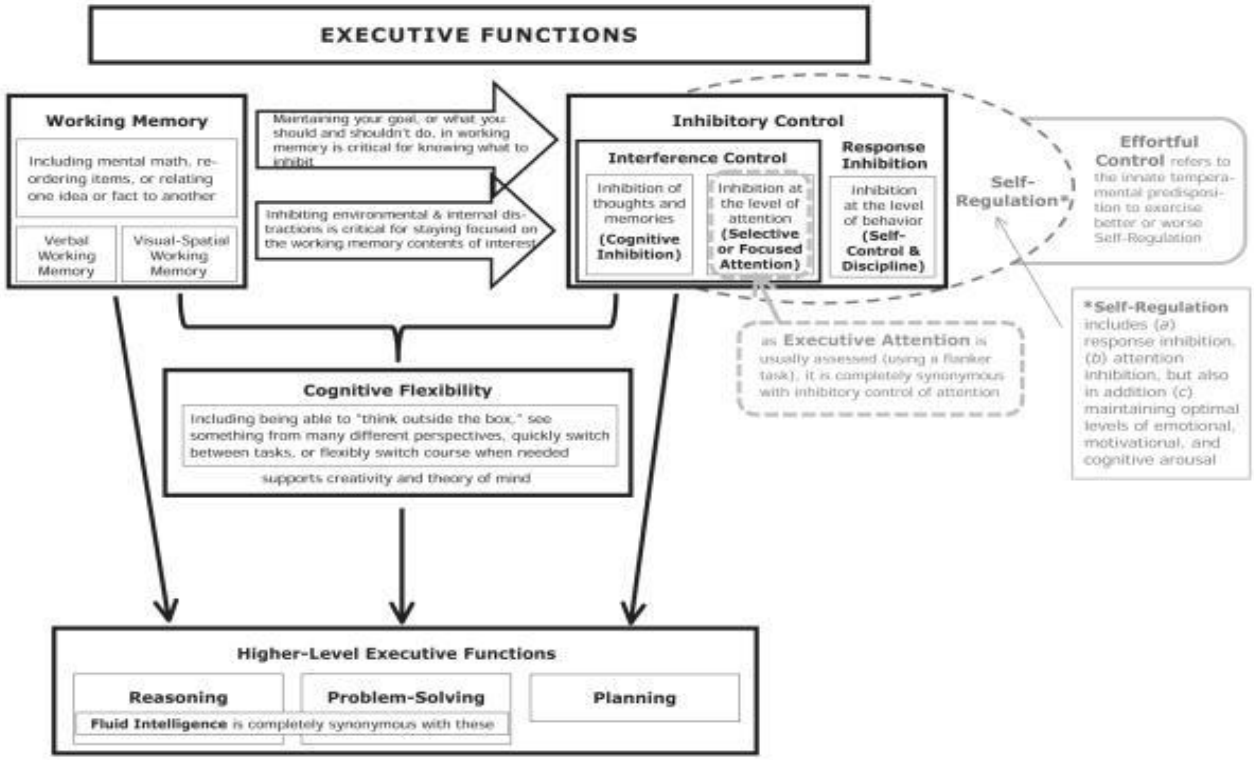
- the grouping of actions into hierarchical sequences of objectives;
- the flexible shift in attention in response to incoming information;
- the activation of appropriate strategies and inhibition of inadequate responses.

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. 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.

Executive Functions

Adele Diamond

Annu Rev Psychol. 2013; 64: 135–168.



Efficient executive functions are important for aspects such as mental health, physical health, quality of life, success at work and in family life, as well as success at school (Adele Diamond, Executive Functions; Annu Rev Psychol. 2013; 64: 135–168).

In more recent articles Adele Diamond has stressed the importance of developing executive functions at a young age, as well as the importance in this respect of motor activity and combat sports.

The field research project

Taking as a starting point our experience at the Minozzi comprehensive school in Matera and data from scientific literature, it was decided to roll out a field research project in infant schools in the Basilicata Region in collaboration with Fondazione Avisper of Potenza, which funded the project.

The project entailed a motor activity course during normal school hours based on a framework drafted by Prof. Pierluigi Aschieri, with playful motor exercises aiming to improve equilibrium and body awareness.

The impact of this activity on executive functions was assessed using a BRIEF-P questionnaire, a recent innovation for Italy, submitted to the parents of children involved in the project and to the parents of a control group.

The BRIEF-P offers an in-depth appraisal of executive functions, taking into account the child's behaviour in two different social settings. This instrument is the first standardised rating scale specially constructed to measure executive functions in pre-school children, relating to behaviour that can be observed in natural settings, namely at home and at school.

The BRIEF-P is broken down into five independent and empirically derived clinical scales, measuring different aspects of the executive functions of the child under observation:

- *Inhibition (controlling impulses and actions; interrupts and modulates behaviour in a manner commensurate with the situation or in the appropriate context);*

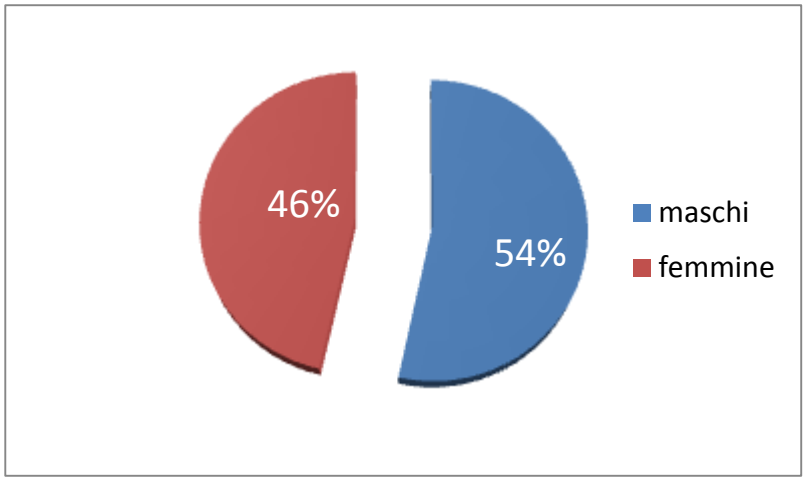
- *Shift (the ability to move freely from one situation, activity or aspect of a problem to another as demanded by circumstances; the ability to switch attention; solving problems in a flexible manner);*
- *Emotional control (modulating emotional responses in an appropriate manner in relation to circumstances or the setting);*
- *Working memory (holding in mind the information needed to complete a task or make an appropriate response; keeping relevant information active to perform the activity);*
- *Planning/organising (planning for future situations or consequences, setting objectives or procedures to govern behaviour in a given setting; developing or implementing sequential steps ahead of time to ensure a task or related action is performed).*

These scales are then pooled together to assess: Shift (freedom of movement in a situation, switching attention and solving problems flexibly); controlling emotions; working memory; planning/organising activities.

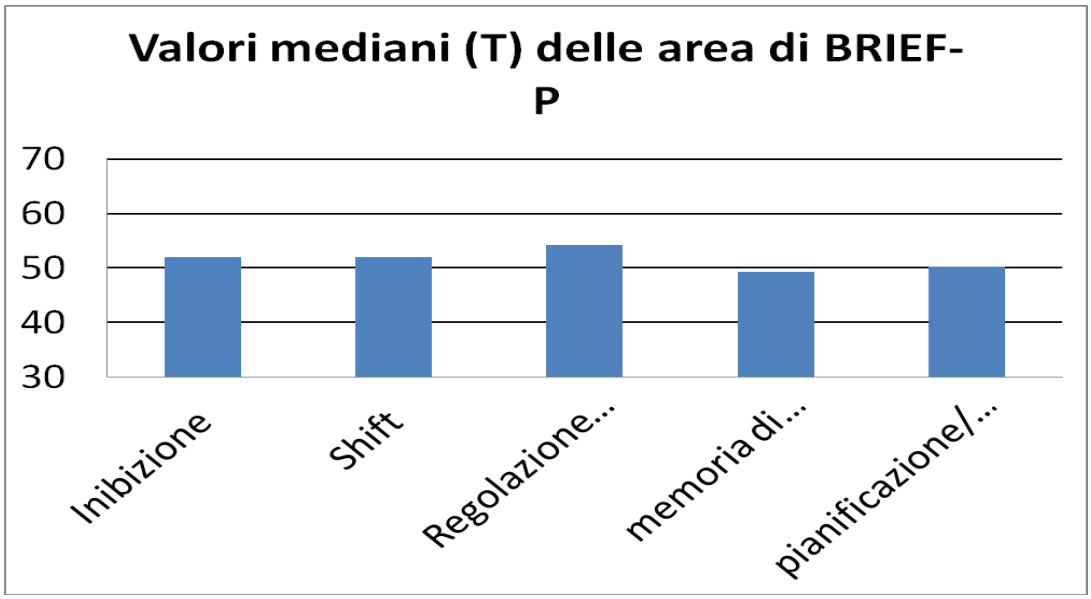
Results obtained in first year

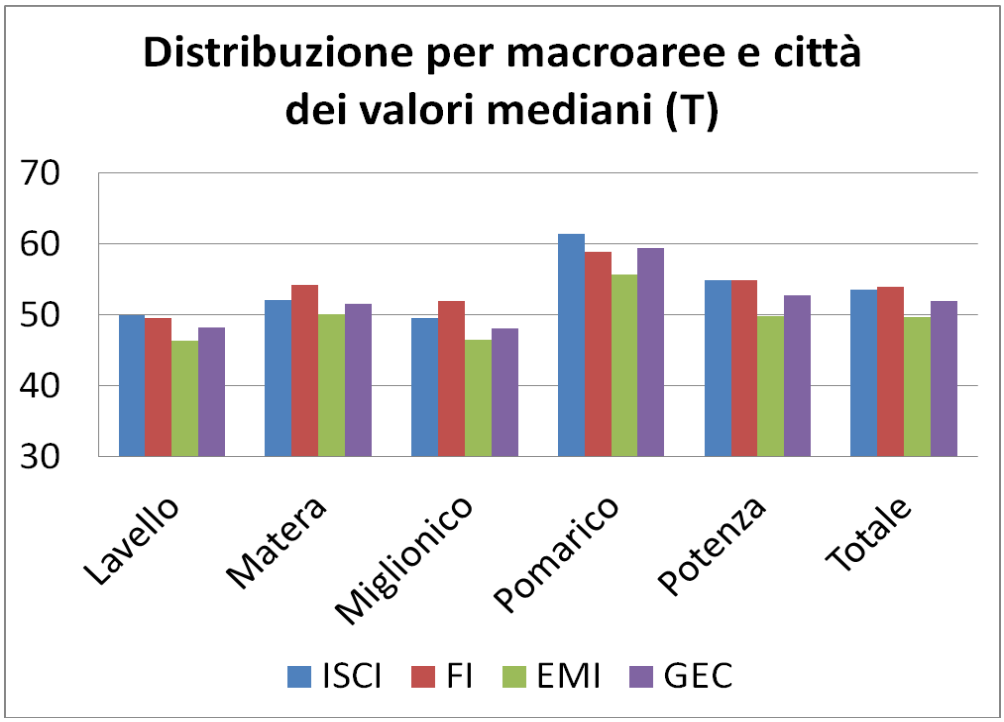
The research conducted in four municipalities of the Basilicata region (Matera, Potenza, Lavello and Pomarico/Miglionico) involved 102 children aged between 42 and 59 months, attending infant schools.
The distribution by gender showed a preponderance of boys.

Figure 2. Distribution of sample by gender



The median values of the children involved were perfectly in the norm for all areas covered by the test.





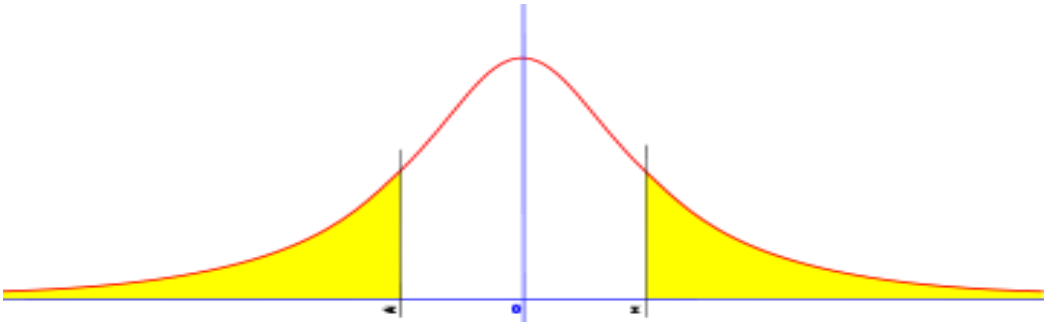
Looking at the interviews by municipality of residency, it is noted that only in Pomarico was there an ISCI value (inhibitory self-control index) slightly above the norm.

To analyse results obtained from the motor activity course given in the schools involved in the project it was necessary to compare dispersion between the values in time T= and time T1.

While the median scores give a general profile of the child observed, variability indices help us to measure dispersion, describing the spread of a frequency distribution.

