Teaching research focused on physical activities in italian primary school: the use of technological instruments for the assessment.

Teaching Research Focused on Physical Activities in Italian Primary School: The Use of Technological Instruments for the Assessment

Maurizio Sibilio, Prof., PhD, University of Salerno, Italy

maurizio.sibilio@libero.it

Claudio Macchi, Assoc. Prof., MD, PhD, University of Florence & Don Gnocchi Foundation, Italy

macchiclaudio@libero.it

Raffaele Prosperi, PhD Student, University of Enna "Kore", Italy

rprosp@alice.it

Antinea Ambretti, PhD Student, University of Salerno, Italy

anti1982@libero.it

Gaetano Raiola, PhD Student, University of Salerno, Italy

gaetanoraiola@libero.it

Paola Aiello, PhD Student, University of Salerno, Italy

paiello@unisa.it

Nadia Carlomagno, Researcher, University "Suor Orsola Benincasa", Italy

nadiacarl@libero.it

ABSTRACT:

The physical and sports activities in Italian primary school are configured as physical activities that do not require intense efforts, inadequate to the educational context and its objectives.

Therefore, when they are not conducted with appropriate methodological approaches, can be potentially dangerous even in the absence of adequate medical checks that are not currently required by the Italian law.

For this reason it is essential to provide adequate training to teachers to acquire a knowledge of the best teaching methodological approaches aimed to achieve the objectives set out in the ministerial educational documents, while promoting awareness of the effects of physical and sports activities among students.

At the same time, the focus on procedures and assessment tools to promote quality teaching of motor activity at an international level (Hay, 2006) has imposed a necessary testing of the instruments not traditionally used in school contexts but that, for their characteristics of handling and measurement accuracy (Jakicic, 2004; Arvidsson, 2007), are valid aids in verifying the results of the adopted methodologies.

The aim of this research was to verify teachers' awareness of the effects of a laboratorial physical education lesson based on light exercises (lasting 15 minutes ± 5 minutes) through a comparison of the pre-defined values of energy expenditure supposed by the teachers and the real values obtained using the calorimeter.

The results have suggested that the teaching methodologies are not suitable for the teaching of light physical activities such as warming up. They also show that the performed activities, although described as "light" and "non-competitive", should require a further medical examination such as "effort test" used for specific sports and fitness competitions.

KEYWORDS: **physical activities, assessment, teaching methodology, energy expenditure, technological instruments.**

Physical activity and sports participation during childhood and adolescence produces psychological and physical wellbeing, reduces cardiovascular diseases risk factors, adiposity, while fostering a healthy bone development (Biddle et al., 2004; Strong et al., 2005).

The scientific literature on this matter recommends that school-age youth should participate in 60 minutes of moderate to vigorous physical activities that should be sufficiently varied to ensure the mental well-being through the personal enjoyment (Seghers et al., 2009). Although individual factors have a significant role in determining its effectiveness, it nonetheless appears to be influenced by environmental and cultural factors that strongly influence the subjective choices and social and educational policies in favor of an increase in quality and quantity of physical activity even in formal educational contexts.

In most European countries, physical education is mandatory and part of the educational curriculum and, particularly in Italy, it is considered to be one of the factors contributing to the general wellbeing of the person.

Not surprisingly, the latest Guidelines of the Italian Ministry of Education in September 2007 in the section on "Body, Movement and Sport" stated that physical activities and sports contribute to the

" ... need to take care of one's own person and his/her wellness. In particular: feeling good with oneself refers to the need that in the curriculum about *movement education*[1] should be defined the educational experiences that lead to healthy lifestyles and healthy". (Guidelines, 2007).

Specifically, as regards as the targets for skills development identified in the Italian Ministerial documents is expected that the student who attends primary school, in the first three years, will be able to acknowledge "some basic principles relating to his/her mental and physical well-being related to the care of his /her body , while in the fourth and fifth years will be able to "recognize the relationship between diet, exercise and health, taking appropriate behaviors and healthy lifestyles" (Guidelines, 2007).

