

MOTOR ACTIVITY AND COLLABORATIVE GAME: DEVELOPMENT OF SOCIAL AND MOTOR SKILLS IN CHILDREN 3-6 YEARS

ATTIVITÀ MOTORIA E GIOCO COLLABORATIVO: SVILUPPO DELLE CAPACITÀ SOCIALI E MOTORIE NEI BAMBINI 3-6 ANNI

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Abstract

Educational research analyzes the increase in social and motor skills in correlation with participation in collaborative motor games. 3-6 years old children were divided into control and study groups, to whom the project was proposed. Both groups were subjected to motor and social pre-tests. School closure due to COVID-19 restrictions did not allow the collection of post-tests. However, effective and alternative solutions were sought to calculate the increase in motor skills and hypothesize the improvement in social skills, giving gratification to the collaboration of managers, teachers, parents, and students involved.

La ricerca educativa analizza l'incremento delle abilità sociali e motorie in correlazione alla partecipazione ad attività motorie collaborative. Bambini dai 3 ai 6 anni sono stati divisi in gruppi di controllo e di lavoro, ai quali il progetto è stato proposto. Entrambe le sezioni sono state sottoposte a pre-test motori e sociali. La chiusura delle scuole dovuta alle restrizioni per la pandemia da COVID-19 non ha permesso la raccolta dei dati del post test. Si sono cercate delle soluzioni alternative ed efficaci per valutare la crescita nelle abilità motorie ed ipotizzare il miglioramento delle capacità sociali, dando gratificazione alla collaborazione di dirigenti, maestre, genitori e alunni coinvolti.

Keywords

Physical activity, Collaborative game, Social Behavior, Preschool children, 3-6 years old

Attività fisica, Giochi collaborativi, Comportamento sociale, Bambini di Scuola dell'Infanzia, 3-6 anni

Contribution equally distributed among the authors of which: Manuela Valentini (*Physical activity in preschool; Collaborative game in preschool children*) and Ann M. Berghout-Austin (*Introduction; Social skills; Experimental research: Research Hypothesis, Research Design, Participants; Conclusions*) scientific coordinators; Monica Minucci (*Experimental research:*

Instruments, Project, Difficulties and Solutions) and Abbie R. Finlinson (*Results*) experimental and educational intervention.

Introduction

Movement represents the cornerstone of children's lives. Human body holds enormous importance as through it a child begins to know himself, other people and the surrounding world. In an increasingly individualistic society, it's essential to encourage, from an early age, formative activities based on collaboration and motor activity. We will disclose experimental research conducted in a kindergarten in Pesaro (PU, Italy), aimed at understanding how much the implementation of playful-motor and collaborative activities can really support and increase the effective acquisition of social and motor abilities.

Physical activity in preschool

School is a fundamental institution for the education of citizens and therefore must constantly respond to current social needs. Motor activity should be a priority element in the educational path of individuals, to ensure a complete formation that uses the knowledge of the body as a means of expression and cornerstone of psychophysical balance in childhood. The growing attention given to physical activity in the different scholar reforms underlines the acknowledgement of movement value for the education of children.

The term "physical education" is used to refer to a "training ability, not only limited to the body, but also extended to the nature and the spirit of those who practice it" (Cereda, 2016, p.27), underlining the global and all-embracing virtue that it carries out in accompanying growth.

Following this direction, the World Health Organization strongly suggests at least one hour of motor activity per day to promote physical and psychological well-being for all age groups (World Health Organization, 2020).

The various scientific evidences highlight the negative health consequences due to physical inactivity. The development of cardiovascular and metabolic pathologies in adulthood is often caused by overweight which occurred during childhood and adolescence. On the other hand, the practice of physical activity promotes the adoption of a healthy lifestyle, marked by the maintenance of psycho-physical well-being, decreasing the possibility of manifestation of health problems (De Mei et al., 2018).

In addition, movement supports children in the development of their self-esteem and self-efficacy, which also has a positive impact on social inclusion. In fact, "the benefits of physical activity translate into psychological benefits and social relationships, such as an increase in self-esteem and quality of life and a better self-image" (De Mei et al., 2018, p.73).