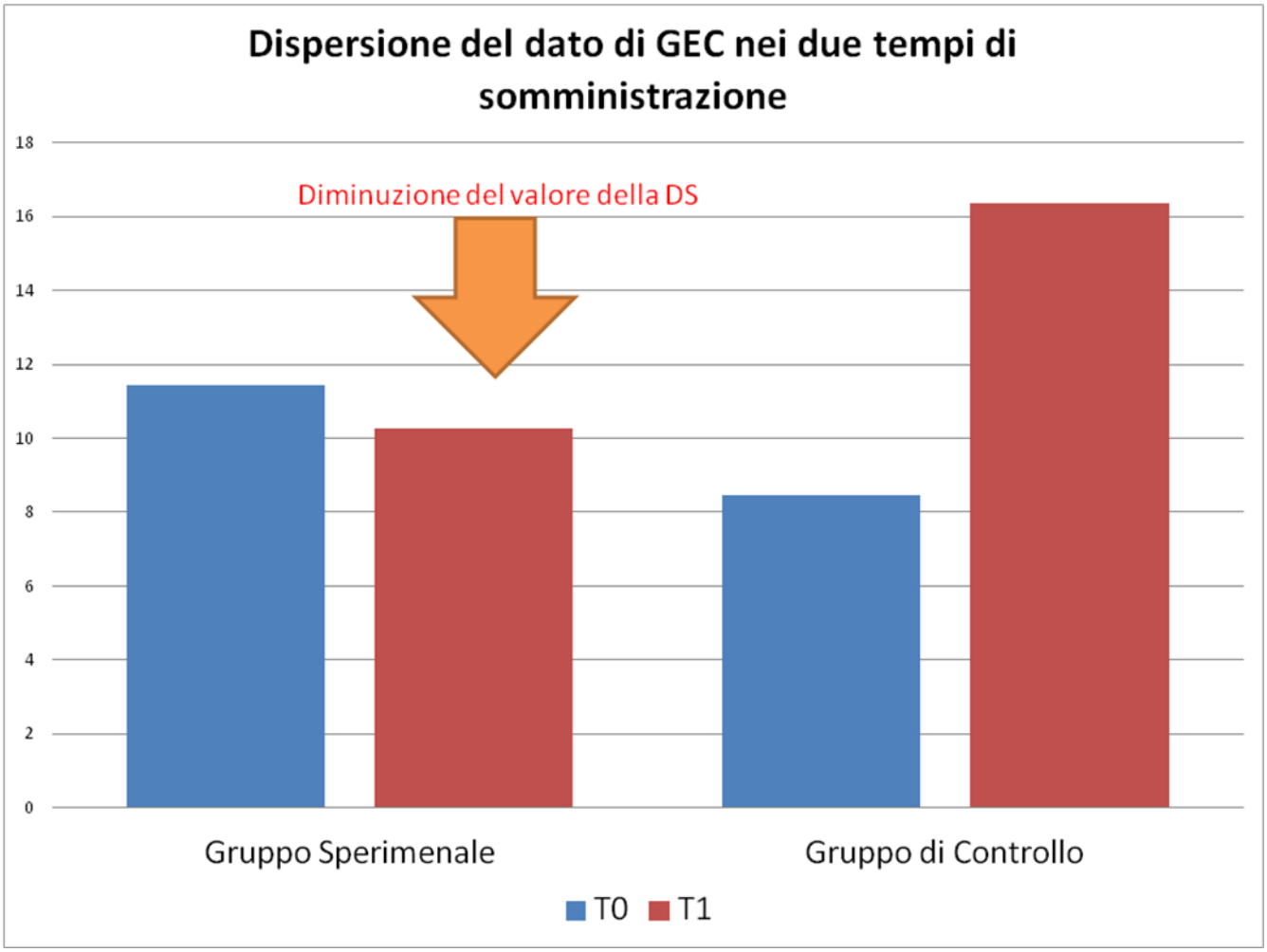
Dispersion marks the greater or lesser density of observations around a pre-established average.
The disparity highlights the diversity of the various observations.

Figure 3. Normal or Gaussian distribution

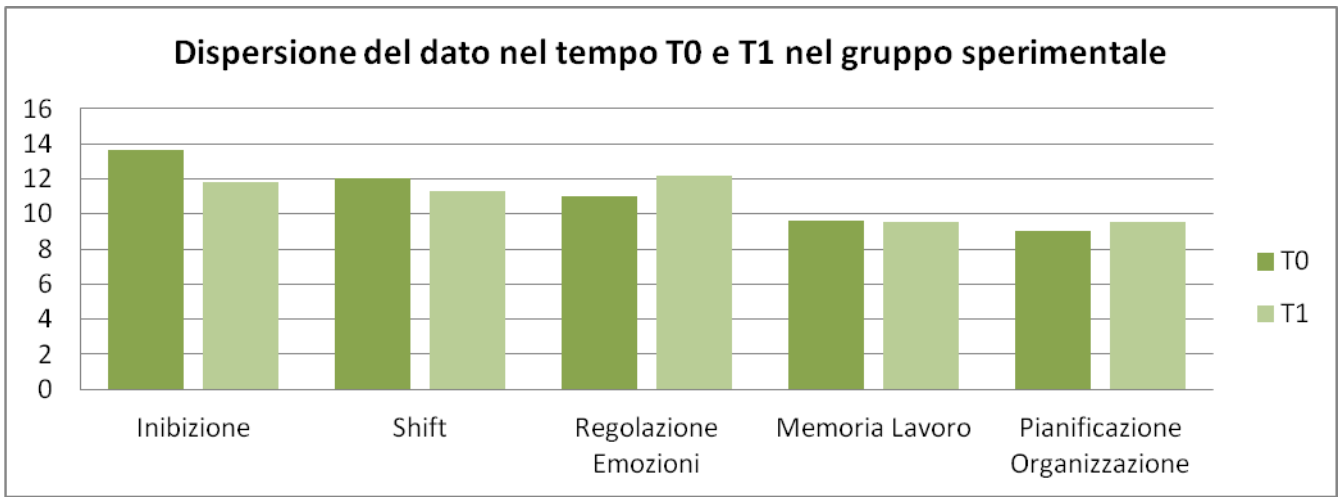


Preliminary results

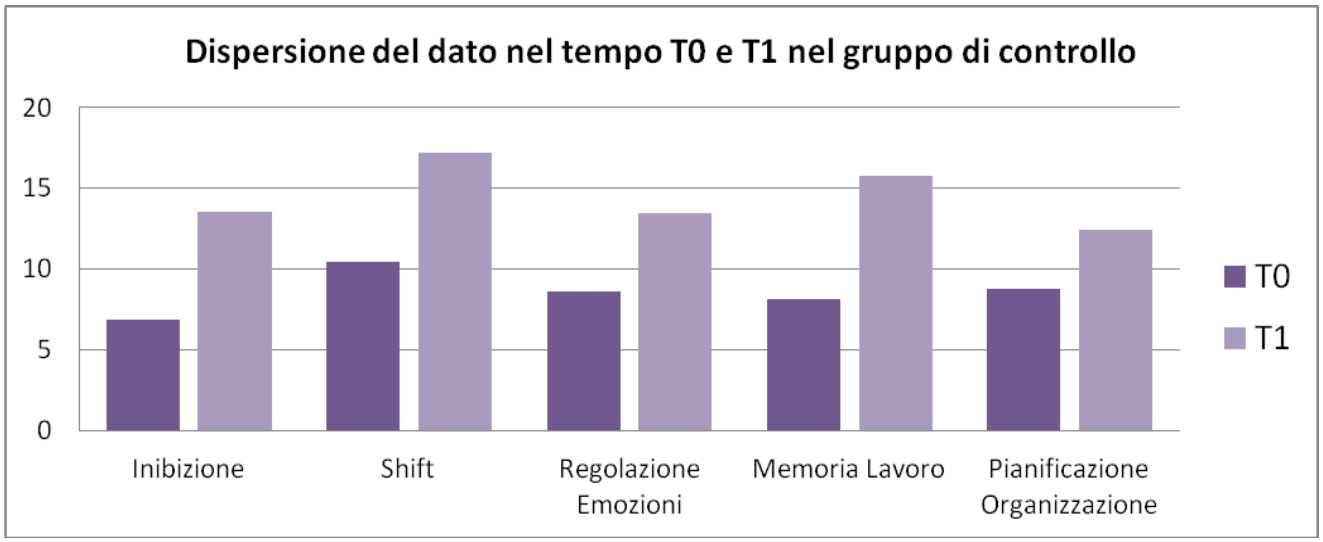
When comparing the data, it was seen that in the move from time T0 to time T1 there was an increase in data dispersion for the control group, while dispersion remained almost unchanged for the test group.



As can be seen from the figure below, dispersion was lower for the test group, demonstrating that the project tended to homogenise behaviour, keeping scores close to a median value.
Dispersion was greater in the control group, indeed it doubled between the two times. Values centring on the general behaviour of children were heterogeneous.



In greater detail, in the two administration times there was a standstill or a drop in dispersion values in the test group. Confirmation of the success of the project was seen by comparing data for the test group and control group. In this case there was a clear difference in the two times in single areas of the test.



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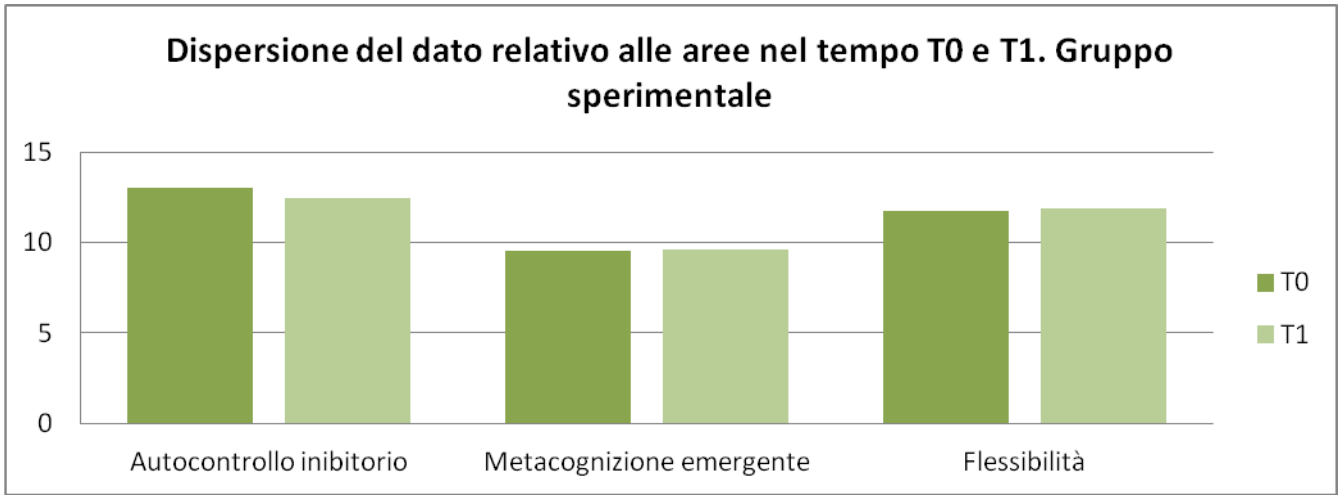

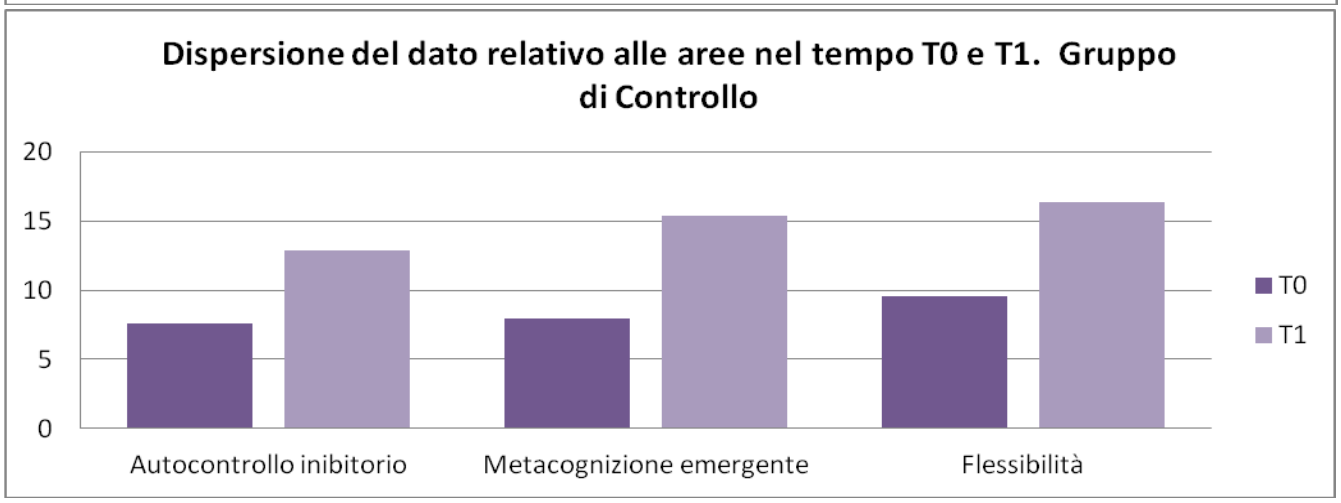

Conclusions

Although these data are not final, they encourage us to continue testing in the second year of the project on other classes of the infant school, so we have more data that can add to the significance of results.

The intention is to demonstrate a clear correlation between motor activity and the strengthening of executive functions among the children involved, and secondly to evaluate the existing differences between: cities and small towns; boys and girls; gender differences on the part of the compiling parent; perception and awareness of the child's skills on the part of the parent over time.

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CHILDREN AND MODERN-DAY PROBLEMS

Dr. Vito Cilla, Paediatrician working in Matera

In order to ensure a fruitful approach for initiatives aimed at children, and at adolescents in particular, we must seek to understand the world we are living in. We must also be prepared to understand youngsters, their family and social context and the problems they are faced with.

Looking at the paediatric population in Italy, we can immediately see that:

BIRTHS ARE AT AN ALL-TIME LOW IN ITALY

- This is the first time in the EU that a negative birth-death rate has been recorded.
- **The highest birth rates** have been posted in Ireland (15.7‰), United Kingdom (12.8‰), France (12.6‰), Sweden (11.9‰) and Cyprus (11.8‰),
- **they are lower** in Germany (8.4‰), Portugal (8.5‰), Greece (both 9.0‰), Hungary (9.1‰) and Italy
- In Italy in 2017 there were 464,000 births (8‰ of resident population), 20,000 fewer than in 2015
  - 2017 was the 9th consecutive year in which the fertility rate had dropped, down to **1.35 children per woman**
  - The average age of mothers at the time of labour has risen to 31.6 years.

The death rate in Italy (10.7 per thousand residents) however is not far from the EU average (10.3), and below that of a number of other countries, such as Bulgaria (15.3), Latvia and Lithuania (14.4), Hungary (13.4) and Romania (13.2).

- The population has grown in Luxembourg, Austria, Germany, Malta, Sweden, Denmark and Belgium.
- The biggest drops have been recorded in Lithuania, Latvia, Croatia, Bulgaria and Greece

DEMOGRAPHIC INDICATORS 2017

- **AGEING PROCESS**
- 22.6% OF THE POPULATION OVER THE AGE OF 65
- Drop in the working population
- Average age up to 44.6 years
- **Birth rate = 8**‰ Trentino Alto Adige and Campania 9.7‰, Liguria and Sardinia 6.7‰

- **There is an increasingly large number of single-child families**
- **The average age of pregnant mothers is rising**
- **Contacts with peers are fewer and fewer**
- **Low GDP and high incidence of obesity**

In this general context, let us move on to the most important stages of development of children and adolescents, and the skills they gradually acquire

Development of child 3-5 years old

- **<u>Motor</u>**
- Eats, washes and goes to toilet without help. May play at wrestling
- **<u>Relational / Cognitive</u>**
- Begins to understand, explain and, when possible, exert control over the world around him.
- Begins to **distinguish between fantasy and reality**.
- Rise in **curiosity about differences**.
- Greater ability to **collaborate and follow rules**.
- Draws a **human figure** in greater detail.
- Improved understanding of the combination of forms, colours and sequences.

