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**Original Article**

# Childhood and nature: research project

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**Abstract:**
The study analyses the correlation between an extended constant educational activity, taking place in a natural environment, and its potential benefits and improvements on the motor level in 5 year-old children.
The research is based on an experimental project called "*Natural-mente*" (Naturally), which lasted eight months and included 42 children from a pre-primary school in Pesaro (Marche, Italy).
The project aims at carrying out planned motor activities and outdoor free play, in particular in the school's garden, one morning per week.
The results obtained through the use of the TGMD test (Test of Gross Motor Development) were subsequently elaborated and analysed with the SPSS (Statistical Package for Social Science) programme.
**Key words**: - outdoor education –TGMD test– motor skills – preschool children- school's garden

**Introduction**

Highly sedentary lifestyles and disconnection from nature are two phenomena that are particularly alarming for current generations.

Nowadays in our cities younger generations not always have the chance to enjoy natural areas and to conduct spontaneous and free physical activities.Therefore, our children spend most of their days indoors, both at school and at home, "protected by the four walls of a house", as stated by Federici (2015, p.105), who affirms that "in an increasingly sedentary world [...] modern-day children are losing their ability to interact with the environment and to explore the surrounding space in order to develop their knowledge." (Federici 2015, p.106)
"Obesity, hypokinetic disease, asthenia, attention deficit, loss of functional coordination skills and conditional abilities such as strength, speed, endurance, are the overt expression of our metropolitan children's negative lifestyles. [...] (Boone-Heinonen, Casanova, Richardson & Gordon-Larsen, 2010; Haug, Torsheim, Sallis & Samdal, 2010; Iannotti et al., 2013)." (Federici, 2015, p. 106)

As Ceciliani (2015) also asserts, it is often adults who structure the children's lives, limiting their natural and spontaneous motor expression; "In our country [...] spaces and time for children's motor activities are among the more limited in the European context [and this] has led to a widespread sedentary attitude in younger generations, who, supported by the raging of technology, limit the use of their body and movement." (Ceciliani, 2015, p.129)

The general tendency is to minimize the risks and contingencies that could arise in our children's life, especially through the limitation of spontaneous movement play, which is preferred during adolescence. This, inevitably falls also on the children's ability to resolve possible problematic situations or to respond to these in a creative and effective way.

By limiting them in their spontaneous and free physical activities, they are no longer able to express themselves as they would like and to know the limits and possibilities that body and movement offer.
Reasonable risks can instead lead them to actwithin their "zone of proximal development", as defined by Vygotskij, and to acquire increasingly elaborate skills. As for disconnection from nature, it is evident that our lives have been dramatically modified by the advent of industrialization,which caused the population to leave the countryside and move to the city, thus improving the living conditions of both adults and children.

This is what Louv (2006) defines as "nature deficit disorder", which affects today's children and teenagers in terms of psychological and physical malaise.

The term he coined indicates the alienation from the natural world, which according to the author's hypothesis produces both physical and motor disorders (e.g. obesity, asthma, allergies, myopia) as well as emotional and psychological ones (e.g. small phobias, insecurity, hyperactivity, incapacity of concentration, ..).
As Farnè (2018, p.30-31) points out, "this loss of connection with the natural environment does not imply nature as an idealized concept, rather it refers to the relationship with the external environment in its various configurations, where [...]natural elements constitute the most significant frameworkin terms of experience for the child".


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We are aware of the fact that "we do not need to go far back in time to find a period in which our lives were in close interdependence with nature, in which children played in the open air. [...] they couldrun and play free in the woods and fields, self-manage their time and relationships [...] The contact with the natural environment was insuredsince the natural environment coincided with the living environment."(Aldi G. et al., 2013)

"Children live far away from nature and have few opportunities to come into intimate contact with it or to directly experience it, on the other hand, children need to live in nature, to "live" nature and not only to know it, just by studying it or admiring it" (Montessori, 1909, p.86). They often live indoors rather than outdoors; they see landscapes through displays; their movements are limited to keyboards, mouse and guided by adults. It is therefore necessary to nourish that "feeling of nature" (as Montessori defined it), i.e. a sense of attention, interest, closeness to all those natural life forms that surround us.