Participation in sports games from an early age is an important "support for children's social development, providing opportunities for personal expression, building self-esteem, interaction and social integration and it has also been suggested that physically active young people easily adopt correct behaviors" (De Mei et al., 2018, p.73). Numerous studies emphasize the value of motor activity as one of the main driving forces of social skill development, allowing the child to integrate within the peer group and form meaningful relationships (Dyson, 2001; Bano et al., 2018).

The literature research makes it possible to support the need to propose activities with increasing difficulty. These activities motivate the child to challenge himself in games that are neither considered too simple and repetitive, nor too complicated and unattainable (Hastie et al., 2018).

Therefore, the child needs a place that encourages his global development day by day, allowing him to experience play and movement activities that bear in mind the diversity and the various possible interpretations. As Firmin and Messmer say, this privileged place exists, and it is the Kindergarten (Firmin & Messmer, 2003).

Collaborative game in preschool children

Nowadays great attention is paid to children and the game activities most suitable for each of them, with extensive research aimed at promoting a global and holistic development of the personality and the identity of each individual. The General Assembly of the United Nations has cited, in Article 31 of the International Convention on the Rights of the Child, the following principle: “States parties recognize the right of the child to rest and leisure, to engage in play and to recreational activities proper to his age and to participate freely in cultural and artistic life” (ONU, 1989).

Following this direction, we need to discuss a fundamental issue: the play. It represents a multifaceted reality, which is why the attempt to find an all-encompassing definition is certainly ineffective. However, to better summarize the type of activity we are referring to, we could list the characteristics that Caillois attributes to the game. The author defines it as an activity that has to be *free, separate, uncertain, unproductive, fictitious* (Caillois, 2016).

Within the macro-category constituted by the game, there are specific types that can be divided and classified according to different criteria. Here we will focus mainly on the category of cooperative game.

We can define cooperative games as those in which no one wins, no one loses and no one is excluded. The participants of the group don't play against each other, but challenge themselves, the limits of their creativity and imagination, to achieve a common goal (Loos, 2011).

A key role for the optimal implementation of the whole collaborative activity is certainly played by the figure of the mediator, also called facilitator. The teacher must prepare the “play ground” considering five basic points: believe in the game, have knowledge of the games, carry out a meticulous planning, take care of the activity environment, be flexible (Nesti, 2012).

Proposing collaborative games in Kindergarten, starting from an early age, has many positive effects.

First of all, cooperative game allows the increase of positive interdependence: each member of the group learns to rely on the whole, collaborating together to achieve the goal (Dyson, 2001). To better understand this concept, we could say that “positive interdependence is considered achieved when the members of the group understand that there can be no individual success without collective success” (Johnson et al., 2015, p.25). Developing positive interdependence within the group both increases the probability of being able to achieve the final goal and supports each child in the growth process and achieving developmental processes such as personal responsibility and autonomy.

Furthermore, these types of activities also stimulate interpersonal skills, underlining the need to improve social abilities. Opting for cooperative game strategies in the classroom, usually guarantees greater group cohesion, the creation of solid relationships based on friendship and trust, better acceptance and inclusion of students (Claparede, 1931).

According to Camoglio and Cardoso, relationships among students (who participate in collaborative activities) are essential to develop cognitive, social and relational skills in children. In fact, the benefits are identified both in the final scholar performance, and

especially, in the ability to learn values and attitudes through identification with friends, to leave behind self-centered consciousness in order to learn to listen and understand other people, developing empathic attitudes that guarantee the sharing of emotions like joy, sufferings and life experiences in general (Comoglio & Cardoso, 1996).

Social skills

Combining different scientific points of views, we could say that social skills are:

- the result of education, so they aren't innate, but always the outcome of a long process;
- focused on the realization of a goal, so they're used when the child recognizes an important final aim;
- tied to the variable situation and context;
- both observable and non-observable. We need to consider not only external behaviour, but also the ones that aren't directly visible;
- composed by communicative skills, leadership and problem resolution;
- formed by social verbal and non-verbal behaviours and emotional management.

(Chadsey-Rusch, 1992; Comoglio & Cardoso, 1996; Easterbrooks & Ogletree, 2011; Kauffmann & Kinnealey, 2015)

Human being is formed by two different dimensions, the individual and the social one. The latter is a system of concepts, feelings and habits that express in us [...] the group or different groups to which we belong (Durkheim, 2009). It's crucial that the establishment of strong and meaningful relationships is encouraged from early childhood. Indeed, this helps to create the favourable context in which the psychological and cognitive functions of the individual will develop.