Children 6 - 11 years: various stages of development

- **physical development, growth** – great improvement in strength and muscle **coordination**. Many children learn to shoot and kick a ball, and to play around with a basketball. Some begin to prefer one activity over another, including some sports.
- **they put on 2-3 kg a year, and grow by about 6 cm**

Remember:

- limit the time spent in front of a screen to 1-2 hours a day
- provide a healthy and diverse diet, encourage them to do physical and group activities
- A lot of progress is made in these years, achieving many goals:
- **Cognitive and linguistic development** – When children begin to go to school they leave behind the safety of home, of their family. They learn to **play** at school with classmates and outside school, with **friends.**
- **they like to sing and play games**
- **they read and write unaided**
- **they begin to understand cause-effect relationships**
- **they begin to grasp the concept of time**

Children 6 - 11 years *part two*

- they develop a more logical and mature way of thinking. Children begin to consider all aspects of a problem in order to find a solution, but they will still find it hard to make connections.
- they learn to better describe their experiences
- they focus a little less on themselves and a little more on others
- **Emotional and social development** – the family is still number one, but friendships become increasingly important.
- They thus acquire some important social skills, such as learning to socialise with persons they may remain friends with for the rest of their lives.
- Being able to interact with one's peers is a very important part of development. The child will continue to enjoy playing alone, but will be increasingly able to forge friendships, and to share things and help during play.
- **they will continue to be afraid of irrational things, such as monsters, abductors and large animals**
- **they will play with a great deal of fantasy and imagination**
- **they will take care of smaller children**
- **they will usually prefer to play with friends of the same sex**
- **they will begin to understand other people's feelings with the encouragement of parents and educators**
- **they will develop a sense of humour**

Children 6 - 11 years *part three*

- As physical abilities and a sense of independence grow, the child will feel more inclined to run risks, so remain alert and supervise the child in potentially dangerous situations, such as climbing activities.
- Do not impose too many rules, choose a few and stick to them. Encourage them to behave well, praising them when they do so.
- From this age onwards you can ask them to give a little bit more, without exaggerating.

- Self-esteem and the sense of belonging may change quickly depending on changing circumstances around them.
- They show greater independence from family and parents.
- They begin to think about the future.
- They understand a lot more about their place in the world.
- They pay more attention to friendships and to team work.
- They want to be admired by friends.
- It thus becomes important to focus on qualities and traits that allow a positive evolution during crucial events they have to face, being stages of their development.
- there is a search for new relations outside the family with peers, but also with other adult figures like teachers;
- there is the impetus to seek new experiences;
- there is a search for new models and values;
- transitions at school and towards adolescence;
- sexual behaviour.

The youngsters of today experience **new forms of solitude** in the family setting, with parents experiencing stressful and often frustrating working, emotional and affection-related conditions.

Youngsters live in families in which, for the first time, they have to face up to the possibility of a **future not as bright as that of their parents** arising from the economic crisis, leading to anxiety.

- There is a **loosening of primary family networks**, families are becoming more isolated, a phenomenon exacerbated by changes to the family fabric, also resulting from separations and divorces.
- **Social networks** are used increasingly to get to know other people and to build and manage a significant portion of relations with others.
- In 2016 83% of youngsters aged between 11 and 17 accessed the Internet via a mobile phone.
- Girls aged between 11 and 17 use mobile phones and the Internet more than boys of the same age.
- These habits also have an impact on **sedentary**
- Four out of 10 youngsters (42%) spend one to two hours a day in front of the television;
- 24.5% spend even longer, 2 to 4 hours
- and 6.2% spend over 4 hours watching TV.

Obesity

- Adults looking after children voice a reduced ability to monitor and manage their children's day-to-day lives, not only due to a shortage of time: there is a lack of knowledge and training on the role of parent.
- The IV National plan of action for childhood stresses the need for suitable policies in support of the role of parent.
- More use is being made of specialists (psychiatrist or psychologist) for purely educational matters, while evident disorders are not tackled promptly.

However, if we look carefully, we can see attitudes that make us think of:

- **positive and creative** impulses from adolescents, who seek recognition and appreciation from the adult world, and have love for the world and for life, a desire to protect nature, concern for the planet and a pressing desire to do something about it.
- **sporting activity** occupies a relevant place in the life of adolescents: 67.2% of boys and 51.5% of girls aged from 14 to 17 regularly play sport in their free time, both amateur and competitive activity.

In conclusion, we should stress:

- **the need for qualified educational initiatives involving all educators from different spheres** (family, school, institutions, voluntary sector), as well as boys and girls themselves, making them greater protagonists.

- ***In this respect, sports education and group activity are levers that are able to generate enthusiasm and mental fortitude.***

Table 8 - Guidelines for Physical Activity (P.A.)

Age	recommendations	Examples
Children still not walking	P.A. should be encouraged from birth, in particular through floor games and water activities in safe settings. All children below the age of 5 should spend as little time as possible "in sedentary" (being held or sitting) for long periods (exception for time spent sleeping)	• Tummy time – this includes any time spent on one's stomach, including turning and playing on the floor • Reaching and grasping objects, pulling, pushing and playing with others • 'parent and child' swimming activity, Games on the floor and in water encourage children to use their muscles and develop motor skills; they also offer invaluable opportunities to build social and emotional ties.
up to the age of 5	Pre-school children that can walk unaided should be physically active every day for at least 3 hours, distributed through the day. All children below the age of 5 should spend as little time as possible "in sedentariness" for long periods (exception for time spent sleeping), reducing "screen time" and time spent on a car seat or pushchair	• Activities encouraging movement of all the main muscle groups, i.e. legs, buttocks, shoulders and arms, and movement of the trunk. • Active games, for instance climbing or cycling • Other intense play activities (running and chasing) • Walking around shops, going to a friend's house, a park or to and from school
From 5 to 18	Children and youngsters aged from 5 to 18 should do at least 60 minutes of P.A. every day, of varying intensity (medium and intense). P.A. in excess of 60 minutes offers further health benefits.	• Most daily P.A. should be aerobic. • Intense and vigorous activity, including those that strengthen muscles and bones, should be performed at least three times a week. • Activities to propose to children and adolescents should support natural physical development, be fun and performed under safe conditions. • "Competitive sporting activity should avoid precocious specialisation".
Adults	At least 150 minutes a week of P.A. of medium intensity or 75 minutes a week of high-intensity P.A. or a an equivalent combination between the two	P.A. may include recreational activities in free time, transport, work, housework, play, sport or exercises planned as part of daily activities in the family and the community

EDUCATIONAL NEEDS IN A CHILD'S GROWTH YEARS

Roberto Tasciotti

Background

In Europe one out of three children aged from 6 to 9 years old are obese or overweight. It is estimated that by 2025 the number of overweight children below the age of five will rise from 41 million to 70 million worldwide. According to researchers, 20-30% of intestinal inflammatory diseases crop up in childhood. Non-alcoholic fatty liver disease has become the most common cause of liver failure among children and adolescents in the West. This disease has even been diagnosed in children below the age of three.

1.5kg heavier every decade

The alarm regarding obesity levels is nothing new, and is not limited to Europe and to children. A recent study conducted by scientists from the Imperial College of London published in the Lancet reported there are an estimated 266 million obese men and 375 million obese women. The population as a whole is also growing "heavier": 1.5kg more per person every decade since 1975. Unfortunately, 90% of obese children continue to be overweight when they become adults, thus experts have called for campaigns focusing on childhood obesity.

SLD in Europe

The number of children of school age with specific learning disabilities (SLD) is on the rise, often caused by a difficulty in structuring the body scheme in spacetime.

Dysmorphic features and deformations

Another relevant point is that of data on dysmorphic features and deformations.

50% of children of school age are deformed, while 5% have dysmorphic features.

The European Commission, meeting in Nice in December 2000, declared 2004 to be the European Year of Education through sport, stating:

"Sport is an integral part of the teaching curriculum and itself contains essential educational values. It is a vehicle for learning the rules of life in society, and is conducive to integration within a group. It makes it easier to embrace values as such respect for others, partners and opponents alike, observance of rules, solidarity, a sense of endeavour, collective discipline and life as part of a group".

The European Commission's 2007 White Paper on education and training states that "knowledge is defined as an acquired corpus of fundamental and technical knowledge and social skills" that

concern “relational skills, such as the ability to cooperate and work as part of a team, creativeness and the quest for quality”, all of which are values conveyed by sport.

In Europe there is a growing focus on the promotion of physical activity. The 2007 White Paper on Sport and the 2009 Lisbon Treaty laid the legal foundations for the EU to seek the promotion of sport and related issues at a Community level. In its 2008 Guidelines the EU placed the spotlight on physical and mental issues that might arise from sedentary lifestyles and a growth in obesity among younger generations. The Commission, through the Eurydice network, examined the state-of-the-art of physical education (PE) in 30 European nations in the Report “Physical education and sport at school in Europe”, the first attempt to pinpoint the strengths and weaknesses of the subject at school.

The recommendations of the World Health Organisation (WHO)

The WHO recommends a minimum of 30 minutes of moderate physical activity (including but not confined to sport) a day for adults and 60 minutes a day for children.

State-of-the-art in countries involved in the project

Physical education is compulsory in all national programmes examined, in both primary and lower secondary schools. In almost all nations the primary goal is to encourage youngsters’ physical, personal and social development. The promotion of a wholesome lifestyle is also often stressed.

In some countries the approach is interdisciplinary: in Germany and Portugal, for example, the **social** and **natural sciences** also come into play during the hour of PE.

In Germany the **highway code** for pedestrians and cyclists forms part of the PE curriculum.

In many countries central authorities decide what should be taught: from **fundamental motor activities** like running, throwing and jumping in the first years of primary education to more complex sporting disciplines. **Games** – usually involving a ball – are the most common compulsory activities.

How many hours of teaching? Compulsory hours dedicated to PE make up 9-10% of all school hours.

Who teaches PE? PE teaching is assigned to generalist or specialist teachers depending on the level of education. At primary school there are two possibilities: the subject can be taught by generalist teachers (Germany, France, Italy) or specialist teachers (Spain, Poland, Portugal).

SPORT AT SCHOOL

The situation described above was the inspiration for our project which, taking 7-year-old children as a sample, sought to develop in these children positive attitudes to movement, fair play and

healthy lifestyles, with the aim of developing transversal skills that can be used in other school disciplines and improving learning processes and the consolidation of know-how.

With this project we sought to help some children to acquire the knowledge and abilities that are needed to build indispensable skills in a complex society.

The EU has identified "life skills" that are today deemed essential for dealing with the future, namely: communication in one's mother tongue, communication in foreign languages, mathematical and basic scientific and technological skills, digital skills, learning to learn, social and civic skills, spirit of initiative and enterprise, cultural awareness and expression.

We believe that it is indispensable, to ensure peaceful coexistence and develop imaginative and productive processes, for new generations to develop: empathy, handling of emotions, handling of interpersonal relations, self-awareness, handling of stress.

We should stress that competence lies not in the resources (knowledge, abilities, etc.) that can be garnered, but in the mobilisation of these resources. It means: knowing what to do, when and why to do it, also in new and unforeseen situations.

The cognitive-motor qualities we seek to consolidate are: proprioceptive discrimination abilities; exteroceptive discrimination abilities; consciousness and self-representation; structuring of the body scheme; appreciation of sensory-perceptive ambiguities; focusing attention; converging and diverging thoughts; strategic intelligence; ability to take responsibility; decision-making ability; observance of deadlines and rules; ability to give order and rhythm to cognitive-motor sequences; neuro-cognitive-motor interaction with others in a given situation.

Choosing the age class

The child at 7-8 years old: towards cooperation and autonomy

The age of 7-8 years is a crucial age, a period of assimilation and adaptation to reality. Freud described it as a latency period (end of Oedipal complex, latency of sexual urges). Subjective attitudes give way to a growing interest in objective data based on reality. Radical transformation of the child's thoughts, changing the way the child views the universe and relations with others. The emergence of logical thought that frees the child of his self-centredness: whereas before he was weighed down by all the illusions of perception, now he is able to rectify thoughts through reasoning and introducing order, stability and coherence in the world of appearances, e.g. being able to grasp different aspects of a situation or problem and connecting objects with causes (acquisition of reversibility). Unlike adult logic (abstract and formal) this is a concrete logic based on facts and relations among objects, and not on ideas and assertions. Influence on social behaviour: thoughts imprint a new structure on interpersonal relations, since by engaging with others the child is able to remedy his illusions and form an objective representation of reality (socialisation of thought).

THE TEACHING METHOD

The broader the range of abilities, the greater the likelihood of acquiring skills quickly and consistently.

Keywords for the project are: VERSATILITY, MULTILATERALISM, TRANSFERENCE

Versatility:

Pertains to methodological aspects of the teaching of motor activities designed to develop multiple abilities and the skills of transferability, valence and validity:

- multiple and global: in relation to cognitive, emotional, social and organic functions

- multiple and specific: in relation to motor functions

Multilateral approach:

Pertains to didactic aspects of the teaching of motor activities, namely contents, resources, organisation (games, circuits, multiple tests, etc.).

According to the principle of multilateralism the planned outcomes of motor activities must be usable and transferable, namely:

– of a general type: developing the broadest motor base possible

– of a specific type: learning motor skills

referring as much as possible to skills useful for different sports and later to specific skills

Transference

According to recent studies, although the emphasis on different elements may vary depending on the nature of the task, pupils that have practised other sporting activities at school than their area of specialisation require fewer hours of training to attain a given level of performance compared with individuals that have not acquired a knowledge of other sports when growing up.

Teaching objectives

The body and its relationship with spacetime

Language of the body as a means of communication and expression

Movement, play, rules fair play

Health and wellbeing, prevention and safety

Project measures and actions – Motor intelligence syllabus 7 YEARS OLD

The body and sensory-perceptive functions

LEARNING GOALS

- to recognise and name various parts of one's own and other people's bodies and to be able to draw them

- to recognise, classify, memorise and reprocess information from the sensory organs (sight, hearing, touch, kinaesthetic).

EXPECTED RESULTS

The pupil:

- identifies various parts of one's own and other people's bodies

- discriminates and verbalises experienced sensations.

- identifies differences between apparatus used through tactile perception

GOALS FOR THE DEVELOPMENT OF SKILLS

- The pupil acquires self-awareness by listening to and observing his/her own body, mastering motor and postural patterns, adapting to space and time variables

Body movement and its relationship with space and time

LEARNING GOALS

- to coordinate and use different motor patterns in combination (running/jumping, catching/throwing, etc.)

- to be able to control and manage static-dynamic body balance conditions

- to organise and manage body orientation with reference to the main time and space coordinates (contemporaneity, sequencing and reversibility) and to rhythmic structures.

- to recognise and reproduce simple rhythmic sequences with one's body and with apparatus

EXPECTED RESULTS

- recognises the intensity of the sound and moves accordingly

- reproduces rhythms and moves accordingly

- assesses distances through body parts used

- assesses distances through the use of small apparatus

- remains balanced with both feet off the floor

- recognises that balance is affected by the placement of different body parts

- is able to move under apparatus, being aware of one's body size

- memorises the sequence of activities on a predetermined course

- controls running, changing direction

GOALS FOR THE DEVELOPMENT OF SKILLS

The pupil acquires self-awareness by listening to and observing his/her own body, mastering motor and postural patterns, adapting to space and time variables.