Supported by Dewey's idea of the man as a psycho-physical unit, in which "body and mind [...] are interdependent and constantly influence each other in the development of the individual" (Schenetti, Salvaterra and Rossini, 2016, p.72), we believe that today children should have the opportunity to enjoy outdoor real life activities, starting right from school, from the educational action.

"Physical activity in the natural environment [...] attests to a truly active school" (Federici, 2015, p.104) within which "the child continually experiences this"being-out-in-the-world of the body", on which he bases an experience that is rich in meanings and values ."(ivi, p.106-107).

**Literature Review**

At present, there are numerous studies and positive feedback showing the positive effects of the environment and nature on our bio-psycho-physical well-being.

Compared to our interest in study, however, we do not find a considerable number of experimental studies that are focused in particular on the effects of education in the natural environment on the development and improvement of motor skills in preschoolers.

On the subject and considering the target chosen, we consider three empirical studies, which report scientific evidence regarding the relationship between activity in the natural environment and motor improvement in children; we report them below in table.

| Numero articolo | Search engine | Magazine | Title, year and authors | Country | Setting | Number of children | Age of children | Actvity | Duration | Result |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | EBSCO | *Early Childhood education journal 29(2): 111-118* | The natural environment as a playground for children: the impact of outdoor play activities in pre-primary school children; Fjørtoft, I. , 2001 | Norway | Forest and traditional outdoor playground | 46 children in experimental group (27 boys, 19 girls) ; 29 children in reference group (11 boys, 18 girls). | | The class of work was involved in free play activities taking place in the woods close to the school for 1-2 hours per day. On the other hand, the control group was rarely involved in activities happening in the traditional school garden. The two groups were subjected to the EUROFIT test, taken both at the beginning and at the end of the research. | 9 month | In the pre-test, the experimental group had the worst results performing worse than the control group, while in the post-test, it has recovered in all items. The independent variable (play in the forest), has influenced the dependent one (motor activity). |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | EBSCO | Sezione: Pedagogia e Didattica dei Servizi Educativi 2007, 2. | Giocare con cura; Ceciliani A., Bortolotti A.; 2007 | Italy | School | 90 children years old | 3-5 years old | The children were observed using an ecological methodology; this happened during activities of spontaneous and free play in the outdoor areas of school taken into consideration. | 15 hours of field data collection | The results have identified a series of conditions that influence and stimulate the motor activities of some children. |
| 3 | EBSCO | South African Journal of Education, V. 37, Number 2, May 2017 | The effect of outdoor learning activities on the development of preschool children; Yıldırım G. , Özyılmaz Akamca G. ; 2017 | Turkey | School | 35 children years old | 5-7 years old | The children received an education of ten weeks developing throughout 5 days per week, 4 hours per day. The majority of the educational activities have been conducted outdoors. The different behaviors of the children were registered using an observational grid. | 10 weeks | The children have reported significant improvements relative to the motor field and motor activities, as well as showing a good development of cognitive, linguistic and socio-emotional skills. |

Source: own

Articles are in ascending order according to the year of publication. We will try to compare the selected studies and their results with ours; justifying some choices we have made. The first is the 2001 study by Ingunn Fjørtoft, carried out during a school year, which found the correlation between the motor improvement of children (5-7 years) and the possibility of free play in a natural context.

The study was conducted in two groups:

- one working, who spent 1-2 hours a day for the 9 months of study in the woods near the school;
- one monitoring, which rarely used the traditional school garden.

Both groups underwent pre-test and post-test; in the first administration the working group got worse results than the control group, while in the post-test it recovered in all items.

The control group, in fact, showed no significant improvements.

In this case the two groups underwent the EUROFIT test: European Test of Physical Fitness, the Motor Fitness Test (Adam et al., 1988).

The above study:

- justifies the methodology used by us: presence of two groups, one working group, with which we carried out activities in the natural environment and one monitoring group, with which we did not carry out any activities.

In our case, however, the natural environment used was the school garden, as there was no forest near the school or more wild natural environment in which to carry out the project;

- justifies a correlation between free play in the natural environment and motor development of children, giving credit to our working hypothesis.