Following the development of meaningful social and affective relationships, the construct of "social participation" is then determined. Levasseur and her collaborators have defined "social participation" as the involvement of the person in an activity that provides interaction with others (Levasseur et al., 2010). This meaning is extremely important because it's a significant predictor of an individual's quality of life (World Health Organization, 2020).

These are all aspects that need to be stimulated from an early age. The classroom is a social microcosm where children spend time every day, that's why is a highly significant institution for children (Schaffer, 1998).

Much space should be dedicated to building the class as a group, promoting cooperative links between its members, and dealing with the inevitable conflicts induced by socialization (MIUR, 2012).

Experimental Research

Research Hypothesis

The research would focus on two principal subject matters:

- Body and movement;
- Collaboration.

Movement is the main tool through which we approach the world, and we discover the surrounding reality. The latter, in the growth of an individual, from an early age, is formed primarily by the group. It could be considered as, an ecosystem in which all the parts are interconnected and contribute to the emergence of the events of the system (Polito, 2000).

Following reflections on these conceptual references, and the theories of the previously cited authors, we elaborated the question that guided us throughout the course of the experiment: do motor activities in kindergartens promote the development of social skills and increase motor abilities?

Research Design

The research took place during the 2019/2020 school year and was articulated in four main phases. In the design phase, we researched and clarified with the teachers at the school complex, the purpose of the research and the general and specific goals of the project to be proposed to the class. In the second phase, we conducted the test (pre-tests) in both the experimental group and the control group, through which we collected the starting data. In the third phase, the project was conducted with the experimental group, once a week from November to March. In the meantime, the control group continued with the usual classroom activities. The fourth phase should have provided for the collection of final data by administering the post-tests to both groups. Due to the closure of the schools because of the sanitary emergency caused by the outbreak of COVID-19, we had to find alternative solutions to gather the final data.

Participants

The test group and the control group are, respectively, the students of classes A and B of the Kindergarten in Via Fermi, of the comprehensive school “Giacomo Leopardi” in Pesaro, Italy.

There are 22 children in total, of an age ranging from 4 to 6 years old:

- Test group: 11 children, 4 female and 7 male;
- Control group: 11 children, 5 female and 6 male.

Instruments

TGMD (Test of Gross Motor Development) is used to analyze motor skills. It is an individually administered test to assess gross motor skills in children between the ages of 3 and 10 years. The TGM measures 12 gross-motor skills that are usually taught subject matters in kindergartens and in the first years of primary school. The various skills are divided into two sub-tests:

- *Locomotor*: 7 items: run, gallop, hop, leap, horizontal jump, skip, slide;
- *Object Control Skill*: 5 items: two-hand strike, stationary bounce, catch, kick, overhand throw.

“The Social Attributes Checklist” is a checklist developed by McClellan & Katz and identifies the elements that underline the presence of social competencies in pre-school individuals.

The checklist consists of 24 items, divided into three categories that we considered coherent with our goal:

- Individual Attributes (8 items);
- Social Skill Attributes (14 items);
- Peer Relationship Attributes (2 items).

(McClellan & Katz, 2001).

“The Social Behavior Scale for Preschool Children”, by authors Lanciano, Cassibba, Elia and D’Odorico in 2016 is a scale of observation to assess the social behavior of pre-school children. The used scale is a revision of Cassibba’s previous work, a survey aimed at examining social interactions between children in daycares. The reviewed scale, however, is only addressed to pre-school children. Its factorial structure is validated by research involving children from 36 to 72 months old (Lanciano e al., 2016; D’Odorico & Cassibba, 2019).

Both social scales were compiled privately by both us researchers and teachers. With these separate observations, we wanted to verify the reliability of the observation, to ensure greater objectivity of data.

Project

This project is born out of a strong awareness of the necessity to increase the social and collaborative potentials of the children. It is addressed to children's primary needs and wants to support their necessities, stimulate their curiosity, and increase their motivation. To create an effectively significant learning environment, we took inspiration from the four fundamental criteria theorized by Bruner: the ability to act, reflection, collaboration and culture (Bruner, 1960).

GENERAL OBJECTIVES

- To develop the knowledge of the body schema and the acquisition of basic motor schemes;
- To increase child's social skills through collaborative games;
- To accept, collaborate, respect, and be able to use games rules.