Body language as a means of communication and expression

LEARNING GOALS

- to use one's body and movement in a custom manner to express oneself, communicate moods, emotions and feelings, including forms of drama and dance. To knowingly assume and control different body postures as a means of expression.

EXPECTED RESULTS

- is able to use body to express situations

- is able to use body to express emotions linked to one's experiences

- is able to work with classmates to invent imagined situations

GOALS FOR THE DEVELOPMENT OF SKILLS

- to use body and motor languages to communicate and express one's moods and feelings, possibly through dramatisation and rhythmic-musical experiences

Play, sport, rules and fair play

LEARNING GOALS

- to know and correctly apply executive functions for numerous games involving movement and pre-sporting activity, both individual and team-based and at the same time to adopt a positive confident attitude to one's body, accepting one's limitations, cooperating and interacting positively with others, aware of the "value" of rules and of the importance of complying with them.

EXPECTED RESULTS

- is able to come up with simple strategies to be successful at the game

- recognises the rules of a game and respects them

- knows how the score works

- distinguishes between different roles in the game

GOALS FOR THE DEVELOPMENT OF SKILLS

- Understands in the various games and sports the value of the rules and the importance of respecting them, aware that playing fairly and with mutual respect are indispensable for any game-sporting experience

- Tries out many experiences in order to find out about and appreciate many sporting disciplines.

- Tries out different sporting techniques, firstly in simple form and then gradually more complex forms.

Safety and prevention, health and wellbeing

LEARNING GOALS

- To know and use apparatus and spaces correctly and appropriately

- To perceive and recognise "a sense of wellbeing" relating to play-motor activities

GOALS FOR THE DEVELOPMENT OF SKILLS

- to move about in school and non-school settings respecting a set of rules to ensure one's own and other people's safety

THE MOTOR INTELLIGENCE PROJECT

Pierluigi Aschieri – Sport at School Project Leader

BACKGROUND

The project came about as a result of strategies first pursued by CONI in 1984 in response to issues raised by Sociologists and Paediatricians and brought to the attention of the public at large and professional categories such as Teachers and the Coaches of National Federations, namely sedentariness and prepubertal obesity. In those years families began to demand motor and sporting activities for children, partly because of growing television coverage of competitive sport.
At that time National Federations did not possess specific skills for introducing children of this age to Sport. Ministerial Programmes introduced the subject of Physical Education, starting with lower secondary schools. Motor education however was still not envisaged at a primary school level.
In 1985 NFs were presented with the Body, Movement, Performance multimedia programme, consisting of training and retraining initiatives managed by SdS (School of Sport) and by the Youth Activity Division, aimed at making Sports Federations aware of strategic social issues centring on the health, education and physical and mental wellbeing of children and adolescents. FIJLKAM produced guides for Coaches working with young children in sports clubs.
Summer camps were then organised for children and sports coaches in order to develop and consolidate the new teaching method to introduce children to the world of Sport. In these camps coaches were given specific training, which produced good results regarding the quality of teaching given to children.
These initiatives were an opportunity to initiate the longitudinal observation of participants, with pre- and post-camp motor skill testing and researches on body balance performed by a team from the University of Rome "La Sapienza", using stabilometric platforms, and the monitoring of cerebral cortex activity using high-resolution EEG and MRI.
In the 2009-2010 school year trials took place in a school setting, first in primary schools in the city of Matera and then in infant schools. Results were excellent.
These trials, conducted in collaboration with the local health authority (ASL) of Matera and the department of Child Neuropsychiatry and Paediatrics, provided clear evidence of the effectiveness of the Motor Intelligence project.

Application of the protocols trialled at the Cesenatico Eurocamp from 2002 onwards confirmed the effectiveness of training given two hours a week, with significant positive evidence given by indicators supplied by the Education Ministry for primary schools regarding:

- Behaviour;
- Attention (focus);
- Learning, in particular for mathematics.

THE "SPORT AT SCHOOL" PROJECT

The project was conceived as a concrete response to problems arising in Europe affecting prepubertal children caused by sedentariness, obesity and, even more seriously, the inadequate development of executive functions (Diamond, 2013). It consists of collaboration between Schools

and Sports Federations, if possible with the participation of local administrations, involving children aged 7/8 years old, during school hours, applying a protocol designed to develop cerebral cortex functions.
The main characteristic is that of creating an "enriched environment" in school gyms using mattresses on the floor for added safety and non-hazardous modular materials for the performance of specific motor actions, using different combinations, according to the enriched environment approach.
This gives children sensory-motor stimuli for the development of "executive functions" in terms of flexibility, balance, speed, coordination, control and the modulation of Myofascial Chains.
Basic motor patterns are accordingly developed thoroughly. The protocols were taught to coaches during the theoretical part of the training course at Cesenatico.
Special focus was placed on the development of dynamic coordination and collaborative interaction among the subjects involved when performing complementary and/or interactive tasks. Some fundamental and very simple steps were followed to introduce forms of segmental coordination that encourage and facilitate the learning of technique.
The aim of the "Movimente" project is to encourage the development of important functions:

- Ability to perceive and exteroceptive/visual-spatial discrimination;
- Ability to perceive and proprioceptive discrimination;
- Afferent synthesis, the Self in a particular situation in relation to a purpose;
- The Self, perceived and represented;
- Structuring of the body scheme.

Developing these important functions enables the child to structure the categories of space and time, to interact with the world around him and with others in a collaborative manner in order to perform group tasks, such as games and studies.
The enriched environment approach enables the child to structure space categories (three-dimensional) and the time category (speed/duration) through the modulation of movement in amplitude and velocity. This in turn allows him to acquire conscious cognitive and motor skills in keeping with the complexity and dangerousness of the environment we are living in.

TRAINING OF COACHES

The Coaches designated by Portuguese, Spanish, French, German and Polish Federations were trained over two 40-hour periods at Ostia during a residential course (theory) and at Cesenatico during a children's Camp (practical application).
The contents were chosen to prepare attendees to work as Trainers by experts in Biology, Auxology, Paediatrics, Child Neuropsychiatry, Training Methodology, etc.
The practical part was conducted in the field, working with children. Protocols were illustrated, and videos were produced.

TRAINING IN PRIMARY SCHOOLS

The Primary School and the 7/8 year age group (Class) were chosen as a result of recommendations emerging from the studies and researches of Neurophysiologists on the subject of child development, in particular the evolution of cerebral cortex functions. Activities were performed in school hours by specialist coaches, assisted by regular school teachers, two hours a week, on different days, making use of special teaching materials.
Pre-course, in-course and post-course motor tests were conducted on the **Trial group** and **Control group.**

The regular school teacher, taking into account the initial profiles of the children, monitored activities and observed the progress made, in the gym and in the classroom, with the aim of observing:

- child behaviour in the Situation and in the Classroom;
- the ability to collaborate with group tasks;
- the improvement and consolidation of attention and concentration during the Situation and in particular Classroom activities;
- school learning (transference), i.e. the development of executive functions using the "enriched environment" protocol in order to have a positive impact on school learning, or significant improvements in interim/final school assessments.

The same protocols regarding neuro-cognitive-motor activities were applied in the chosen schools of sundry regions of participating nations so as to provide comparable data for external evaluators (Faculty of Medicine of University of Padua, Complutense University of Madrid).

TESTS

Motor tests took into account the neurocognitive components present and biomechanical components commensurate with the age of the children. Accordingly, the "Somersault" and the "Castle" should be considered as being suitable tests for assessing chiefly cognitive-motor abilities, the one-leg balancing test is more specific, connected with Karate, while the Y test is more general. The flexibility test is to be considered as both general, assessing the general capabilities of the coxofemoral joints, and more specific.

The extremely important role assigned to regular school teachers covered not only general monitoring but also tasks pertaining to:

- **Monitoring of the socialisation/behaviour of children;**
- **Consolidation of school attention and learning;**
- **Interim assessments and final results.**

FINAL RESULTS/TESTS:

University of Padua

Cerebral cortex functions were found to be readily available for the 7/8 year age class, however a sedentary lifestyle imposes limitations on the body/effector.

Results were significant for the somersault, for which cognitive and coordination factors prevailed over the conditioning factor. An important role was played by coaches' expertise during practical activities.

There was general evidence of an improvement in executive functions.

It may be concluded that final tests showed a general improvement in general coordination abilities, the goal of the project.

University of Madrid

It may be concluded that the protocols drawn up for the Sport at School project were able to effectively stimulate, with just two hours of activity a week, the sensory-motor functions of the subjects involved in the project. There is clear evidence to suggest that Problem Solving, as a training method, connected with activities in an Enriched Environment, can bring about significant improvements in school learning skills.

It should be stressed that “difficult” children tended to benefit most from activities performed.

FINAL CONSIDERATIONS

The results obtained in the project allow us to conclude that the “Sport at School” project successfully showed that the training of the Federal coaches involved, undertaken in a relatively short time span, made it possible to perform in chosen schools very fruitful experimental activities in terms of collaboration between the Primary School and Sports Federations and the development of Executive Functions. These are complex abilities, marked by neurocognitive and motor activities, proposed to children living a sedentary lifestyle and often overweight. The improvement in specific motor abilities produced a significant improvement, with transference, also in the areas of “behaviour, attention and school learning”. The general improvement in the structuring of “Spacetime categories” was obtained through the performance of specific cognitive-motor exercises.

It may be surmised that the training of Federal coaches on these subjects might lead to an educational **Introduction to Sport** with a markedly social purpose. This may help to prevent forms of early specialisation that often lead to demotivation and early dropout.

In short, motor and sporting activity that can be proposed to children that is very alert to their educational needs, measured and ethically correct, and not oriented towards sporting performance.

FINAL REPORT FROM THE UNIVERSITY OF PADUA

Introduction

The Karate sport at school project was designed according to best-practice recommendations derived from research into teaching experiences that maximize opportunities for learning and success. It enhances cooperation between sport clubs and schools in order to increase the amount and quality of physical activity performed by children. It is suitable to be endorsed by local authorities, healthcare centers, private companies, etc. and therefore to be sustained by a local network of relevant stakeholders. The program aims not only at enhancing motor skills but at the harmonious development of children's body and personality. Secondary aims of the program include increasing the competency and skills of federal teachers/coaches, promoting the role and contribution of research in sport, and highlighting school teachers' expertise and training as an important consideration that can be analyzed and developed in future projects or initiatives. Evaluation of the program focused on two aspects:

- change in children behavior and learning abilities (level of attention, socialization with peers, etc.);
- change in children motor abilities (the focus of this report).

Procedure

The project involved 4 schools from each participating country. Schools were recruited from different regions with different characteristics in order to ensure a broadly representative sample. The project was implemented in one class per school (pupils aged 7-8 years) with a control class from the same school. Each partner was responsible for conducting the study in their own country. The experimental group (K group) carried out the "karate mind & movement" activities for 2-hours per week during school hours, throughout the academic year. The students in the control group (C group) followed their usual activities throughout the year.

The physical activities performed in the experimental group were conducted by trained technicians (Action 2.1 of the Erasmus+ protocol) in cooperation with school teachers. These activities were age-appropriate and included both theoretical and practical components. Specific equipment (sponge balls, tatami, etc.) to create the "enriched environment" was used. A preliminary test was conducted to assess children abilities and skills. Specific motor activities were

used with consideration of the individual pupils' varying levels of competency and ability to ensure inclusion.

Tests to evaluate motor performance designed by experts have been administered by federal technicians at two-time points (at baseline – October 2017 - and after 6-months of project – May 2018), while results have been analyzed by external university experts.

Participants

At baseline, a total of 688 pupils (mean age 8.1 ± 0.4 years) from 5 Countries participated in the study and were randomized into an experimental group (Karate group *n*= 353) or a control group (*n*=335). Distribution of participants in the intervention and control groups by city is shown in Table 1.

Table 1. City-based distribution of participants that commenced the intervention.

		Karate Group	**Control Group**	**Tot**
Germany	Bremen	22	17	39
Portugal	Braga	18	20	38
	Vila Franca	26	26	52
	Trofa	18	26	44
	Faro	23	19	42
Spain	Alcalà	18	19	37
	Campanillas	21	19	40
	Arnedo	26	28	54
	Palencia	13	12	25
Poland	Poznan	18	9	27
	Szczecin	20	20	40
	Elblag	15	13	28
	Lodz	24	17	41
France	Paris	24	24	48
	Locon	21	22	43
	Orleans	22	22	44
	Bousse	24	22	46
Total		**353**	**335**	**688**

Measures

Participants in both the experimental and control groups took part in two evaluation sessions (pre and post intervention) consisting of five fitness tests. The tests were selected in order to evaluate general coordination, karate-specific coordination, balance and flexibility. Below is a detailed description of each test.

Y Balance test

In the Y-balance test (Kinzey & Armstrong, 1998) the child stands on one leg in the center of a grid (Figure 1), with the most distal aspect of the great toe at the starting line. While maintaining a single-leg stance, the subject is asked to reach with the free limb in the anterior, posteromedial, and posterolateral directions in relation to the stance foot (Figure 1). The maximal reach distance is registered, corresponding to the point where the most distal part of the foot reached. The test is considered null when the subject:

a) fails to maintain unilateral stance,
b) lifts or moves the stance foot from the grid,
c) touches down with the reach foot, or
d) fails to return the reach foot to the starting position.

The process should be repeated while standing on the other leg. The greatest of 3 trials for each reach direction is used for analysis of the reach distance in each direction. In addition, the greatest reach distance from each direction is summed to yield a composite reach distance for analysis of the overall performance on the test, having in this way a total Y-right and a total Y-left leg score.

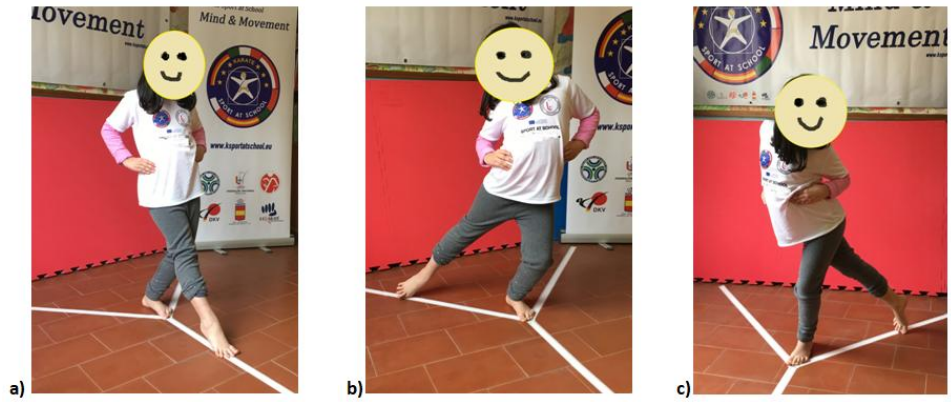


Figure 1. Y-Balance test execution: a) anterior reach; b) posteromedial reach; c) posterolateral reach.