[1] In Italy the Italian National Programs of the primary school, from those issued in 1985 up to the National Directions of 2007, assert the new meanings of corporeity, movement and sport through a terminological evolution. The traditional expression "physical education" still used in many European countries, has been replaced by "movement education".

To achieve these aims, Italian primary school (attended by children aged from 5 and six months to 11) includes movement activities since the first class year and the Decree of the President of the Republic no.403 (20.10.1993), Article no.10, requires that the medical doctor, with a certificate valid for one year, authorizes the practice of non-competitive sport at school.

The medical children examination does not includes effort testing or other more specific surveys to check for any contraindications to physical exercise intensity. The physical and sports activities in Italian primary school are configured as light physical activities that do not require intense efforts, inadequate to the educational context and its objectives.

Therefore, when they are not conducted with appropriate teaching methodological approaches, can be potentially dangerous even in the absence of adequate medical checks that are not currently required by law. Physical activities in the Italian primary school should also support the construction of a real mental and physical wellbeing, the gradual awareness among students of the effects of the movement, of the benefits and contraindications of a vigorous practice, provided by an increasing high quality teaching.

For this reason it is essential to provide adequate training to teachers to acquire a knowledge of the best teaching methodological approaches aimed to achieve the objectives set out in the ministerial educational documents, while promoting awareness of the effects of physical and sports activities among students.

In fact, university curriculum for teachers of Italian schools aimed at the academic qualification of teachers of infant and primary school started only in 1998 when, with the Ministerial Decree 05.26.1998 (03.07.1998 G.U.) No 153, with the establishment of the Degree course in Sciences of Primary Education, for the first time was paid attention also to the potentialities of the movement education in contributing to the physical and mental wellbeing of students (Sibilio & Gomez Paloma, 2004).

The new model of university education, proposed by the Ministerial Decree in 1998, has placed new emphasis on the need for a greater specialization in the teaching of physical activities during childhood and adolescence, including in the degree sports and motor disciplines, exercises, training courses and training workshops, which for the first time have represented a privileged and indispensable area for the qualification of the university curricula of the will-be teachers.

Only recently an educational reform envisages a course of five years for the training of the will-be primary school teachers also defining a standard number of credits required for the motor field.

Despite the attention paid to these aspects and to the importance of teaching methodologies to be acquired in training laboratorial university activities, in the definition of the portfolio of teachers skills, there is still a clear need to combine theory and practice.

This has led to conduct researches aimed at defining the training needs of teachers who still seem to apply inappropriate teaching methodologies in the sports and motor field in many cases characterized by an absolute lack of knowledge of the physiological effects produced on students.

At the same time, the focus on procedures and assessment tools to promote quality teaching of motor activity at an international level (Hay, 2006) has imposed a necessary testing of the instruments not traditionally used in school contexts but that, for their characteristics of handling and

measurement accuracy (Jakicic et al., 2004; Arvidsson et al., 2007) are valid aids in verifying the results of the adopted methodologies.

Aim

In line with the proposed scientific rationale, the purpose of this research was:

- ✓ to verify teachers' awareness of the effects of a laboratorial physical education lesson based on light exercises (lasting 15 minutes ± 5 minutes) through a comparison of the pre-defined values of energy expenditure supposed by the teachers and the real values obtained using the calorimeter.

In particular, to assess the competence of teachers in terms of:

1. knowledge of the values of energy expenditure of the proposed motor activities;

2.consistency between the values estimated by teachers and those actually measured during the activities.

Methods

PHASE I

The research methodology has included a first phase, in which have been gathered from 22 teachers their estimated values of students' average energy expenditure, (taking into account the weight of each student), during a light physical activity lasting 15 ± 5 minutes.