The study, in fact, shows that in nature children have more possibilities to experiment with their body, to move and therefore to improve their motor skills.

As for the test administered for data collection, in our case it is the TGM (test of gross motor skills), as the EUROFIT test seemed to us inappropriate for the selected target. The second study allows us to further confirm the hypothesis that activities in the natural environment can also bring benefits in the field of motor skills to preschool children, coinciding with the target selected by us.

In this case it is not only a matter of spontaneous play activities to be carried out in the natural environment, but also of activities designed both for the outside and for the inside of the school building.
We can therefore count on the effectiveness of that continuity that we have carried out in our project, between inside and outside the school.

As for the third study, this leads to justify our choice to let children play freely in the school garden.
As the authors point out, certain special conditions stimulate and influence the motor game of children: attitudes of educational staff towards conflicts and physical risk, age and gender of pupils, use/ non-use of tools/ toys and spaces available to pupils. In particular, it is emphasized that, in the observation of spontaneous play, children of 5 years demonstrate a natural tendency to implement motor behaviours such as: running, climbing, sliding, manipulating, jumping, throwing. Considering therefore the study, it appears scientifically proven how spontaneous play in the natural environment can stimulate the motor activity of children, and we convinced, can bring benefit and improvement.

In this way we also justify the choice of the TGMD test, as in the natural environment children are spontaneously led to carry out all those big motor movements that we considered as possible elements of improvement thanks to contact with nature.

**Material & methods**

***Participants:***

42 children from the preschool on Togliatti street in Pesaro:
- 22 children of 5 years in the working group, with whom the research was carried out;
- 20 children aged 4-5 years in the control group did not carry out any outdoor activities.

***Method:*** pre-test and post-test to both research groups (work group and control group) to compare the effect of activity in the natural environment carried out over eight months, to the evolution of the movement of children aged 5 years. The test used is the TGMD, Test of Gross Motor Development, chosen as considered suitable for our research criteria and for the target taken into account.

***Procedure:*** before proceeding with data collection we contacted the school selected for the research.

The details are presented to the teachers and to the headteacher, clarifying the purpose and agreeing methods and timing. Once the consent is received, the project is shared with the parents requesting their collaboration and membership through insurance and personal data processing forms.
Pre-test (in November) through the administration of the TGMD test, both to the working group and to the control group, to determine the starting scores of children in gross motor skills.

Implementation of the project “Natural-mente” (Naturally), lasting 8 months, only with the working group, and finally again both classes at the post-test (in June).

The tool used for our survey, which will provide us with the necessary data for statistical analysis, is the TGMD test for assessing gross motor skills. «Williams (1983) defines gross motor development as “the progressively more and more skilful use of the totality of the body in an activity involving large muscle groups and requiring spatial and temporal coordination of the simultaneous movement of various body segments”.» (Ulrich, 1992/2002, p.10) It is an individual test that evaluates gross motor function of children aged 3 to 10 years; it measures 12 gross motor skills that are frequently taught to preschoolers and early primary school classes. The abilities are grouped into two sub-tests, each of which evaluates a different aspect of the gross-motor development: locomotion and object control.

The locomotion sub-test includes 7 skills (item): running, galloping, high jump on the same foot, forward jump, long jump from stationary, forward and side skips.

For each item there are criteria for the execution of movements, observable by the person administering the test, which allow to focus on specific aspects of the movement. The object control sub-test includes 5 skills (item): hitting the ball with a tennis racket, bouncing and catching a ball, taking the thrown ball with hands, kicking the ball and throwing the ball with one hand. Also in this case for each item there are some execution criteria observable by the administration. Each pupil carries out three tests for each item, which will be awarded a score: 1 if the execution is correct, 0 if it is incorrect. In this way, the raw score is obtained for each child, derived from the sum of the scores attributed by the investigator to the sub-tests "locomotion" and the sub-tests "object control". Then by raw scores, through the use of the grids present in the test, are obtained the scores in percentages and standard scores; the latter will add up and, through the normative grids considering the age of the children, we get the QSGM (gross motor development quotient) for each person participating in the test. Finally, we used the values of the 1st QSGM (obtained from the pre-test) and the 2nd QSGM (obtained from the post- test) as two variables within the statistical analysis carried out to achieve the actual motor skills improvement of children. The TGMD test was considered suitable for our research as:

- suitable for selected age target;
- accessible to a large number of operators;
- simple administration;
- suitable to investigate our object of research, as the gross-motor skills are widely put into action by children in a natural context and we assume are the most stressed in this environment;
- usable as a research tool.