Castle test

The Castle test evaluates the rapidity and reaction of inferior limbs muscles; however, the result of this test is also influenced by the coordinative ability of the subject.

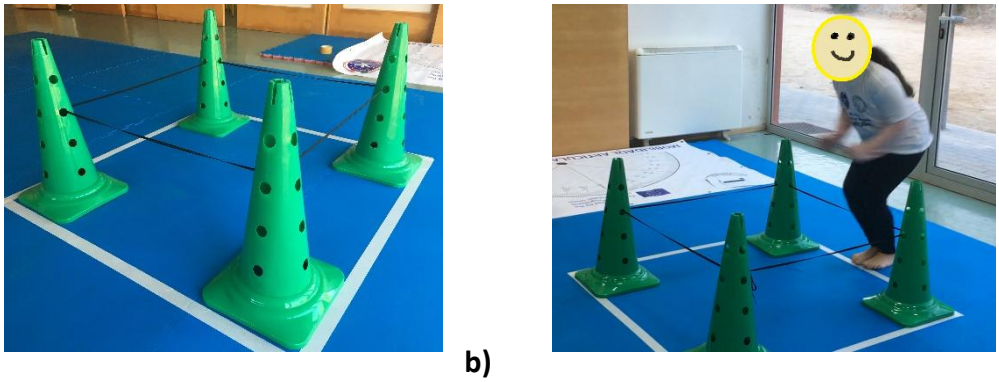
The Castle test consists of six, feet together jumps inside-out of a square (the castle) with sides of 80cm length and a rope positioned at 30cm high from the ground (Figure 2). The subject is asked not to use their arms to help the jumps and to perform three repetitions. The time registered in each repetition corresponds to the score, and the best of the three trials is considered as final score.

The test is considered null, thus reporting a score of 0, when the subject:

a) uses arms to help the jumps,

b) jumps more than 6 times, adjustment jumps are not allowed,

c) jumps without keeping their feet together.



a) **b)**

Figure 2. Castle test structure (a) and execution (b).

Frontal split test

The Frontal Split test measures the flexibility of the hip joints. It is executed with the subject seated on the ground, their back vertical and against a wall, with legs stretched apart. This test measures the maximal frontal split in angle degrees (Figure 3), and it should be executed once.

Figure 3. Frontal split test execution.

Somersault test

The Somersault test evaluates the overall motor control ability and coordination of the subject that is asked to perform a somersault on a mat.

The Somersault test is evaluated using three parameters:

a) Stiff legs: 1= not ok and 2= ok.
b) Contemporary feet arrival: 1= not ok and 2= ok.
c) Stand up arrival: 1= not ok and 2= ok.

The test is null if participants can't perform a somersault, and the score is recorded as 0. If performed, it can reach a final value of between 3 and 6 by summing up the scores on the three parameters. The test is performed three times and the final total score is the average of the three trials.

Frontal Kick preparation test

The Frontal Kick preparation test (FKP) is useful in evaluating specific coordination ability. The participant is asked to stand with their feet together with arms alongside the body. It consists of flexing each one of the legs until reaching a 90° angle at the hip joint and maintaining the position for at least 5 seconds (Figure 4). The test is executed three times per leg, and the ground foot should be kept stationary.

The Frontal Kick preparation test is evaluated on three parameters:

a) Ground foot stationary: 1= not ok and 2= ok.

b) The thigh is parallel to ground: 1= not ok and 2= ok.

c) The trunk is vertical: 1= not ok and 2= ok.

For each leg, the FKP test can reach a final value of between 3 and 6 if performed. The test is null when the participant loses balance within the first 5 seconds of testing and touches the floor with the suspended leg in which case the score is recorded as 0.

Figure 4. Frontal Kick preparation test execution.

Results

Country-based participants distribution by gender and group is reported in Table 2, the descriptive statistics of all the motor tests for the Karate and the Control groups at baseline are reported in Table 3. Only participants with complete baseline data are reported.

Table 2. Country-based distribution of participants' gender.

	Karate Group			**Control Group**		
	Boys	**Girls**	**Tot**	**Boys**	**Girls**	**Tot**
Germany	10	12	22	6	11	17
Portugal	32	30	62	56	35	91
Spain	33	45	78	37	41	78
Poland	48	29	77	31	27	58
France	43	48	91	43	47	90
Total	**166**	**164**	**330**	**173**	**161**	**334**

Table 3. Descriptive statistics and independent samples *t*-test results for each assessment at baseline for the two groups.

	Karate Group M ± SD (*n*)	**Control Group** M ± SD (*n*)	***t***	***p***
Y balance anterior reach (right leg)	43.4 ± 10.8(*325*)	41.5 ± 16.5 (*325*)	1.806	n.s.
Y balance posteromedial reach (right leg)	50.5 ± 15.1 (*326*)	50.1 ± 18.9 (*325*)	0.255	n.s.
Y balance posterolateral reach (right leg)	45.3 ± 16.1 (*325*)	43.0 ± 20.2 (*325*)	1.583	n.s.
Y-Right (composite score)	139.3 ± 36.5 (*325*)	134.6 ± 47.9 (*325*)	1.418	n.s.
Y balance anterior reach (left leg)	45.0 ± 10.6 (*325*)	42.9 ± 16.7 (*325*)	1.923	n.s.
Y balance posteromedial reach	52.9 ± 12.5 (*325*)	49.9 ± 20.1 (*325*)	2.273	**0.02**

(left leg)				
Y balance posterolateral reach (right leg)	46.7 ± 14.4 (*325*)	43.9 ± 20.8 (*325*)	2.024	**0.04**
Y-Left (composite score)	144.7 ± 31.7 (*325*)	136.7 ± 49.1 (*325*)	2.447	**0.02**
Castle test	7.8 ± 4.4 (*327*)	8.0 ± 5.0 (*326*)	-0.652	n.s.
Frontal split test	119.7 ± 17.4 (*327*)	126.4 ± 64.6 (*328*)	-1.837	n.s.
Somersault test	3.3 ± 1.6 (*326*)	3.3 ± 1.5 (*328*)	-0.220	n.s.
Frontal kick preparation test right leg	4.5 ± 1.4 (*327*)	4.7 ± 1.1 (*326*)	-2.341	**0.02**
Frontal kick preparation test left leg	4.5 ± 1.4 (*327*)	4.5 ± 1.2 (*327*)	-0.401	n.s.

Note. M = Mean value; SD = Standard deviation; (*n*) = number of participants; *t* = *t* value at independent sample *t* test; *p* = *p* value, significance level has been established at *p*<.05; n.s. = not significant.

As per results highlighted in Table 3, the Karate and the Control group reported some significant differences at baseline, namely in the Frontal kick preparation test (right leg) and the Y-Balance test posteromedial, posterolateral reach, and total score for the left leg. For this reason, analyses of the differences between groups in the post-intervention measure have been conducted via ANCOVAs, adjusting for baseline values (Vickers & Altman, 2001). Results are reported in Table 4.

Table 4. Descriptive statistics and ANCOVA results for each assessment at post-intervention for the two groups.

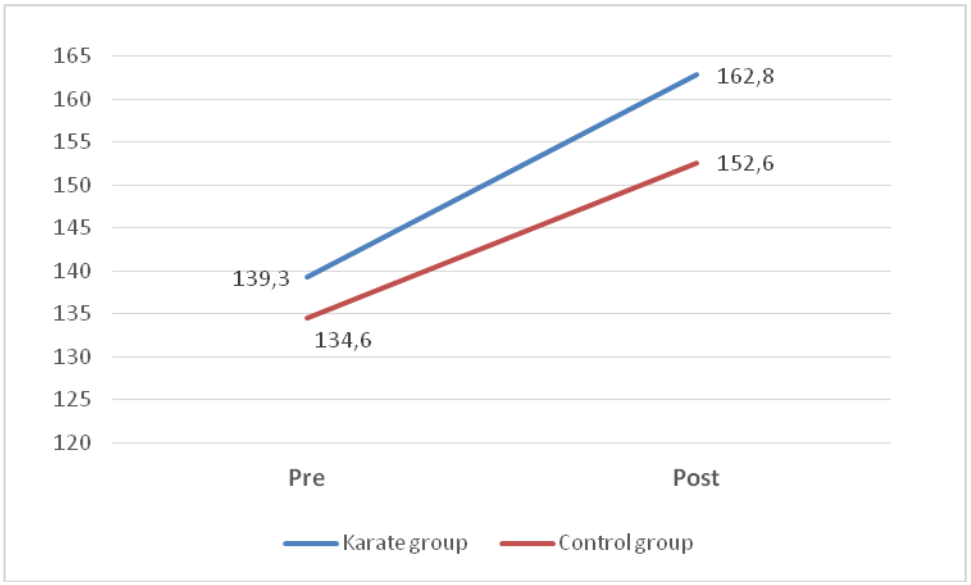
	Karate Group **M ± SD (*n*)**	**Control Group** **M ± SD (*n*)**	***F***	***p***
Y balance anterior reach (right leg)	50.1 ± 7.6 (*320*)	48.4 ± 12.0 (*302*)	6.8	.01
Y balance posteromedial reach (right leg)	56.8 ± 12.7 (*320*)	52.5 ± 15.9 (*302*)	30.9	<.001

Y balance posterolateral reach (right leg)	55.9 ± 13.2 (*320*)	51.6 ± 15.1 (*302*)	13.2	<.001
Y-Right (composite score)	162.8 ± 28.5 (*320*)	152.6 ± 36.8 (*302*)	26.8	<.001
Y balance anterior reach (left leg)	50.6 ± 8.1 (*320*)	49.9 ± 11.0 (*302*)	.01	n.s.
Y balance posteromedial reach (left leg)	57.8 ± 11.3 (*320*)	52.8 ± 16.0 (*302*)	23.7	<.001
Y balance posterolateral reach (right leg)	57.1 ± 11.3 (*320*)	51.8 ± 15.0 (*302*)	24.1	<.001
Y-Left (composite score)	165.5 ± 25.5 (*320*)	154.6 ± 36.0 (*302*)	21.9	<.001
Castle test	7.7 ± 4.3 (*320*)	7.5 ± 4.6 (*303*)	0.8	n.s.
Frontal split test	125.9 ± 15.9 (*320*)	123.3 ± 17.2 (*305*)	6.2	.013
Somersault test	5.0 ± 1.3 (*320*)	4.0 ± 1.4 (*302*)	99.0	<.001
Frontal kick preparation test right leg	5.4 ± 0.9 (*321*)	4.8 ± 1.4 (*303*)	56.8	<.001
Frontal kick preparation test left leg	5.3 ± 0.9 (*321*)	4.8 ± 1.3 (*304*)	45.3	<.001

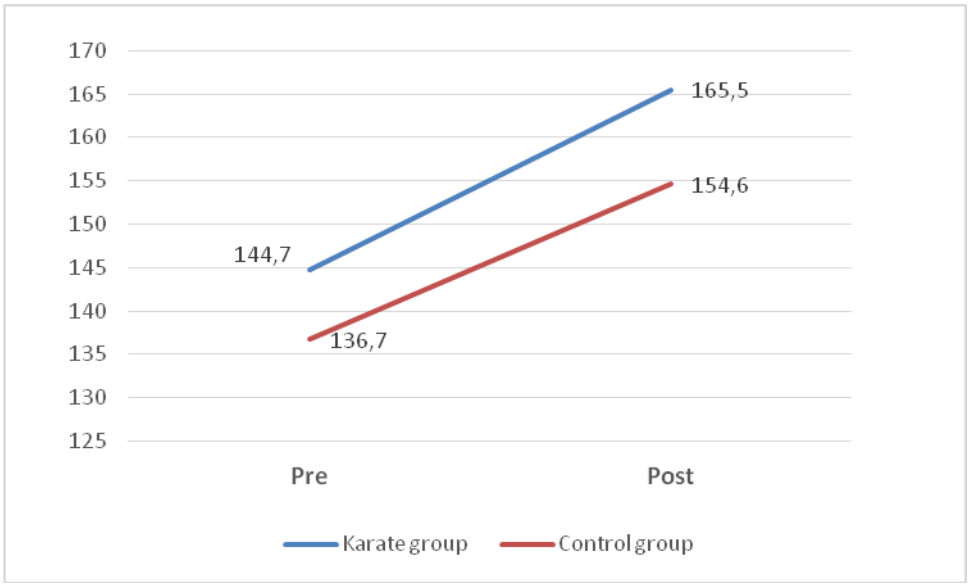
Note. M = Mean value; SD = Standard deviation; (*n*) = number of participants; *F* = *F* index of ANCOVA analysis; *p* = *p* value, significance level has been established at *p*<.05; n.s. = not significant.

In the following graphs, representations of the pre-post variations in the Karate and the Control group are reported (Graph 1 to 7).

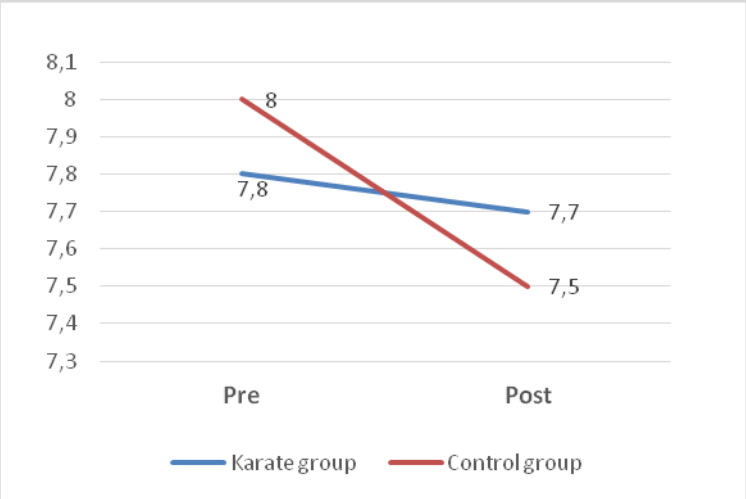
Graph 1. Pre-post-intervention variations of Y balance test composite score for right leg, for both the groups.



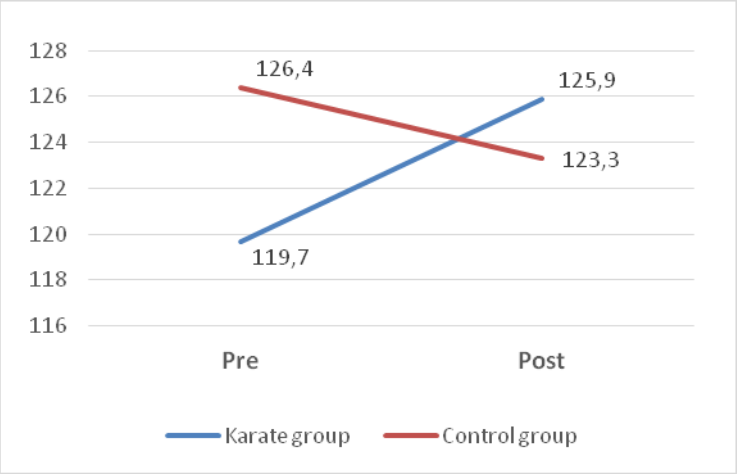
Graph 2. Pre-post-intervention variations of Y balance test composite score for left leg, for both the groups.