The teachers have all indicated their estimated values of the energy expenditure related to predefined weight ranges by indicating the corresponding value in a grid.

PHASE II

The second phase, the experimental one, has required the detection of the energy expenditure of 178 pupils from 11 primary school classes during the proposed light motor activities lesson held in each class, following the instructions given simultaneously by two teachers.

PHASE III

1. Description with graphs and tables of the results of the previous two phases, class by class;

2. Inferential data analysis: for each type of class it has been compared the average estimated values with the average standard and the actual measured average valued. (All these values are in METs.).

CLASS GROUP	Number of Students
First year class	36
Second year class	28
Third year class	33
Fourth year class	43
Fifth year class	38

The hypothesis of the statistical analysis were the following:

1. For the study of the competence of teachers about the estimation of the energy expenditure

- ✓ **Null Hypothesis H_0: $\mu_{esti} = \mu_{stand}$** (average value estimated by the teachers the same as the standard required).
- ✓ **Alternative hypothesis H_1: $\mu_{esti} \neq \mu_{stand}$** (average value estimated by

teachers different from the standard required).

2. For the study of teachers' competence in the execution of the requested task and for the consistency between the estimated values and those actually consumed by students.

- ✓ **Null Hypothesis H0: $\mu_{esti} = \mu_{meas}$** (average value estimated by the teachers the same as the measured).
- ✓ **Alternative hypothesis H1: $\mu_{esti} \neq \mu_{meas}$** (average value estimated by teachers different from measured).

The verification of this hypothesis was made with the two tailed Student test for paired data (dependent samples), given the bilateral nature of the alternative hypothesis.

The value of reliability of the test was set at α = 99%.

Instruments

The table given to teachers for the prediction of students' average energy expenditure during the proposed light motor activities (lasting 15 ± 5 minutes) is the following:

CLASS YEAR _____

	Estimated Energy Expenditure for 15 ± 5 minutes during light motor activities in kcal																
Students weight range in kg	30-45	45-60	60-75	75-90	90-105	105-120	120-135	135-150	150-165	165-180	180-200	200-220	220-240	240-270	270-300	300-330	330-360
20-30																	
30-35																	
35-40																	
40-45																	
45-50																	
50-55																	
55-60																	
60-65																	
65-70																	
70-75																	
75+																	

For every row please put a cross in the column referring to the related estimated energy expenditure

Throughout the period of the performed activity, it has been applied to each student a calorimeter, the SenseWear Armband, a scientifically validated multi-sensor that measures the energy expenditure in calories (EE = Energy Expenditure) and in MET. It is