SPECIFIC OBJECTIVES

- To identify and name body parts;
- To use basic motor schemes as an expression of their personality, even within various activities;
- To respect rules, wait for their turn, and not rise above others;
- To help classmates in need;
- To work with others proactively.

The unit of learning is divided into different teaching plans that last from 45 minutes to an hour each. Every teaching plan is characterized by the sequence of the following steps: the preparatory phase, central phase, and final phase or cool-down (Federici et al., 2011).

Difficulties and Solutions

In February 2020, the global pandemic caused by COVID-19 determined the occurrence of a situation of health emergency, resulting in the closure of schools. It was no longer possible to perform the remaining teaching plans with the students. After numerous research, we found two different solutions with regard to the course related to motor tests and social tests.

The TGMD is used to evaluate the growth of motor skills through the execution of several exercises. We thought that it would have been possible, then, to request the collaboration of parents to obtain this data. We managed to explain the situation by phone and asked them about their willingness to film their children while they conducted the required exercises (it also proved a valid way to keep their children active during the lockdown). Thus, we were able to obtain data regarding the motor post-tests.

Differently, the selected checklists for the evaluation of children's relational competencies require the observation of individuals' behavior and of the dynamics that are established among them. Being forced to social distancing and finding ourselves in a situation of national lockdown, it would not have been possible to observe peer relationships directly. At the same time, it would not have been in any way truthful to have parents fill out the checklists at home, as these want to specifically analyze social competencies inside a group of peers. After thorough thinking and analysis of a never-before-experienced context, we decided to search for an examination protocol having the following characteristics:

- Same age target of the children participating in our research;
- Similar objective to the one we were pursuing;
- Proposed activities linked to those conducted in our teaching plans;
- The test aimed at measuring the same elements to those investigated by us.

Therefore, to identify research as similar to ours as possible, we could extrapolate the final data necessary to calculate the post-test scores and compare them to the scores obtained in the pre-tests.

After a further month of research, we decided that the most coherent protocol with our requests was one of those already present in our systematic search: “Cooperative Games and Children’s Positive Behaviors”. Authors Abbie Reynolds Finlinson, Ann M. Berghout Austin, and Roxanne Pfister publish the article on “Early Child Development and Care” in 2000, at the Utah State University. The protocol has been selected by the search engine BASE. The goal of the research is that of understanding the change in social behaviors implemented by children following cooperative or competitive ludic-motor activities.

After having selected this protocol, we contacted one of the authors – Ann M. Berghout Austin – to whom we explained the goal of our research, the setbacks encountered during the pandemic, and the solution we would have liked to adopt. The author made herself available to support us in the rest of our experiment, also telling us that she would have contacted her colleague Abbie Reynolds Finlinson to ask for the original version of the checklist used in their article. At this point, we were able to analyze the actual similarity between the objectives examined in our pre-tests checklist and the one used in their protocol.

In this article, in fact, the selected social test is “The Observational Checklist of Children’s Behavior” (OCCB), designed by Grineski in 1989. This test takes into consideration the observation of both positive (help, support, encouragement) and negative (aggression, strength, lack of bonding with others) interactions.

Once it was verified that the protocol fitted our criteria perfectly (age of participants, enquired similar objectives, coherent proposed activities, the comparable purpose of the research) and having obtained the authorization to proceed by the authors, we decided to use this protocol data to complete our analysis.

Results

Data collection and empirical strategy: motor tests

Analyzing the data collected with the TGMD, the average sum of the experimental group’s standard scores in the pre-test is 19.5. However, the post-tests average of the same value is 24.4. The average GMQ value of the pre-test of the experimental group is 98.6. The same group shows growth in GMQ values of 14.5, achieving an average of 113.1.

In the control group, there are 11 children in total and none of them takes place in the project. In the pre-test, the average sum of standard scores is 24.3. In the post-test, it amounts to 25.2. Concerning the GMQ values of the pre-test, the average of the control group is 116.9. The GMQ values’ average for the post-test is 119.6.

In this way, we determined the descriptive statistics of the dependent variables, that is the results of the sum of the standard scores, and of the Gross Motor Quotient (GMQ) in the periods prior to the treatment and after the treatment, for both the test group and the control group.