***Results:***

The variables used are: age, 1st QSGM, 2nd QSGM; control improvement, work improvement; sport, weight improvement L, weight improvement C.

- Age: 4-5 years
- 1st QSGM and 2nd QSGM: these are the gross motor development quotients, obtained from the two tests carried out on children of both groups in two different time periods (November and June).
- Control and work improvement: are two dummy variables (dichotomous variable, that is, a variable that assumes value 0 or 1, depending on whether a given condition is met or not) that assume value 0 when there was no improvement, 1 otherwise. In our survey, these variables (improvement control and improvement work) correspond to the possible improvement given by the positive difference between the result of the 1st QSGM and the 2nd QSGM. We can find it in tab.1 and tab.2 in the fourth column. For each subject it was assumed value 1 or 0 based on the presence or not of improvement of the gross motor quotient. A comparison was therefore made for the possible negative or positive difference of these two values of the two tests under consideration (1st QSGM and 2nd QSGM).
- Sport: the sport variable is a dummy that assumes value 1 if the child does sport, 0 otherwise and has been included in the survey as it is interesting to investigate the possible contribution to the improvement of the QSGM indicator.
-Improvement Weight W and C: variable obtained from the product between 2nd QSGM and improvement, because we wanted to assign, to the main variable of our study 2°QSGM, a positive or negative weight based on the presence or absence of improvement in the subject.

***Data analysis:***

the analysis performed for the experimentation was processed through the SPSS (Statistical Package for Social Science) program for Windows.

Table 1 contains the data for the control group, Table 2 for the working group, showing the values of the measures takeninto account.

| ID | 1°QSGMC | 2°QSGMC | ImprovementC | SportC | Improvement weightC |
|---|---|---|---|---|---|
| 1 | 115 | 91 | 0 | 0 | 0 |
| 2 | 124 | 136 | 1 | 1 | 136 |
| 3 | 88 | 85 | 1 | 1 | 85 |
| 4 | 139 | 118 | 0 | 0 | 0 |
| 5 | 142 | 124 | 0 | 0 | 0 |
| 6 | 136 | 106 | 0 | 1 | 0 |
| 7 | 115 | 118 | 1 | 0 | 118 |
| 8 | 145 | 112 | 0 | 0 | 0 |
| 9 | 133 | 127 | 0 | 1 | 0 |
| 10 | 121 | 112 | 0 | 1 | 0 |
| 11 | 115 | 109 | 0 | 1 | 0 |
| 12 | 106 | 85 | 0 | 1 | 0 |
| 13 | 112 | 91 | 0 | 0 | 0 |
| 14 | 100 | 88 | 0 | 1 | 0 |
| 15 | 121 | 124 | 1 | 1 | 124 |
| 16 | 115 | 115 | 0 | 0 | 0 |
| 17 | 115 | 118 | 1 | 1 | 118 |
| 18 | 121 | 106 | 0 | 1 | 0 |
| 19 | 91 | 82 | 0 | 0 | 0 |
| 20 | 142 | 115 | 0 | 1 | 0 |