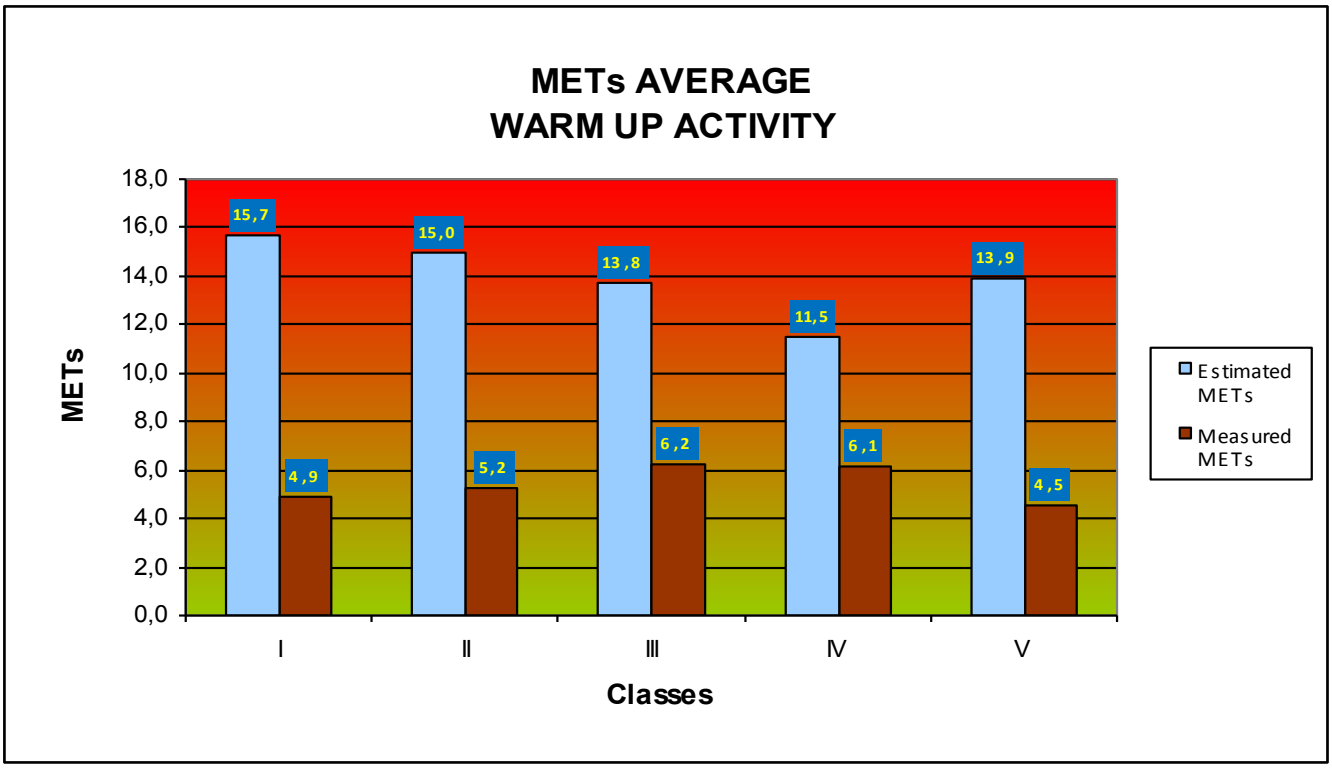
wearable on the rear triceps in a very comfortable position; it does not affect the monitoring for the sampling data on energy/calories consumed (calculated using a unique and patented algorithm).

Data collection

During the calorimetric data collection, initially, before the application of the measuring device, the student data (name, height, weight, age, sex) have been set.

Next, it was applied to each student the calorimeter that measured the values of energy expenditure during the performed motor activities, as well as the related Mets; the values provided by the software of the calorimeter have been incorporated into software for the statistical analysis.

From the estimated energy expenditure values the software has calculated and given outputs about the corresponding values of MET.