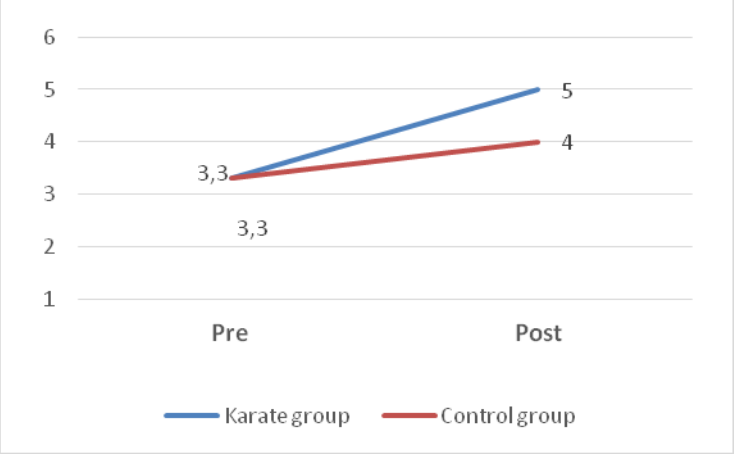
Graph 3. Pre-post-intervention variations of Castle test for both the groups.



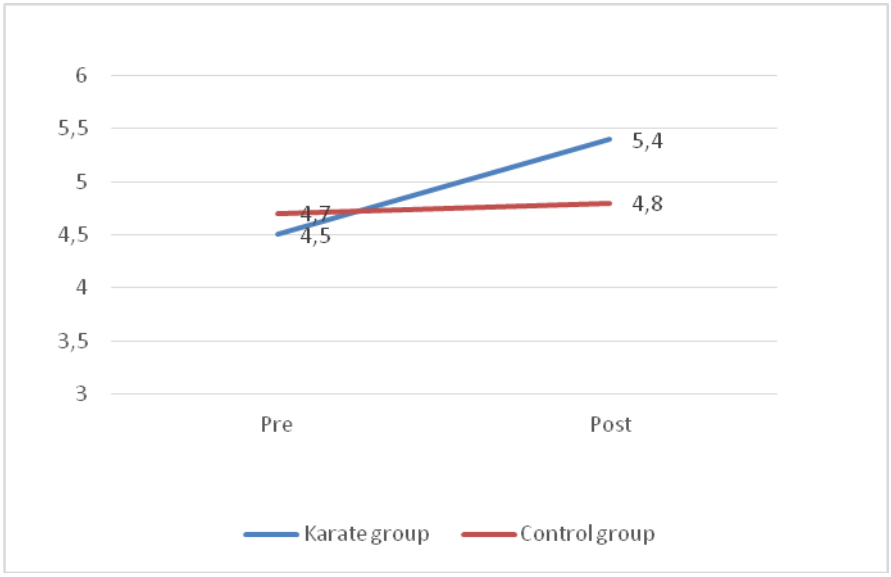
Graph 4. Pre-post-intervention variations of Frontal Split test for both the groups.



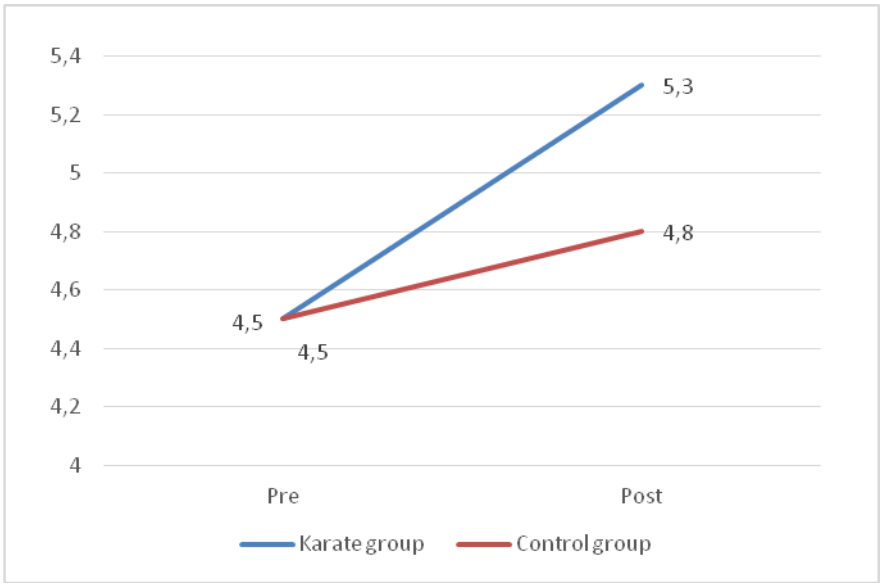
Graph 5. Pre-post-intervention variations of Somersault test for both the groups.



Graph 6. Pre-post-intervention variations of Frontal Kick preparation test for right leg for both the groups.



Graph 7. Pre-post-intervention variations of Frontal Kick preparation test for left leg for both the groups.



In Table 5, mean percentage change and the associated effect size are reported for each assessment with significant differences between groups at post intervention only.

Table 5. Mean percentage changes of the significant tests at post-intervention and associated effect sizes of the differences between groups.

	Karate Group Mean % change	**Control Goup** Mean % change	η^2
Y balance anterior reach (right leg)	15.4%	12.2%	.011
Y balance posteromedial reach (right leg)	10.0%	3.2%	.048
Y balance posterolateral reach (right leg)	25.2%	19.0%	.021
Y-Right (composite score)	20.5%	15.2%	.041
Y balance posteromedial reach (left leg)	9.3%	1.3%	.037
Y balance posterolateral reach (right leg)	24.3%	13.2%	.037
Y-Left (composite score)	19.0%	15.4%	.034
Frontal split test	8.3%	-0.8%	.01
Somersault test	60.3%	28.4%	.138
Frontal kick preparation test right leg	26.9%	4.9%	.084
Frontal kick preparation test left leg	26.2%	10.6%	.068

Note. M = Mean value; SD = Standard deviation.

The Karate group reported moderate effects (highlighted in yellow) in improvements on Y balance test posteromedial reach and composite score for the right leg; and on frontal kick preparation test of both the legs. Strong effect size (highlighted in green) was reported on Somersault test (η^2

= .138) with a mean percentage increment of 60.3% in comparison to that of the control group of 28.4%. Weak effects were reported for all the other outcomes' improvements in the Karate group.

The study reports also some limitations. One in particular impacting in the interpretation of the significant difference found in the somersault test. Somersault is a complex movement that has been taught to children in the karate group by the technicians involved in the project. The control group were not exposed to physical education lessons taught by qualified teachers, in fact in primary schools in Europe generalist teachers teach also physical education. Maybe the teachers of the control group did not have the specific competences to teach the somersault to children, and the registered improvement in the karate group should be attributed to the level of expertise of the coaches in addition to the specific project contents.

Discussion

After the intervention period, participants in the Karate group reported significantly higher values in the post test evaluations in comparison to the Control group in all the motor tests, with exception of the Castle test and the Y balance anterior reach for the left leg where no differences were detected. The findings support the fact that Karate sport at school project is effective in improving motor abilities of children aged 7-9 years. In particular, a strong effect was reported for Somersault test with an average improvement of 60.3% among the experimental group. Therefore, the intervention seems particularly effective in improving general coordination.

Karate sport at school project seems particularly effective in improving specific coordination, balance and also overall coordination of children. Improving general coordination of 7-9 years old children is very important. Apart from the physical domain in which the reported results can have an impact, the importance of motor competence on the psychosocial lives of children has been recognized in the literature (Piek, Baynam, & Barrett, 2006; Skinner & Piek, 2001). Children with higher coordination abilities generally perceived themselves as more competent in several domains, with higher self-worth and lower levels of anxiety and depression than children with coordination problems. The Karate sport at school project showed promising results on motor coordination with far-reaching implications for social and emotional functioning of children. It can be predicted that this would have broad implications on the development of the coordinated child's self-perceptions extending beyond the athletic domain.

Adding to this, scientific literature reported that age appropriate balance and motor coordination contributes to an amount of benefits for the child's general health (Lopes, Rodrigues, Maia, & Malina, 2011; Lopes, Santos, Pereira, & Lopes, 2013; Lopes, Stodden, Bianchi, Maia, & Rodrigues, 2012), in particular it allows the child to:

- be involved in physical activity and sports participation;
- perform fluid body movements;
- limit the energy required to do a specific movement thus minimizing sense of fatigue;
- experience less likelihood of injury, because he/she will be ready to have appropriate postural control and responses when needed;
- maintain self-regulation in daily tasks;
- develop a social network, also determined by a sustained participation in sport activities;
- achieve a sense of belonging in a community or social setting, thus resulting in a more harmonious development.

Lastly, in the last Eurobarometer report on physical activity among European citizens, it has been reported that nearly half of Europeans (46%) never exercise or play sport, and the proportion has increased gradually in recent years (Eurobarometer, 2018). Projects like Karate sport at school, addressing children's need of movement and development of motor abilities, are fundamental to counteract the trend reported in the Eurobarometer report. Starting from early childhood to educate to healthy and active behaviors, improving motor competencies necessary to successfully participating in sports, could sustain the adoption of active behavior also during adulthood, thus impacting on population's general health (Boreham & Riddoch, 2001).

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BEHAVIOURAL AND COGNITIVE EVALUATION OF THE *SPORT AT SCHOOL* PROJECT:

Complutense University of Madrid

1. INTRODUCTION

This project has been funded with support from the European Commission in the framework of the Erasmus+ Programme. This document reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Sedentary lifestyle and physical inactivity have increased in recent decades. In fact, according to World Health Organization (WHO) in 2006, two-thirds of the European population is physically inactive. This physical inactivity is the fourth death risk factor in the world (WHO, 2010). It is also known to be related to health problems, such as coronary and cardiovascular diseases, hypertension, high blood pressure, heart disease, low back pain, increased of blood lipid profile, diabetes, obesity, cancer, dementia, stress, anxiety and depression (Blair, 2009; Lee, et al., 2012; De Pinho & Petroski, 1999). Thus, WHO (2010) recommends at least 60 minutes of moderate to vigorous daily physical activity for children and adolescents.

Moreover, studies have shown how physical activity has social, physical and psychological benefits. In fact, due to neurosciences research, in recent years a great deal has been written about the relationship between exercise and cognition. It has been shown that physical activity improves academic achievement (Booth et al., 2013), mental health (Doré, O'Loughlin, Beauchamp, Martineau & Fournier, 2016) and behaviour (Ussher, Owen, Cook, Whincup, 2007).

The evidence from this literature suggests that the “mind & movement” karate intervention carried out in *Sport at School* project would be able to have positive effects on students’ learning, mental health and behaviour. Therefore, the Complutense University of Madrid's team is in charge of analyzing children's behavior and learning abilities from the *Sport at School* project.

The objectives of the project belonging to the evaluation from Complutense University, its procedure, participants, evaluation moments, assessment tools and results will be presented below.

2. OBJECTIVES

Given the scientific evidence the main objective is to know the effect of an intervention based on karate basic motor skills on children's cognitive performance. Thus, the specific aims of this project are:

- To analyse if a karate intervention oriented to motor intelligence during a school year influences students' mental health.
- To identify the effect of the karate mind and movement program on children academic achievement.
- To discover if a karate intervention during a school year influences children's behavior related to emotional symptoms, conduct problems, hyperactivity/inattention and peer relationship problems.

3. PROCEDURE

Taking into account the objectives set out in the preceding section, a longitudinal-synchronous research with experimental design was carried out, since the results of the Karate *Mind and Movement* program were measured in the *Sport at School* project during a school year on a stratified random sample, establishing cause and effect relationships.

Sport at School is a project co-funded by the European Union in which 21 schools from Germany, France, Spain, Poland and Portugal participate. These schools were selected based on a homogeneous distribution of each country in terms of location and including state and private centers from the north, south, coast and inland. Likewise, a control and experimental group was randomly assigned in each school, having the participants similar characteristics regarding age, gender and number of pupils.

The Karate *Mind and Movement* program was implemented in 21 European schools by 20 karate black belt technicians who received specific training from the program in cooperation with school teachers. The activities from this program were age-appropriate and they included both theoretical and practical components.

These activities were carried out with the students of the Primary Education second year from the experimental group during two hours per week in 2017-2018 academic years. In contrast, the control group continued with their habitual classes.

Prior to the intervention, once the objectives and methodology were known, a search of validated, reliable and translated instruments in the language of the five participating countries was made, taking into account that they could be done from afar and the entire group-class at the same time . Subsequently, the evaluation procedure, the assessment tools and all the evaluation documentation required were explained to the technicians in an Italian meeting. In the same way, all the technicians and presidents received by mail a document in which all these aspects were thoroughly explained. Also, taking into account the diversity of the project languages, the technicians reviewed the translation of all the documents necessary to carry out the Complutense University evaluation at the beginning, in the middle and at the end of the intervention. Before the Karate *Mind and Movement* program, all the schools received specific equipment to implement the program and the technicians sent the list of possible participants to assign them a code used in the collection of the data throughout all the intervention. Afterwards, the management team from each school and the technicians summoned the parents and the students to a meeting where the project was explained with its evaluation instruments and the confidentiality of the data.

4. PARTICIPANTS

688 students (mean age 8.1 ± 0.4 years) from Primary Education second year participated in the study and were randomized into an experimental group (Karate group n= 353) or a control group (n=335). They were from 5 different European countries: Poland (Poznań, Szczecin, Elbląg and Łódź), Spain (Alcalá de Henares, Campanillas, Arnedo and Palencia), Portugal (Braga, Vila Franca De Xira, Trofa and Faro), France (Paris, Locon, Essars, Orlèans and Bousse) and Germany (Börnecke, Bremen, Rhauderfehn and Hude).

5. EVALUATION MOMENTS

The participants were evaluated in three moments:

- <u>At the beginning of the course (Test 1):</u> The first evaluation started the first few weeks of the 2017-2018 academic year, corresponding to September.

- In the middle of the course (Test 2): This evaluation moment began the third and fourth weeks after the Christmas holiday, corresponding to the end of January or the early February.
- At the end of the course (Test 3): This evaluation started was held during the last month of the 2017-2018 academic years. Depending on the country, this moment corresponded to May, June and even the early July.

6. ASSESSMENT TOOLS AND OTHER PROJECT EVALUATION PROCEDURES

In this section, the evaluation tools and other evaluation procedures will be explained attending on the person who complete them.