Table1

| ID | 1°QSGML | 2°QSGML | MiglioramentoLavoro | SportLavoro | Peso Miglioramento L |
|---|---|---|---|---|---|
| 1 | 115 | 115 | 0 | 0 | 0 |
| 2 | 76 | 91 | 1 | 1 | 91 |
| 3 | 121 | 136 | 1 | 1 | 136 |
| 4 | 127 | 136 | 1 | 1 | 136 |
| 5 | 118 | 124 | 1 | 1 | 124 |
| 6 | 115 | 106 | 0 | 0 | 0 |
| 7 | 67 | 82 | 1 | 0 | 82 |
| 8 | 112 | 109 | 0 | 0 | 0 |
| 9 | 88 | 109 | 1 | 0 | 109 |
| 10 | 133 | 115 | 0 | 1 | 0 |
| 11 | 115 | 118 | 1 | 1 | 118 |
| 12 | 112 | 100 | 0 | 1 | 0 |
| 13 | 136 | 112 | 0 | 0 | 0 |
| 14 | 112 | 118 | 1 | 0 | 118 |
| 15 | 118 | 124 | 1 | 0 | 124 |
| 16 | 112 | 106 | 0 | 0 | 0 |
| 17 | 112 | 118 | 1 | 1 | 118 |
| 18 | 109 | 112 | 1 | 1 | 112 |
| 19 | 115 | 112 | 1 | 1 | 112 |
| 20 | 94 | 121 | 1 | 0 | 121 |
| 21 | 88 | 106 | 1 | 1 | 106 |
| 22 | 118 | 112 | 0 | 1 | 0 |

**Table2**

In the first column we look at the identification of children; following in order the following variables: 1st QSGM, 2nd QSGM, control and work improvement, sport, weight control and work improvement.

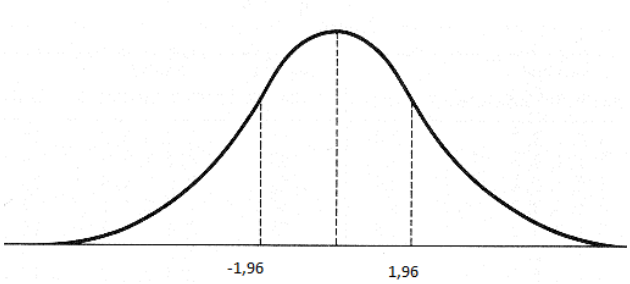
Our goal is to study the significance of the variables under consideration using multiple linear regression. The multiple linear regression is a technique used to analyse a set of data involving one dependent variable and two or more independent variables: the aim is to estimate a possible functional relationship between the dependent variable, which in this research is 2nd QSGM, with the independent variables which are: 1st QSGM, Sport, Improvement of both control and working group and Weight of improvement in control and working group. Being the dependent variable a value to predict, the variable 2nd QSGM was chosen, that is the result obtained from the second test after eight months of work.

Our intent is to go to verify if there has been an actual improvement of the children of the working group whoparticipated in the project "Natural-mente"; that there is consistency in the improvement of the second administration of the test (i.e. value of the 2nd QSGM > 1st QSGM).

The remaining variables are the independent ones, which have influenced and determined the value of the 2nd QSGM. As for significance, it is a value, called p-value, which indicates the probability of a given result occurring. In our analysis p-values correspond to the values of the significance of the variables taken into account. An alpha α (threshold value) must be placed to assess the significance of the treated variables.

There are several levels of significance, including 0.001, 0.01, 0.05 and the preferred one for analysis is $\alpha = 0.05$. If the value assumed by the variable is less than the threshold value (α), then the variable is significant.

A further way to study the significance of the different factors that make up our linear regression is the observation of the value of the standardized normal distribution. Looking at *figure 1*, if our coefficients fall into the acceptance zone between the values -1,96 and +1,96 (called theacceptance zone) they are not considered significant; otherwise, if they fall outside the acceptance zone, they areconsidered significant.



In addition to the linear regression analysis we wanted to study the coefficient of determination, (more commonly R2), which is used to measure the goodness of fit of the regression model to the data we are studying and allows us to understand to what extent the independent variables are able to explain the variability of the dependent in the data that we are analysing.

In other words, allows us to understand if the independent variables of our analysis are able to predict the value of the dependent variable that, as the word says, it is not independent but depends on the values of the independent variables, which help us to understand and interpret the dependent variable.

The interpretation of R squared is as follows:

R squared < 0.3 means zero or very low
R squared between 0.3 and 0.5 means low
R squared between 0.5 and 0.7 means moderate
R squared > 0.7 means high

***Results:***

below are the results obtained from the multiple linear regression and the Chi-Square test for the control group and the working group.