Table I - Descriptive statistics of dependent variables (motor tests)

GROUP	PERIOD	STANDARD	GMQ
		POINTS	

TEST	1	19,5	98,6
CONTROL	1	24,3	116,9
TEST	2	24,4	113,1
CONTROL	2	25,2	119,6

In the control group – who did not conduct collaborative ludic-motor activities – there is no clear change between pre-test and post-test scores. Instead, the evolution of the data of the test group shows a greater discrepancy between period 1 (pre-treatment) and period 2 (post-treatment).

Table II - Chart Evolution results sum standard points

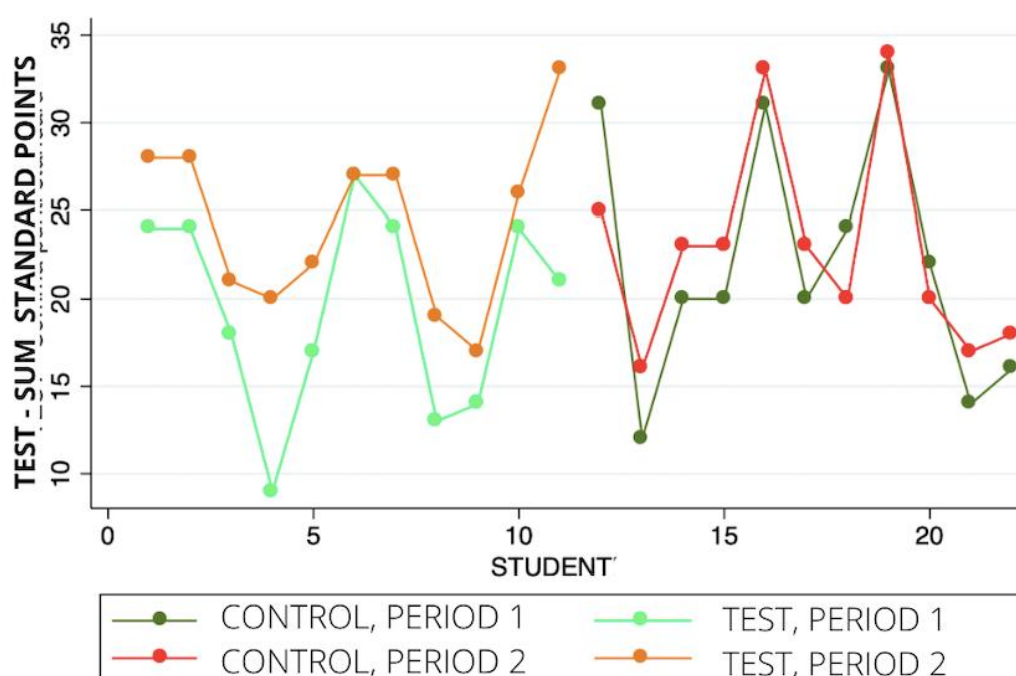
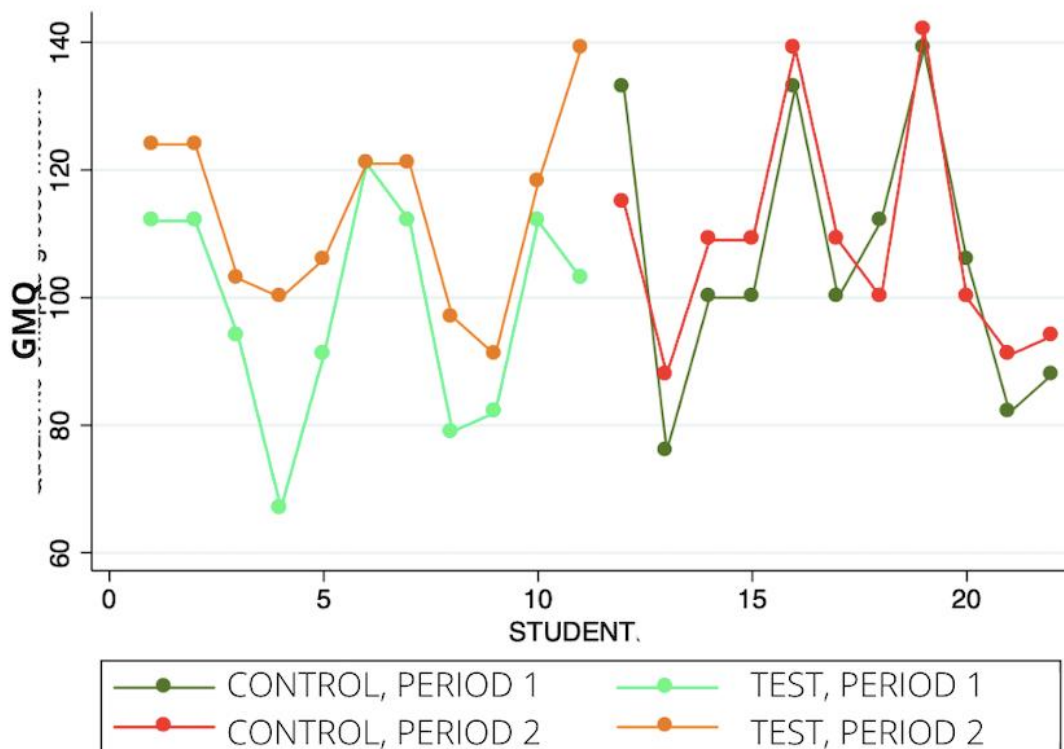