6.1. Technicians:

Technicians completed the following documents:

- List of possible participants document: Technicians sent to the researchers the "List of possible participants" document (see Annex 1) with the name, surname and gender of the students. Later on, taking into account the Data Protection Laws, Complutense University researchers returned the document assigning a code to each child according to the following criteria:

    - *000+list number:* All codes will start with 000.Then 1, 2, 3, etc. were written according to the order in which the technician wrote the student's name on the list.
    - *Country:* after 000+list number, the country's initials were written. Spain: S / Portugal: POR / Germany: G / France: F / Poland: POL
    - *City:* after 000+list number + country initials, the city's number were written. Börnecke (Harz): 01 / Bremen: 02 / Rhauderfehn: 03 / Hude: 04 / Braga: 05 / Vila Franca De Xira: 06 / Trofa: 07 / Faro: 08 / Alcalá de Henares: 09 / Campanillas: 10 / Arnedo: 11 / Palencia: 12 / Poznań: 13 / Szczecin: 14 / Elbląg: 15 / Łódź: 16 / Paris: 17 / Locon and Essars: 18 / Orlèans: 19 / Bousse: 20.
    - *Gender:* after 000 + list number + country initials + city initials, 1 was written if the child is a woman and 2 if the student is a man.
    - 000: after 000 + list number + country initials + city + gender, 000 were written again.

- Student information document: At the beginning of the karate Mind and Movement programme, technicians sent the “Student information” document (see Annex 2) to the Complutense's team with all the students' group (karate or control), name, surname, age, gender, health problem, learning disorder and participation.

- Attendance document: Technicians recorded the K group attendance every day that children do the karate mind and movement activities. The technicians wrote in the “Attendance” document (see Annex 3) if each child has attended to class and done the activities, indicating the date. This document was completed throughout the academic year and sent it in the three evaluation moments.

Furthermore, technicians obtained the following assessment tools:

- School marks tool: Grades are often used in numerous scientific studies to assess the participants academic performance (Kyan, Takakura & Miyagi, 2018; Marques, Santos, Hillman & Sardinha, 2018). Thus, in order to evaluate the academic achievement, the technicians with sent to the researchers the final evaluation document from the previous course (2016-2017) that will be provided by the school teachers/administrators. The marks of all the students who took part on the Sport at school project were sent as accurate as possible according to the country specifications (report, numerical grades, etc.). The same process was followed at Christmas period, at Easter period and at the end of the 2017-2018 academic course.

  Moreover, in order to unify the scores of all countries, technicians sent a document called “Grades”(see Annex 4) to the Complutense's researchers. In this document, numerical marks in all the subjects were requested keeping in mind all students who participate in Sport at School project, both karate and control group. The numerical grades were range from 0 (lowest score) to 10 (highest score), with the possibility of adding up to two decimal places (e.g. 8.75). These numerical grades were provided for each subject with the help of the school's teachers.

  It has to be pointed out that to carry out the evaluation 5 groups of subjects were created: Maths, Mother Tongue (Spanish, French, Portuguese, Polish and German), Sciences (Natural Sciences, Social Sciences, Geography, History and Sciences), Arts (Arts and Crafts,

Music and Theater) and Foreign Language (English, German, Arabic, Turk, Rumanian, Russian and Bulgarian).

- Body Mass Index The technicians measured the Body Mass Index (BMI) that is a person's weight in kilograms divided by the square of height in meters. Thus, all students were measured and weighed following these instructions:

    - *Weight*

      Children's weight were calculated before the school break as long as the children have not eaten anything before. In addition, before measuring them, students were allowed to go to the toilet. Moreover, the day before technicians asked students to bring light clothes.

      To calculate the weight of the children, technicians used a scale that measured it as accurately as possible. This scale were placed on a flat, horizontal and firm surface. Before getting on the scale, children removed their shoes, sweatshirt and jackets. Also, they took everything they had in their pockets. No child was measured with a schoolbag, bag, toys, school supplies, caps, or any weight-bearing material.

      When the scale was placed, the child step on to it, standing in the middle with the heels together and the tips separated. The child couldn't move to avoid oscillations in weight.

    - *Height*

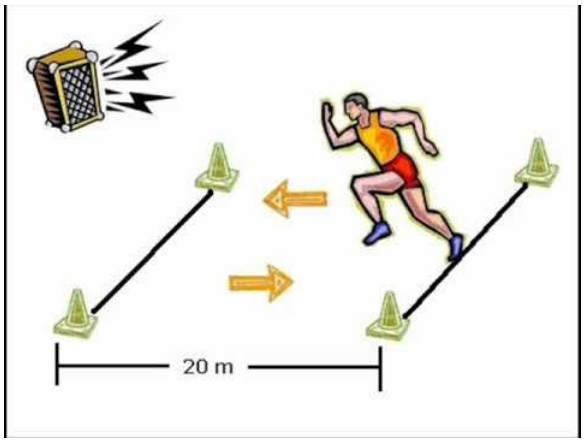
      Technicians placed the tape measure on the wall perpendicular to the floor. For this, a framing square helped them. Technicians made sure that the first measurement line at ground level was 0.0 cm. Then, technicians stuck the 2 meters tape measure to the wall with adhesive tape.

      Children were asked to removed their shoes, headbands, hair clips, caps and any element over their heads. They stood with their head, shoulders, hips and heels together glued to the wall under the tape measure. The arms hung freely and

naturally to the sides of the body. The head had to stand firm, looking at a fixed point. The legs were straight, the heels together and the tips separated by a 45º angle. Children were not be able to stand on tiptoe. Finally, a square or a ruler was positioned perpendicular to the wall at the highest point of the child's head to determine the height as accurate as possible. Technicians wrote down all the information in the “20 meter shuttle run test and BMI” document.

-20 meter shuttle run test is a commonly used test This maximal running aerobic fitness test and it measures the maximum oxygen uptake (Lang, 2018; Bandyopadhyay, 2013). The test involves continuous running between two lines 20m apart in time to recorded beeps. The participants stand behind one of the lines facing the second line, and begin running when instructed by the recording. The speed at the start should be quite slow. The subject continue running between the two lines, turning when signaled by the recorded beeps. After about one minute, a sound indicates an increase in speed, and the beeps will be closer together. This continues each minute (level). If the line is reached before the beep sounds, the student must wait until the beep sounds before continuing. If the line is not reached before the beep sounds, the child is given a warning and must continue running to the line, then turn and try to catch up with the pace within two more ‘beeps’. The child completes the test when he does not reach the line (approximately 2 meters from the distance) for two consecutive ends after the first warning.



The students’ score is the level and half level reached before they were unable to keep up with the recording. The beep test audio tell the levels in which the children are. So, students remember this number and give it to the technician, who write it

down on the recording sheet. The technician is aware when children have not come twice to the line to remove it from the test and add their score.

Before the test: technicians made sure they have:

- *A flat non-slip surface.* Students cannot slip during the test.
- *Chalks or adhesive tape with different color from the floor.* These materials were necessary to limit the test lines. These lines had to be in parallel separated by 20 meters. If the sports facility already had these lines separated by 20 meters, it was not necessary to mark them again with chalks or adhesive tape. These lines were easily seen by the students during the test.
- *Measuring tape.* The tape measure was long enough to ensure objective measurement of 20 meters.
- *Electronic equipment that allows the beep test audio reproduction.* The music player had a loud volume enough that allowed the students hear properly the beeps of the test within the 20 meters of the limited lines.
- *Beep test audio.* After explaining to the students the test procedure and ensuring that the students had understood the rules, the technician reproduced the beep test audio sent by researchers from Complutense University.
- *Recording sheet:* Technicians noted the stage in which each student finished on the recording sheet. Researchers sent it to the technician by mail too.

The 20 meter shuttle run test's day the technicians explained to the pupils that the class consisted only of the explanation and implementation of this test although they could schedule other physical or cognitive activities when the test is over. It is important to avoid students do not know it in order to make their best efforts in the test.

In a schools with projectors technicians shown to the children one video to explain how to do the test. It was very important to encourage students to get a higher score. Also, technicians explained the children that the time between the lines would gradually decreasing, forcing them to increase their speed in order to reach the next line. They would also be reminded of the importance of reaching the line.

During the test: The technician was aware when children had not come twice to the line to remove it from the test. Students remembered the last number said by the beep test audio (last level) and the technician wrote down the final scores on the recording sheet called “20 meter shuttle run test and BMI”.

6.2. Parents

Parents completed a questionnaire in the school's computer room or at home with their technological devices in the three evaluation moments. At the beginning of the course they filled out the informed consent and the first questionnaire composed by three parts (see Annex 3):

- General questions: name of the school, child's date of birth, gender, health problem and learning problem.
- Short Questionnaire Rotation A (SQR-A), belonging to the World Health Survey 2002 from the World Health Organization. This questionnaire has been translated and validated in more than 70 countries (Salk, Hyde & Abramson, 2017; Stubbs, Koyanagi, Hallgren, Firth & Richards, 2017). For this questionnaire, 5 items related to race, parents education and jobs were selected.
- Strengths and Difficulties Questionnaire (SDQ). This questionnaire has been translated and validated in more than 80 languages (Ortuno-Sierra, Aritio-Solana & Fonseca-Pedrero, 2017; Becker, Rothenberger & Sohn, 2015) It is a brief behavioural questionnaire from 2 to 18 years old with different versions. For the *Sport at School* project, the parents version of 4-17 years old was chosen. This tests evaluates the children total difficulties based on 4 scales (5 item per scale): emotional symptoms, conduct problems, hyperactivity / inattention and peer relationships problems. Also, this test has an impact supplement related to if parents think the child has a problem, and if so, enquire further about distress, social impairment, and burden to others.

However, in the middle and at the end of the course parents will complete just the health and learning problems from the general questions, SQR-A and SDQ.

Before completing the questionnaire, technicians explain the questionnaire to the parents, solving any doubt. At that time parents were encouraged to reply as sincerely as possible because research needs the data to guarantee the quality of the results and the effectiveness of the

project. It must be remembered that processing of information is anonymous and all the data will be coded. According to Data Protection personal data of participants will not be revealed. Before starting the test, the technician gave to each parent their child's code in writing form.

6.3. Children

- Physical activity questionnaire. This is a self-administered, 7-day recall assessment tool. It was developed to assess general levels of physical activity and it has been validated and used in several investigations (Janz, Lutuchy, Wenthe & Levy, 2008; Silva & Malina, 2000). This is compound by 10 items scoring the following scales: spare time activity, moderate to vigorous physical activity at physical education, recess, lunch, right after school, evening and weekends, the mean physical activity of all days of the week and unusual activity during the previous week.

The children version of 7 to 14 years old was completed in the three evaluation moments. Students completed this questionnaire (see Annex 6) in the school's computer room. Before completing the questionnaire, technicians explain it to the children, solving any doubt. At that time children were encouraged to reply as sincerely as possible, remembering them that this test is not an exam and it does not influence in their evaluation. Also, technicians gave to the children their participant codes. If a child is missed the class that day, he/ she retook the test another day in the computer room.

7. RESULTS

Taking into account the objectives from the *Sport at School* programme and using the data collected from the evaluation tools, the inferential and descriptive statistics was made using SPSS and EXCEL software.

In order to know the effect of the programme on the total difficulties assessed by the total score from the SDQ, an analysis of repeated measures was made with the inter-subject variable "group" with 2 levels: "control" and "karate: mind & movement" and the intra-subject variable "difficulties" with 3 levels: "test 1", "test 2" and "test 3".

These results showed (F = 2,565, p = 0.087) a major tendency to decrease the total difficulties in the karate group against the control groups, as it is exposed in the figure below.

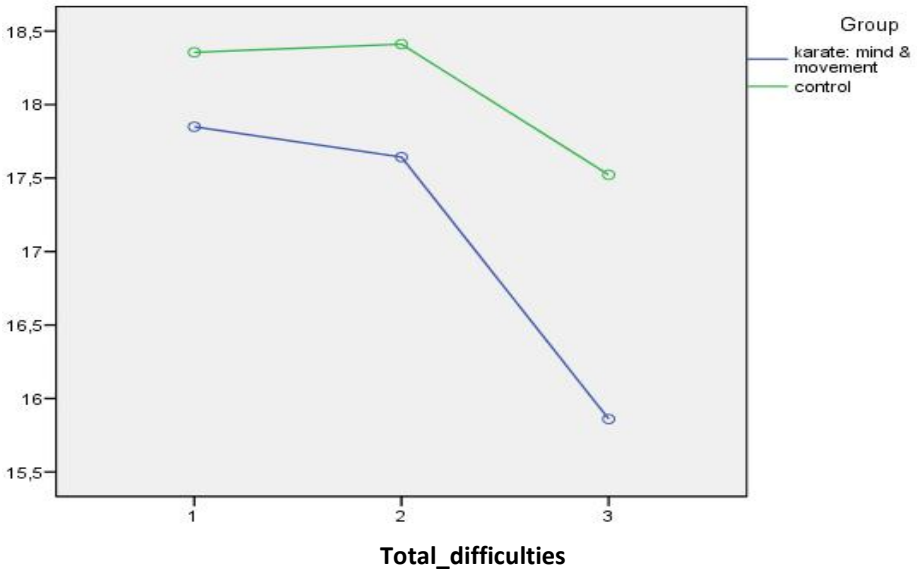


Figure 1: marginal measures estimated for the variable total difficulties in the 3 moments of evaluation.

Specifying on the SDQ total score scales, the results were not significant for emotional symptoms (F = 1,008, p = 0,635), neither for hyperactivity / inattention (F = 0,589, p = 0,549) and peer relationship problems (F = 0,536, p = 0.464). However, the conduct problems scales presented significant differences (F=4,437, p=0,013) in support of the karate *Mind and Movement* group.

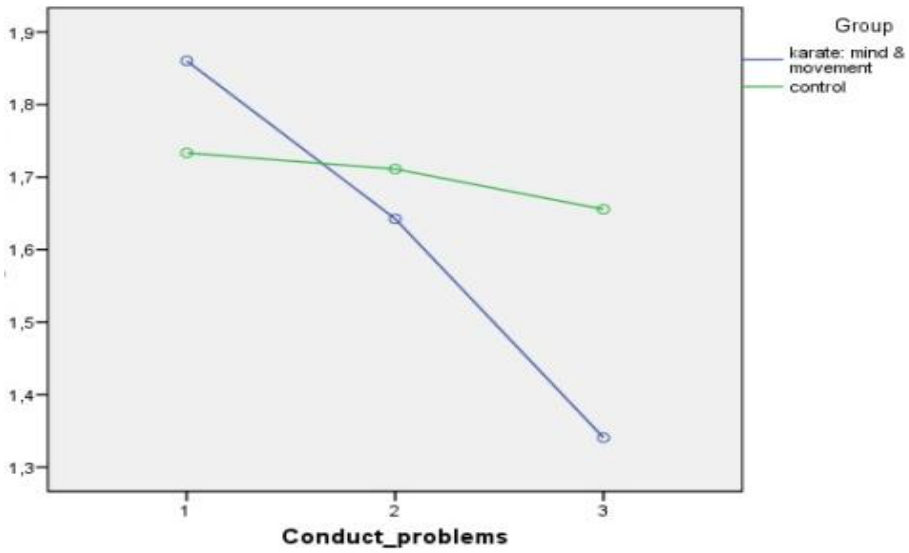


Figure 2: marginal measures estimated for the variable conduct problems in the 3 moments of evaluation.