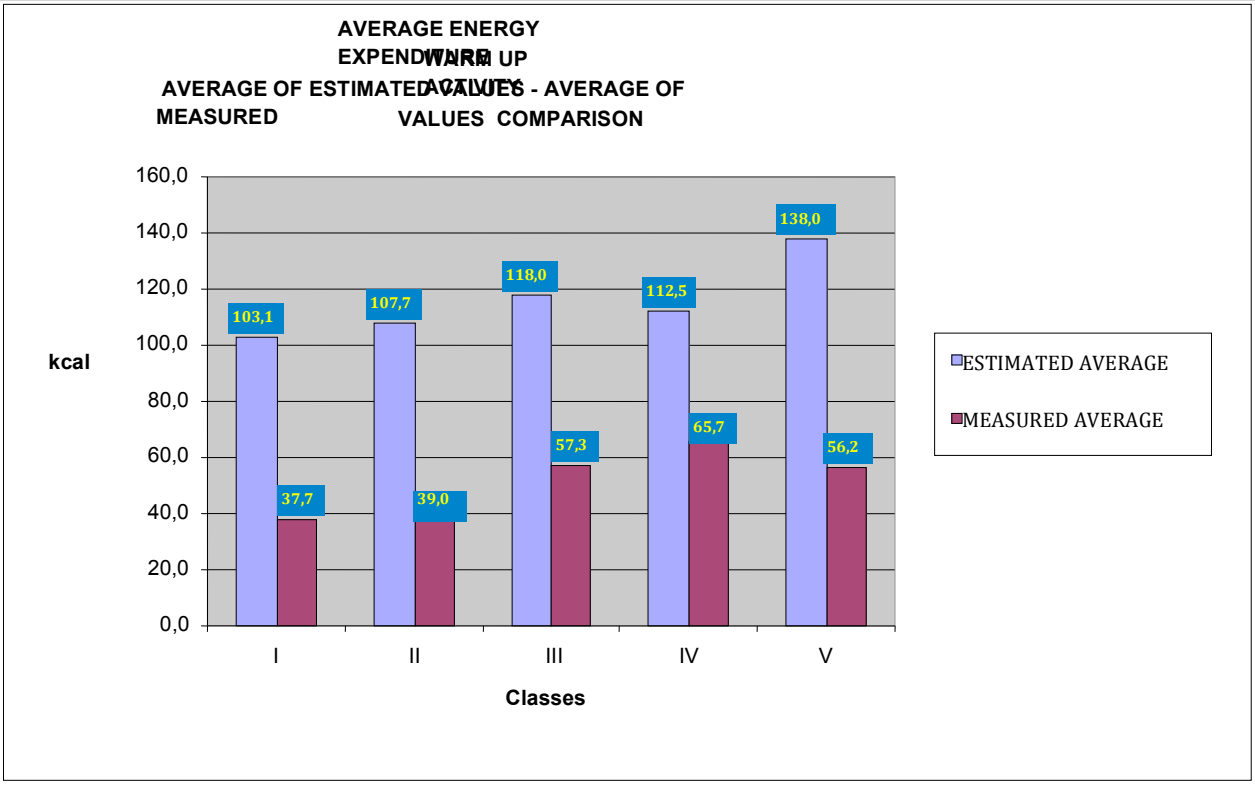


Data analysis

The teachers' responses were collected in a table, and the averages were calculated for each type of class.

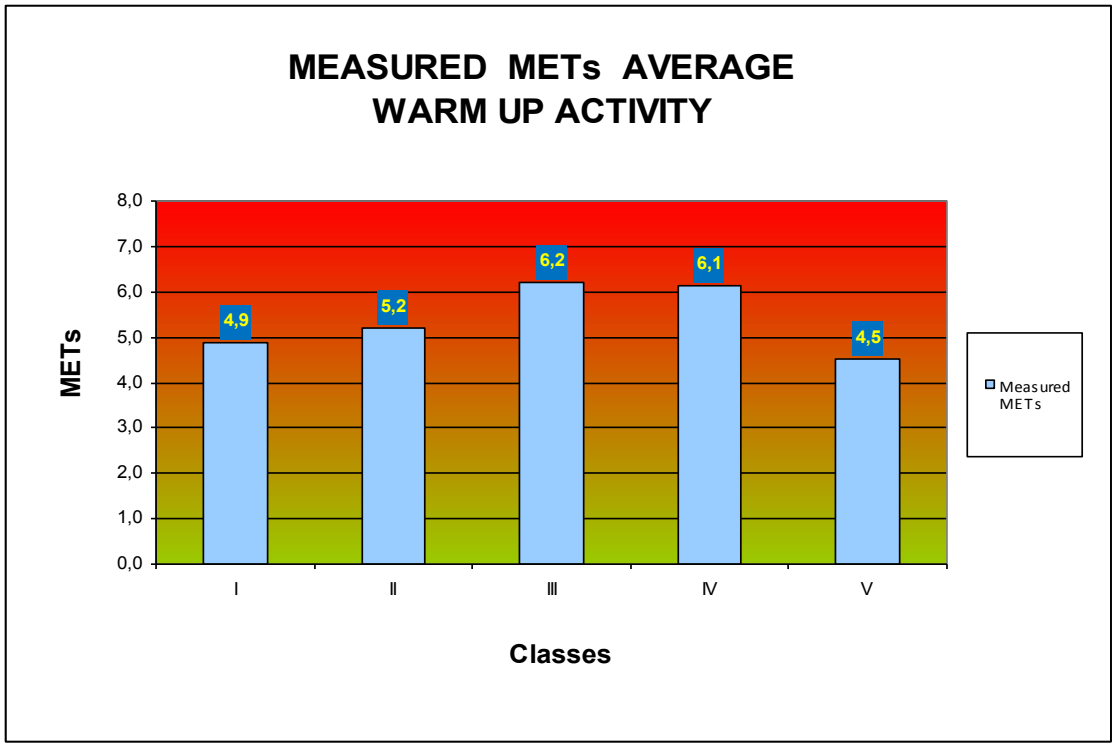
For each student the values of total energy expenditure and its related METs have been tabulated and, for each of the five types of classes corresponding to the related year course (I, II, III, IV, V), it was calculated the mean, the standard deviation and the coefficient of variation.