1. **Control Group**

**COEFFICIENTS[a]**

Table 3

| Model | | non-standardized coefficients | | standardized coefficients | t | Sign. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Costant) | 17,980 | 16,140 | | 1,114 | 0,283 |
| | 1° QSGM | 0,708 | 0,129 | 0,725 | 5,471 | 0,000 |
| | Improvement C. | -38,092 | 28,077 | -1,064 | -1,357 | 0,195 |
| | SportControl | 1,787 | 3,798 | 0,056 | 0,471 | 0,645 |
| | Improvement weight C. | 0,475 | 0,234 | 1,564 | 2,029 | 0,061 |

**a.dependent variable: 2°QSGM**

The dependent variable corresponds to the 2nd QSGM and the corresponding independent variables are 1st QSGM, sportControl and Improvement weight C.

We give importance to the significance of the variables “Control improvement”, “Sport Control” and “ImprovementWeight C” as we want to check the motor improvement of children in the control class who did not participate in the project “Natural-mente” and to study a possible influence of the Sport factor.

Given an alpha significance level set equal to 0.05, so the null significance hypothesis is rejected if the significance of the variable is less than 0.05. Looking at the last column named "Sign." in Table 3, the following statements can be concluded:

- Improvement C.: it is not significant for a value of 0.195 (> 0.05) so it can be assumed that there was no improvement in the control group;
- Sport Control: it is not significant for a value of 0.645 (> 0.05) so it can be assumed that the practice of a sports

activity has no influence on the improvement;

- Improvement weight C: it is not significant for a value of 0.06 (> 0.05), consistent with the significance of the variable "Control Improvement".

As reported earlier, the same solution can be derived looking at the column "t" of Table 3 where are indicated the values of the standardized Normal distribution in which, for the significance of the variable, its value must be outside the zone of acceptance [-1.96, + 1.96] defined by the curve (see figure 1).

| | | |
|---|---|---|
| Control improvement | **-1,357** | -1,96 < X < +1,96 |
| Sport Control | **0,471** | -1,96 < X < +1,96 |
| Improvement weight C | 2,029 | -1,96 < X < +1,96 |

The values"Control improvement" and "Sport Control" fall within the acceptance zone so they are not considered significant. With regard to the variable "Improvement weight C", its value is approximately within the significance zone; in fact, it is consistent with the value of the significance which corresponded to 0.061 in Table 1, therefore slightly higher than $\alpha = 0.05$.

We can in any case consider it not significant in relation to the results obtained. Reported below is a brief analysis on the goodness of the control group model via the R-squared index that assumes a value between 0 and 1. We get the following result:

**Model Summary**

Table 3.1

| Model | R | R-square | R-square adapted | std. error of estimate |
|---|---|---|---|---|
| 1 | 0,892[a] | 0,796 | 0,742 | 8,079 |

a.Predictors: (costant), iterationControl, 1°QSGMC, sportControl, Improvement Weight C.

The R-squared index is approximately 79%, so the goodness of adaptation of the regression model to the data is apparently high. This is due to the fact that having 1 significant variable and 3 not significant, one of which is close to the threshold of significance, the model perceives that these two variables (1st SQGM and weight improvement C) are able to explain fairly the variability of our dependent (2nd QSGM).

This can be explained by referring to the fact that there may be mechanisms that we cannot interpret and see within our analysis.

1) **Working group**

**COEFFICIENTS[a]**

Table 4

| Model | | non-standardized coefficients | | standardized coefficients | t | Sign. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Costant) | 107,054 | 3,830 | | 27,953 | 0,000 |
| | 1° QSGMW | 0,021 | 0,032 | 0,049 | 0,667 | 0,514 |
| | ImprovementW | -107,005 | 8,086 | -4,239 | -13,234 | 0,000 |
| | SportW | -0,606 | 1,580 | -0,025 | -0,384 | 0,706 |
| | Improvement weightW | 0,985 | 0,067 | 4,574 | 14,779 | 0,000 |

**a.dependent variable: 2°QSGM**

Following the control group, the same analysis was repeated for the working group.

In this case our intention is to observe that the variables concerning improvement are significant because the working class participated in the project “Natural-mente” and was therefore exposed to the natural environment.