On the other hand, taking into account that some children cannot present the difficulties evaluated with the SDQ, we proceeded to search also among the most problematic children (more than 17 in total difficulties score) to know if the effect of the program was greater. In this way, the results showed (F = 3.149, p = 0.052) that reaching the level of significance required, the experimental group improves with respect to the control group.

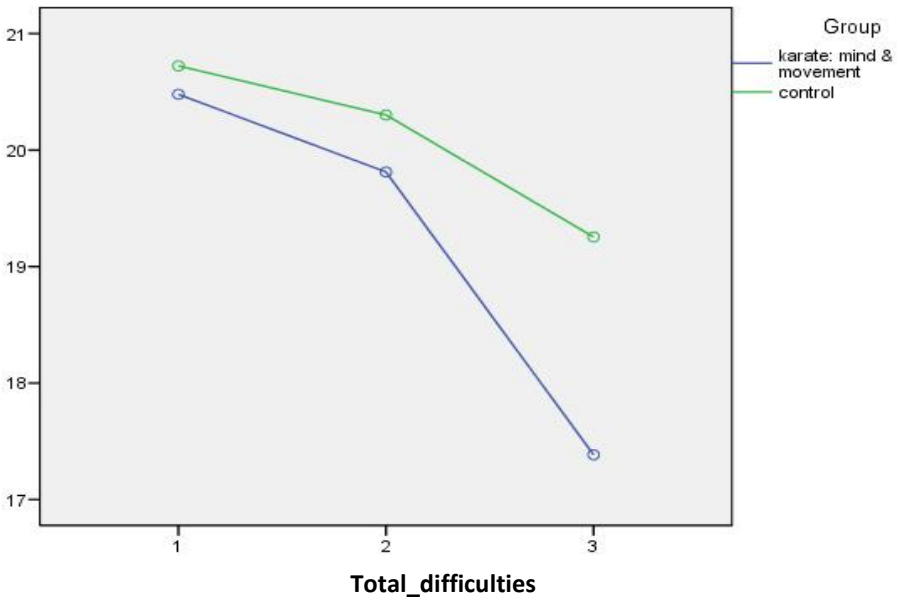


Figure 3: marginal measures estimated for the variable total difficulties in the 3 moments of evaluation from the children with more difficulties.

Choosing the children who presented more difficulties in the SDQ, the differences were not significant in the following scales: emotional symptoms (F = 0.105, p = 0.895), hyperactivity / inattention (F = 0.154, p = 0.851), neither in peer relationship problems (F = 1.119, p = 0.301). Nevertheless, in all of this variables the group experimental obtained slightly better results.

In the same way that in the total sample statistical analysis, the behaviour problems results were better in the experimental group than in the control group (F = 5.127, p = 0.007). The figure below shows this difference.

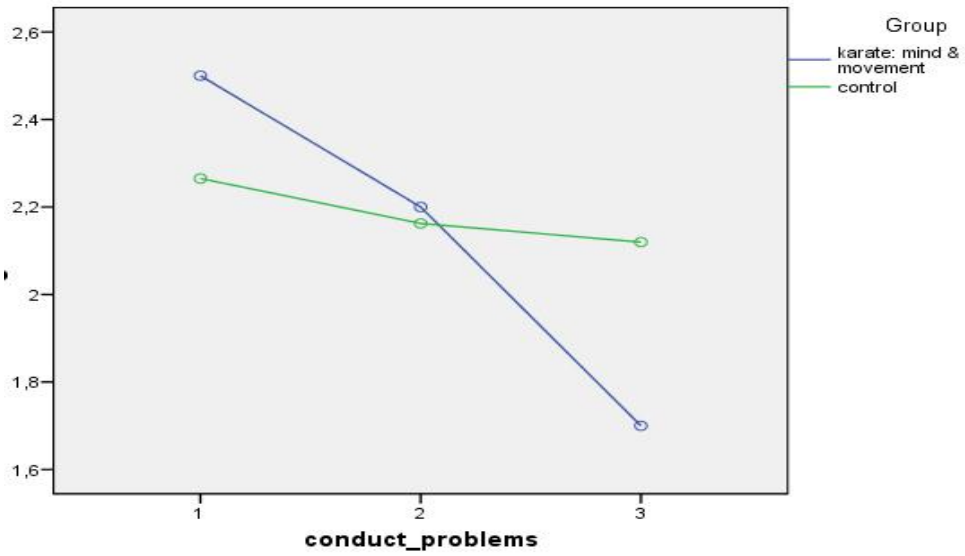


Figure 4: marginal measures estimated for the variable conduct problems in the 3 moments of evaluation from the children with more difficulties.

Once the SDQ results are exposed, the academic achievement statistical analyzes results are presented. The school marks results revealed (F = 2.269, p = 0.117) that the experimental group obtained better grades than the control group, although these differences were not significant. This improvement is present in the figure below.

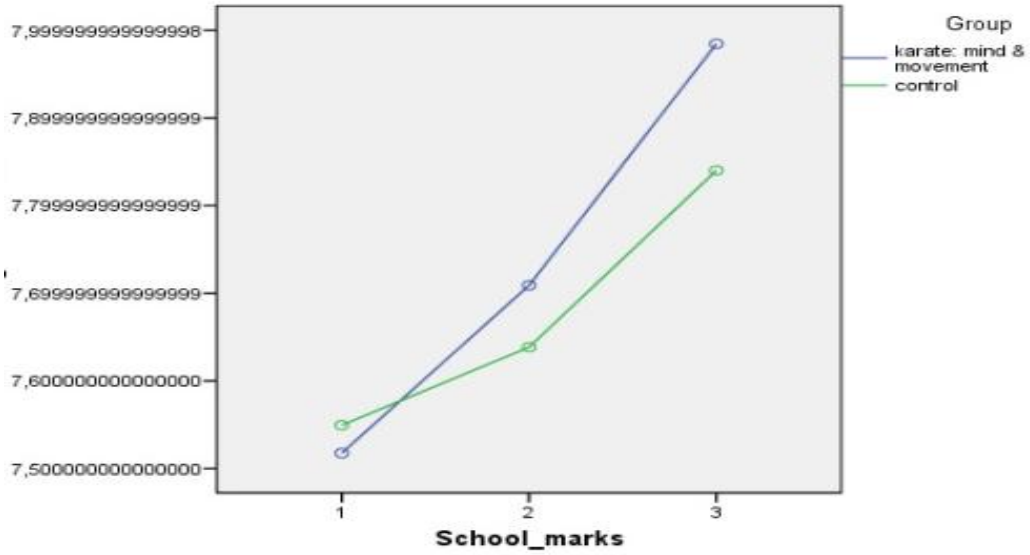


Figure 5: marginal measures estimated for the variable school marks in the 3 moments of evaluation.

If the subjects are analyzed in particular, mother tongue language significantly improves the school grades in the karate group compared to the control group (F = 3.241, p = 0.043).

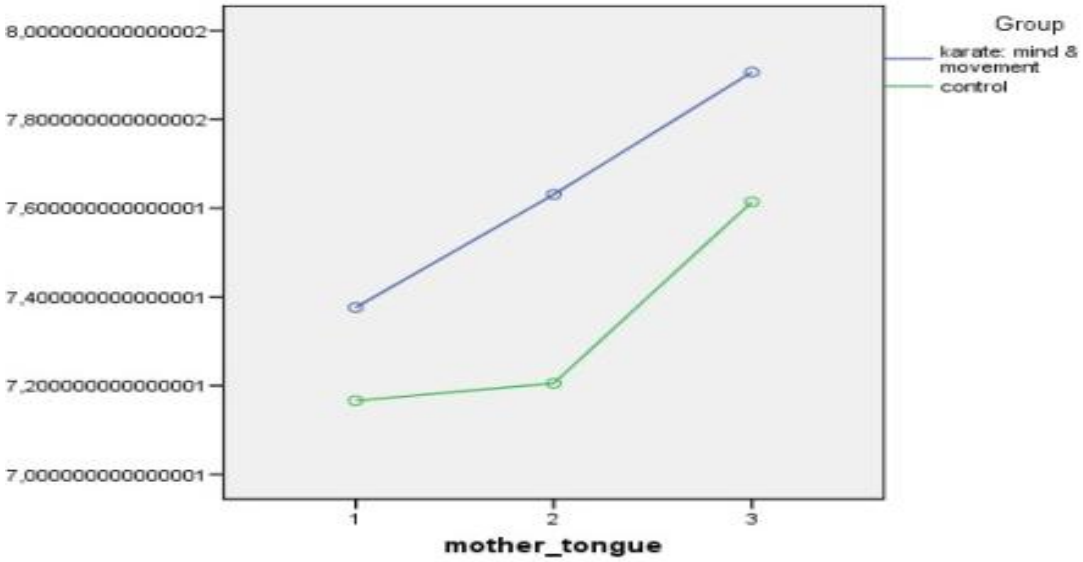


Figure 6: marginal measures estimated for the variable mother tongue in the 3 moments of evaluation.

Furthermore, arts and crafts presented significant differences between both groups in favor of the karate group (F = 3.370, p = 0.040), as it is exposed below.

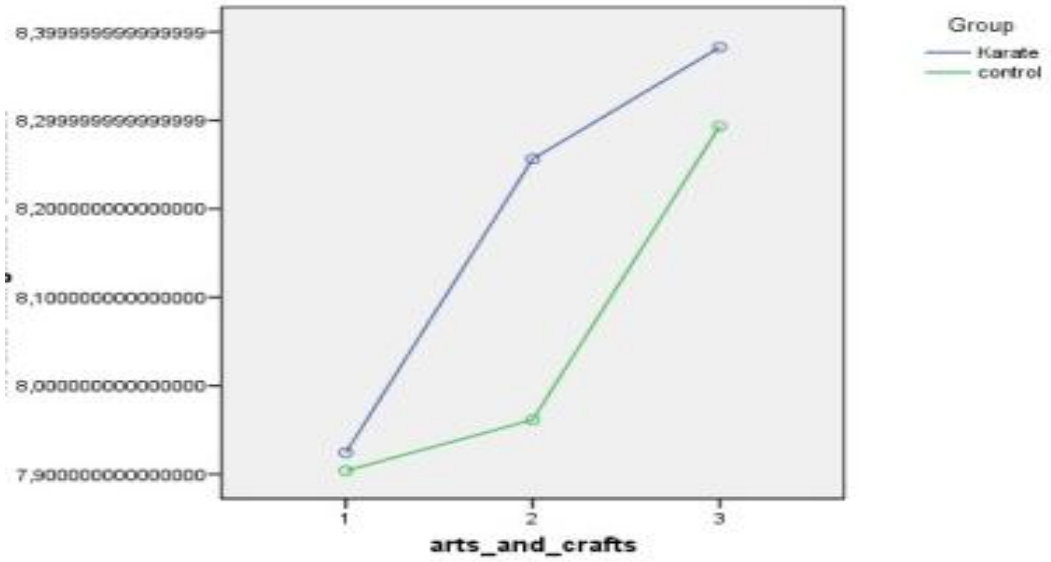


Figure 7: marginal measures estimated for the variable arts and crafts in the 3 moments of evaluation.

Nevertheless, the differences were not significant for Maths (F = 0.011, p = 0.987), Sciences (F = 1.398, p = 0.252), neither for Foreign Language (F = 0.791, p = 0.441).

As it was done with the SDQ, statistical analyses were carried out taking only the children who presented difficulties in the total score of the SDQ as sample. Thus, taking into account the arithmetic mean of all the school marks, the experimental group improved its results compared to the control group, although these differences were not significant (F = 2.269, p = 0.117).

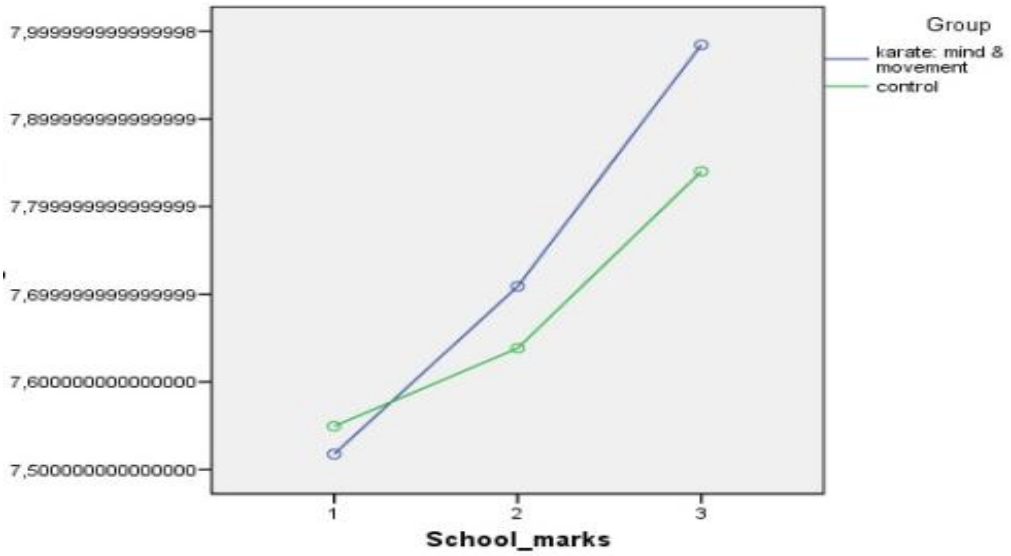


Figure 8: marginal measures estimated for the variable school marks in the 3 moments of evaluation from the children with more difficulties.

Analysing the subjects individually, Arts and Crafts was the only subject that grazed the level of significance (F = 2,846, p = 0.066), while the rest of the subjects did not reach the level of significance required: Mother tongue (F = 1.441, p = 0.238), Maths (F = 0.274, p = 0.670), Sciences (F = 2.249, p = 0.127) neither Foreign Language (F = 0.105, p = 0.885).

8. CONCLUSIONS

Finally, bearing in mind all the information presented along this document, the following three conclusions could be extracted:

- The Mind & Movement (movi-mente) program benefits parents´ perception of their children difficulties (emotional symptoms, conduct problems, hyperactivity/inattention and peer relationships problems), with statistically significant benefits in the conduct problems scale.
- Children who presented high or very high difficulties initially showed a significant improvement of their total difficulties score and conduct problems scale.
- Children from the experimental group in the Sport at School project had a significant higher increase in the school grades of Arts and Mother Tongue Language subjects (French, German, Polish, Portuguese and Spanish) than control peers.

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