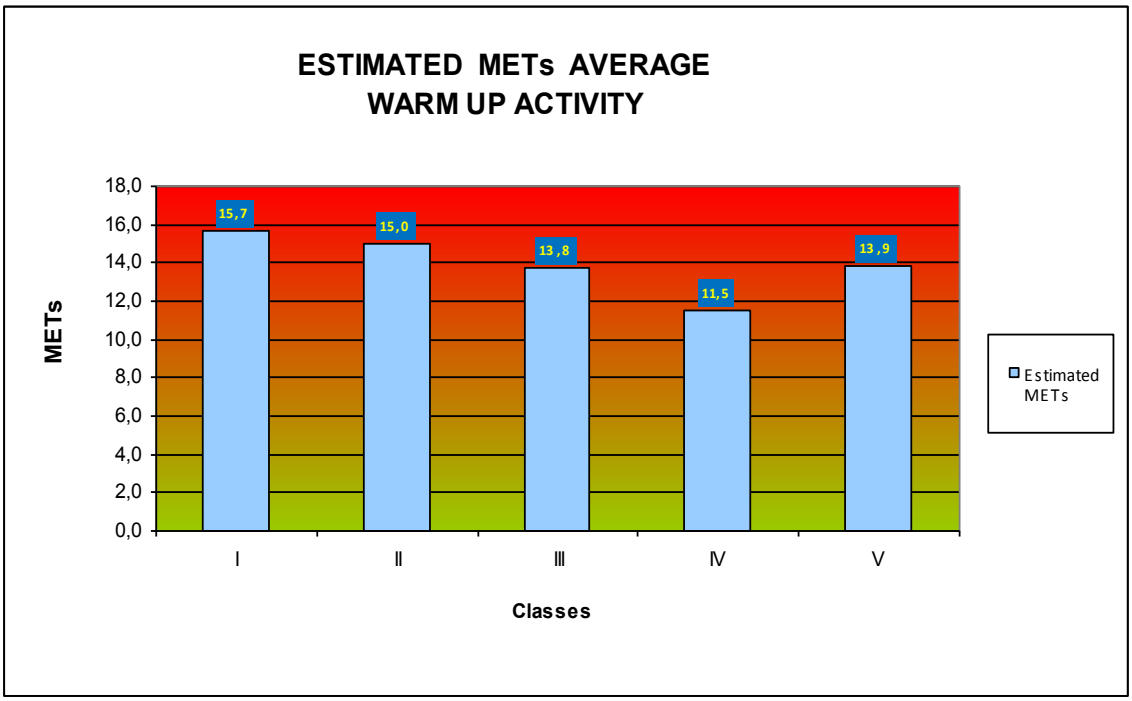
The chart below shows the comparison between the measured average energy expenditure (kcal) and the estimated one.