The interpretation of Table 4:

- Improvement W.: is significant for a value of 0.000 (< 0.05) so it can be assumed that there has been an improvementin the working group;
- Sports Work: is not significant for a value of 0.706 (> 0.05) so it can be assumed that the practice of a sports activity hasno influence on the improvement;
- Improvement weight W: is significant for a value of 0.000 (< 0.05), consistent with the significance of the variable "work improvement".

Also this time the same solution can be obtained, looking at the column "t" of Table 4 and referring again to fig.1.

| | | |
|---|---|---|
| Work improvement | -13,234 | -1,96 < X < +1,96 |
| Sport Work | **-0,384** | -1,96 < X < +1,96 |
| Improvement weight W | 14,779 | -1,96 < X < +1,96 |

The variables "Work Improvement" and "Improvement weight W" are related to each other and in fact may be seen from their values that they are both in the area of significance and their position leads us to affirm that both variables are significant, when distant from the zone of acceptance defined by the curve.

In the working group Sport is again not significant, so it can be seen as an irrelevant factor for the analysis.

Table 4.1 shows the index of the R-squared.

**Model Summary**

Table 4.1

| Model | R | R-square | R-square adapted | std. error of estimate |
|---|---|---|---|---|
| 1 | 0,971[a] | 0,944 | 0,930 | 3,280 |

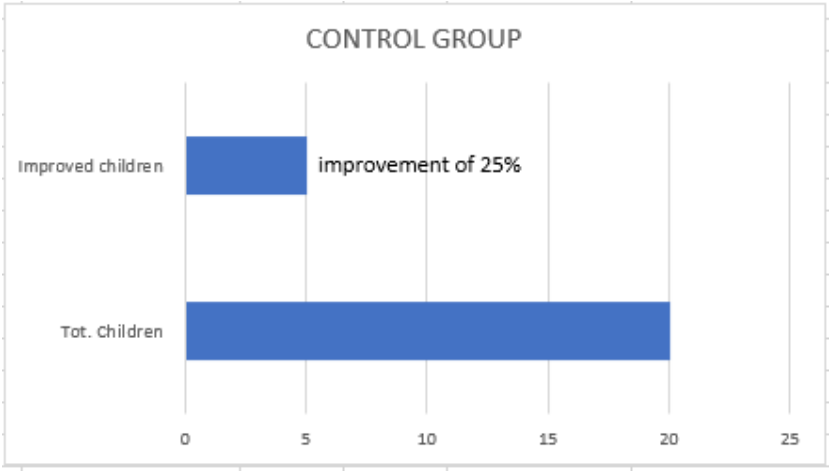
a.Predictors: (costant), iterationWork, 1°QSGMW, sportWork, Improvement Weight W.

The R-squared is approximately 94%, which indicates a very high adaptation to the data since the maximum level that the R-squared index can take is 1. So we can say that the goodness of adaptation to the data is high and there is correlation between the independent variables and the dependent one.

**Discussion**

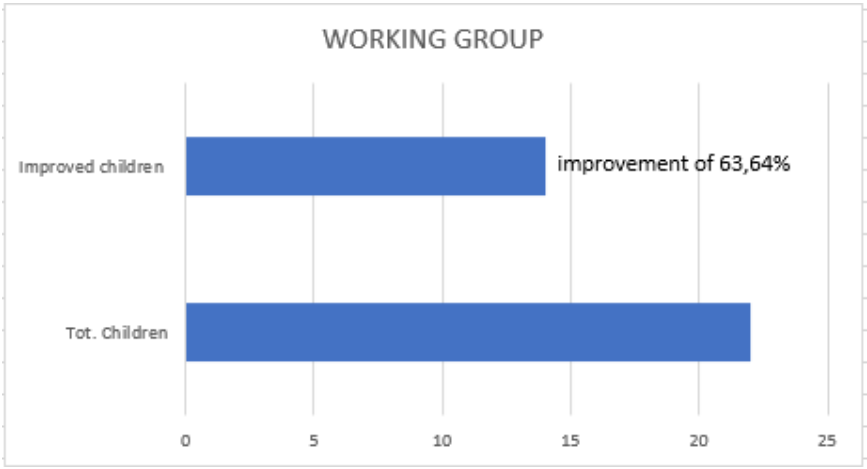
The purpose of this study is to determine if the learning activity prolonged, carried out in a natural environment can bring benefits and improvements at the motor level in children aged 5 years compared to subjects of the same population that provide educational activities within the school building.