Table III - Chart Evolution of GMQ results



The empirical strategy used to compute the end results of the motor test and to evaluate the growth of motor skills in preschool children is that of an econometric model. The empiric work uses the “Difference-in-Differences” estimator.

The estimation model will result in the following:

$$y_{i,t} = \beta_0 + \beta_1 dB + \sigma_0 d2 + \sigma_1 d2dB + u$$

In this formula:

- Y is the variable of interest, observed in periods 1 and 2. In our research, the motor test examines the gross-motor skills in pre-school children before and after the realization of a project that aims at stimulating ludic-motor activities in a collaborative manner.
- d2 is a dummy variable that takes values 1 in the post-treatment period and 0 in the pre-treatment period.
- dB is a binary variable that takes the value 1 if the individual is in the test group and 0 if the individual is in the control group.
- d2dB is a variable that indicates the interaction between the two dummy variables and takes value 1 in correspondence to the individuals of the test group in the second period (post-test).
- U is the standard error.

Motor tests results

Test group individuals, in the post-treatment period, increase their score relative to the sum of the standard scores by 4 more points than the control group individuals. With regards to the GMQ scores, the difference in the increase amounts to 12 points in favor of those who received the treatment.

Table IV - Results TGMD test

VARIABLES	(1) SUM STANDARD POINTS	(2) Gross Motor Quotient - GMQ
TREATMENT	-2.545 (2.779)	-7.636 (8.336)
POST	0.818 (1.010)	2.455 (3.030)
INTERACTION	4** (1.505)	12** (4.514)
Observations	44	44
R-squared	0.087	0.087
Media Outcome	22.22	106.68

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The treatment consists of a series of collaborative ludic-motor activities, once a week for a total of 7 weeks. Each teaching lasts one hour. The results prove to be statistically significant, with a cut-off of 5%. These results, on average, show an increase of 18% with regard to the sum of the standard scores, and an increase of 11.25% with regard to GMQ values.

The test group shows a statistically significant improvement after the treatment, as the sum of the standard scores grows by 4 points, on average. The data relative to the GMQ exhibits the same kind of growth.

Table V – TGMD test results for the sum of standard points

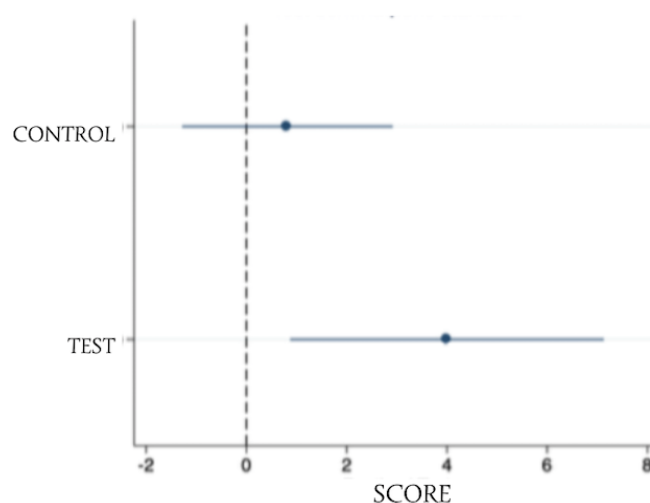
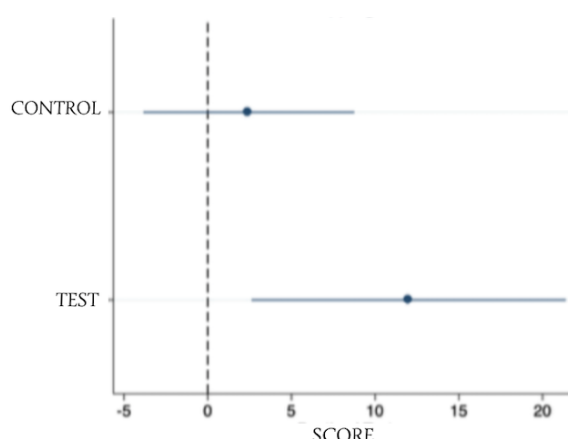