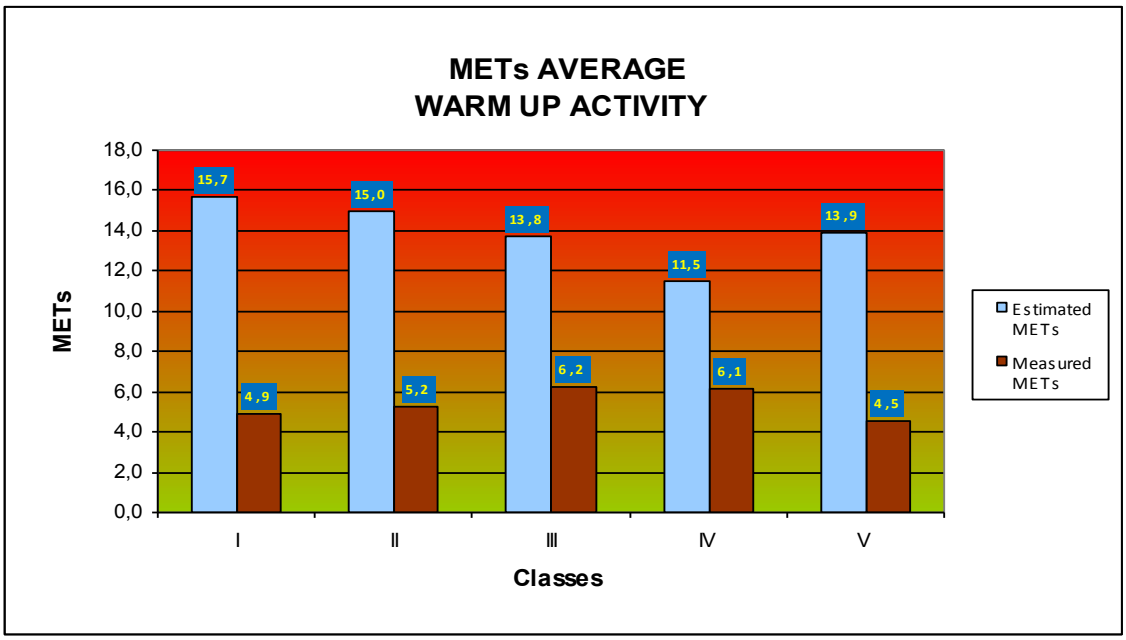


In terms of METs, the obtained global average value from the prevision of teachers was 13.82 MET, SD 2.78 (VC 0.20), the measured global average value was 5.41, SD 1.02 (VC = 0.19), while the standard is for such type of light activities, an energy expenditure below 4-MET.