The results lead us to say that the work done outside the classroom positively affects the results of the TGMD test. In fact, we can see through the analysis carried out with the multiple linear regression, that the working group had a significant improvement of the gross motor skills investigated through the administered test. Speaking in terms of percentages, we report below the % improvement of the two classes that were given the test.




Considering the control class, as we can see in graph 1, the number of children improved is 25%, that is, 5 out of 20 total.

As far as the working class is concerned, we refer to graph 2. We can see that the improved children are 63.64% of the total of 22; also we see that the actual number of children who have made an improvement from the first to the second administration, is 14.




**Conclusions**

These results show that exposure and activities in the natural environment benefit children of preschool age on the motor level.

While in nature, they use their body to experiment movements and actions, resulting in physical development and improvement; which are usually not solicited and overlooked in the classroom.

far as the control group is concerned, although the model is well adapted, there has not been a significant improvement in children, as they have not acquired the necessary skills to improvetheir physical abilities.

However, it should be noted that the control class, although it did not participate in the project, reported results that were not extremely negative, and this can be due to several factors:
- as the work group did, the control group dedicated one hour per week to physical activity throughout the whole school year;
- the control group used the school garden as well, even if more rarely and with different methods;
- it was a heterogeneous class, so there were also 4-year-olds, i.e.children younger than the sample average.

We would also like to point out that in the analysis we did not take into account the children's physical growth during the eight-month study period (therefore, we do not know if it could have enhanced the improvement) nor their gender.

As far as sport is concerned, it had no significant impact on the test results of both groups. Moreover, we highlight that only half of the sample carried out sport activities, therefore our model did not take these into account.

Taking the class of work and the R-squared value into account, it is evident that the project has achieved the expected results, obtaining 94% accuracy of the model.

The factors we considered were useful to carry out our analysis and to obtain positive results, which show that educational activities and free/spontaneous play in the natural environment can help5-year-old children develop and improve their motor skills, especially those examined with the TGMD test (gross motor skills). We are aware of the fact that our sample was small and that if the analysis had been carried out on a larger population, results may have been more valid and reliable. Nevertheless, we confirm the reliability of the sample and the fact that we have found effective improvements in children's motor skills.

We would also like to highlight that the results obtained suggest that if the project had not taken place in a limited time span but was part of the daily school programme and if it was possible to use less structured and wilder areas, such as the woods, the final results may have been even more interesting and valid, thus further proving our hypothesis.

Furthermore, the use of the school garden does not allowsome movements and motor challenges, such as climbing trees or finding steep ground to walk on. These motor patterns could instead be encouraged in the natural environment. The elements above could be considered as limits with respect to our research; yet we aimed at involving children who were used to the traditional school method in a new stimulating experience, thus allowing them to have a taste of Outdoor Education. We would also like to stress that cooperating with teachers was not always easy, since they are still often reluctant to go outside their "comfort zone" and they are often afraid ofchildren's possible movements and of weather conditions, in particular during winter.

Indeed, it often happened that, due to the cloudy sky or tolow temperatures, they did not allow us to carry out any of the activities planned for the morning, thus depriving children of the possibility to enjoy the school garden in a different way and preventing the project from being carried out as planned.
This aspect is particularly significant, given that teachers should be the first in line to seeeducational opportunities and the potential offered by nature.

Often children are ready to change, to get involved, while teachers show less excitement for different reasons, e.g. for fear, thuspreventing their students fromputting themselves to the test, from experimenting with the world firsthand and fromgoing through meaningful experiences that can enhance their own growth.

This is the most burdensome limit of experimentation and, in general, of the education of current generations. «Seefeldt and Haubenstricker (1982) note that when subjects are not yet able to master adequate performance levels in terms of fundamental gross-motor skills and patterns, they encounter obstacles that can reduce their learning potential in many other advanced abilities, even in areas that do not relate to sports». (Ulrich, 1992/2002, p.14).

It is therefore necessary to start from body and movement, to obtain good motor patterns and a positive self-image in order to encourage the child to keep learning, thus making the natural environment an educational and essential didactic resource.

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