Table VI – TGMD test results for GMQ



The dummy variable is not significant. There are no ex-ante differences between the test group and the control group, and the hypothesis of non-parallel trends is supported.

Before the treatment, there is no statistically significant difference between individuals in the control group and the individuals that are going to receive the treatment – that is, those in the test group. The results also consider the different characteristics of students, e.g., age and sex.

Table VII – Not parallel trends (motor tests)

VARIABLES	(1)	(2)
	SUM STANDARD POINTS	Gross Motor Quotient - GMQ
Treated	-0.545 (2.427)	-1.636 (7.281)
Observations	44	44
R-squared	0.058	0.058

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Data collection and empirical strategy: social tests

Prior to the project, the average of the test group for the first checklist is of 8.45. It is reminded that this score is obtained by the average of the results gathered in the observations carried out by us examiners and by the teachers. In the same checklist, the control group has an average score of 7.36 in the pre-project period.

With regards to the other checklist, the maximum score is 66. Even in this case, the grids were filled out separately by us and the teachers, to achieve higher objectivity in the observations. The reported results are obtained by the average of the scores of these independent observations. With regards to the test group, the score is 48.77, whereas the control group scores 45.32.

Table VIII – Descriptive statistics of dependent variables (social tests)

GROUP	PERIOD	SOCIAL ATTRIBUTES CHECKLIST	SOCIAL BEHAVIOR SCALE
TEST	1	8,45	48,77
CONTROL	1	7,36	45,32

A comparison of the pre-treatment data for both checklists shows that the results are uniform. This confirms a good level of objectivity of the observation, which was specifically carried out by distinct figures with two different scales.

Table IX - Pre-test data “Social Attributes Checklist”

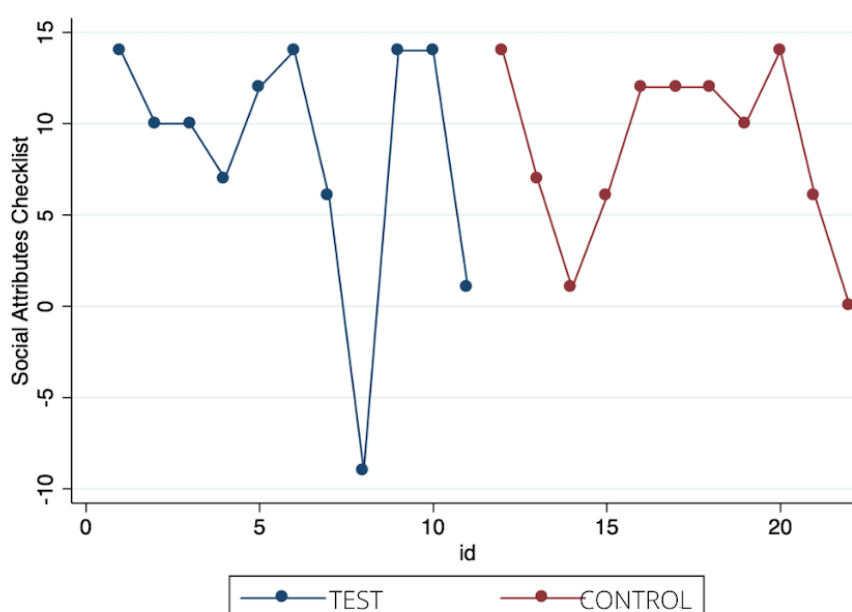
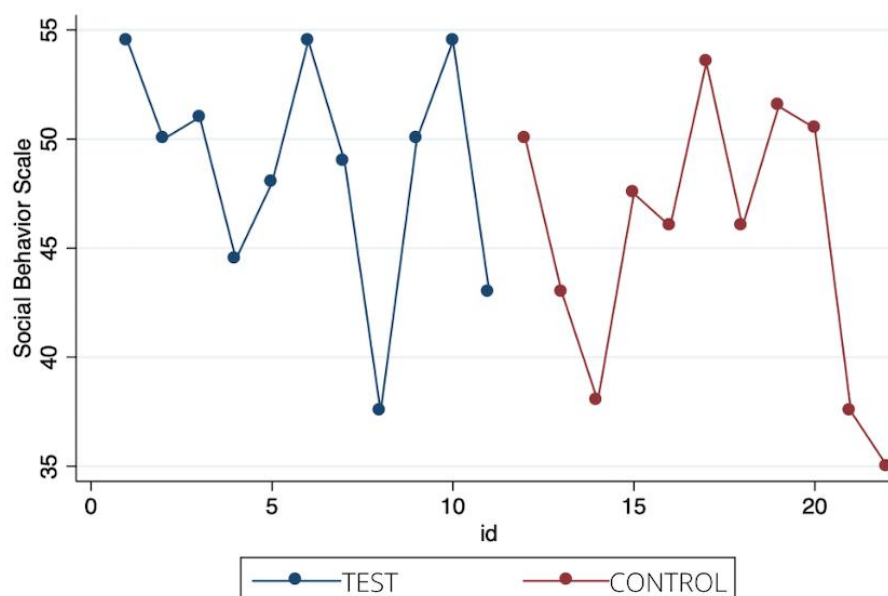


Table X – Pre-test data “Social Behavior Scale”



We will try to predict the results we should have got after the actualization of the project in the test group, using, though, the coefficients found in the “Cooperative Games and Children’s Positive Behavior” protocol, designed by Abbie Reynolds Finlinson, Ann M. Berghout Austin, and Roxanne Pfister (2000, U.S.A.). Unlike the data analyzed in the motor stage, this part will not be able to show a causal relationship in our results, but only a possible prediction.

Social tests results

The experimental group and the control group do not manifest any statistically significant difference for the social tests either. This is true for both “The Social Attributes Checklist” and “The Social behavior Scale for Preschool Children”. Even when taking into account the age and sex of the students, the results are robust.

Table XI – Not parallel trends (social tests)

VARIABLES	(1)	(2)
	Social Attributes Checklist FINAL AVERAGE	Social Behavior Scale FINAL AVERAGE
Treated	1.624 (2.777)	3.455 (2.471)
Observations	22	22
R-squared	0.082	0.089

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Multiplying the work group’s average of the two checklists by the coefficient found in the “Cooperative Games and Children’s Positive Behaviors” protocol, we were able to attain a hypothesis of the outcome at least in compliance with what we should have found once the post-test data were collected and analyzed.

The average of the workgroup for “The Social Attributes Checklist” pre-test is 8.45, which should become 9.63. The reason is that the protocol’s outcome shows a growth of 0.14% in social behaviors after performing collaborative ludic-motor activities. In our case, this amounts to an increase of 1.18 points (the difference between negative and positive scores).

The “The Social Behavior Scale for Preschool Children” checklist analysis shows a pre-test average of 48.77 for the workgroup. Following the previous explanation, the hypothesis of outcome is a growth of 6.83 points, increasing the post-treatment average to 55.60.

Conclusions

With this analysis, we wanted to verify the growth of the variables taken into consideration, namely social and motor skills. From a technical standpoint, it is worth noting that the sample was randomly chosen, and hence it supports the research and it ensures the solidity of results, but it is probably not representative, because of the limited number of available observations.

Analyzing the results, the motor tests can be considered causal because the econometric model – and thus the used statistical calculations – is reliable and the assumptions are satisfied, supporting the starting hypothesis.

Due to the problems encountered regarding the closure of the schools and hence the impossibility to collect outcome data, social tests are less robust and cannot be considered causal. However, we managed to extrapolate the final data of the “Cooperative Games and Children’s Positive Behaviors” protocol (by Abbie Reynolds Finlinson, Ann M. Berghout Austin & Roxanne Pfister, 2000, Utah University), representing the growth coefficient of social skills in children after the conduct of collaborative games. This allowed us to predict what the effect of the project performed in class should have been.

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