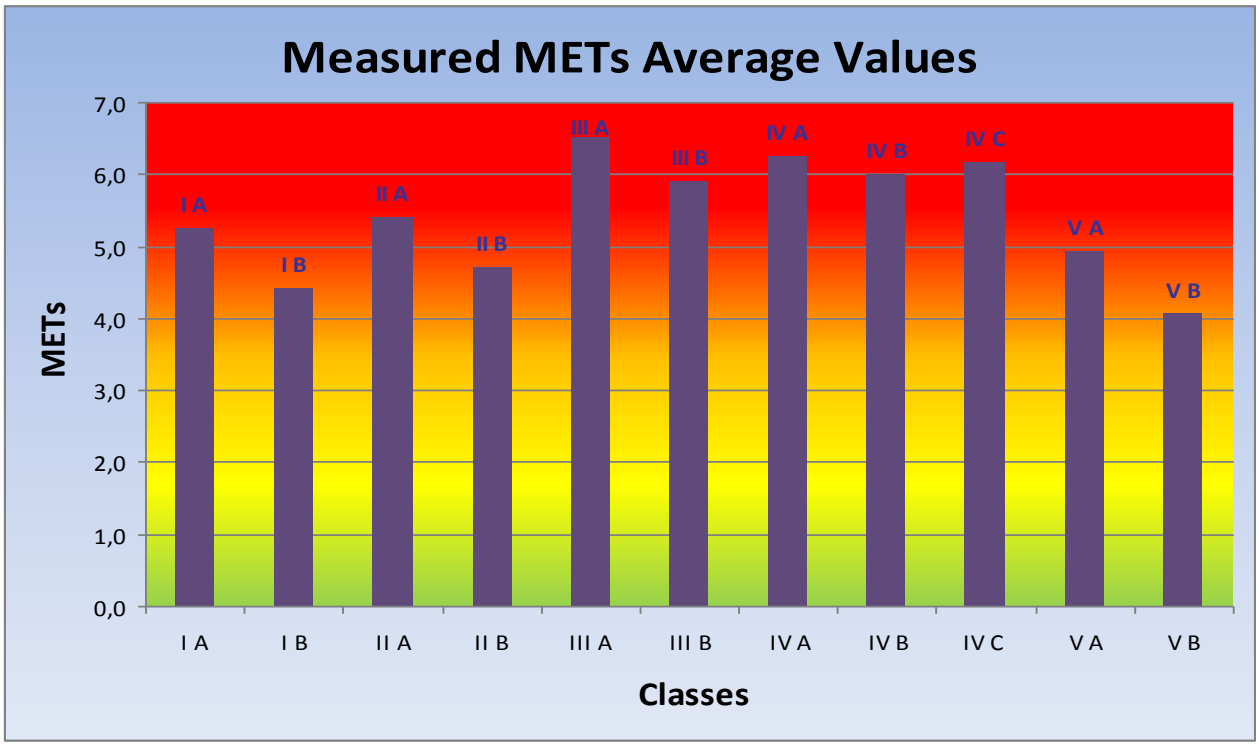
The following graphs show ,respectively, the average values of estimated MET, the average values of measured MET and the comparison between them.







In the next graph the average energy expenditure is shown for each class in terms of METs,(the classes of the same year were identified by adding the Roman numbers indicating the year (I, II, III, IV, V) a progressive letter in alphabetical order (A, B, C).



It has been applied, for each class, the analysis of variance comparing the actual data with the data given by the teachers in order to verify if there was any significant difference; then for each type of class it was considered the variance comparing the values given both by the individual teachers and from the group of teachers of each different class.

GROUP OF CLASSES	p-value	N	ESTMATED MEAN (kcal)	MEASURED MEAN (kcal)	Estimated MET	Measured MET
I	**6,1E-23<<0,0001**	35	**102,9**	**37,1**	**15,9**	**4,9**
II	**2,2E-22<<0,0001**	28	**107,7**	**39,0**	**15,0**	**5,1**
III	**2,6E-21<<0,0001**	33	**118,0**	**57,3**	**13,8**	**6,2**
IV	**5,6E-19<<0,0001**	43	**112,5**	**65,7**	**11,5**	**6,1**
V	**1,5E-27<<0,0001**	38	**137,0**	**56,2**	**13,9**	**4,5**

For each group of classes the probability values (p_value) are much lower than 0.0001, for this reason the null hypothesis is rejected and an error less than 0.01% can be made in accepting the alternative hypothesis, namely affirming that the average estimated values are significantly different (higher) than that of the measured values; both are also much higher than the standard values.

Discussion & Conclusion

From the analysis of the predicted values, ranging from standard and the actual values of energy expenditure it has been observed that:

1. teachers have predicted very different values in terms of MET;

2. the average values of the estimated energy expenditure was 13.82 MET, much higher than the standard values;

3. the average values of measured energy expenditure was 5.41 MET thus higher than the standard value;

4. the average values of estimated energy expenditure (MET 13.82) were much higher than that measured (5.41 METs) (p_value <0.0001);

5. for each group of classes (first, second, third, fourth and fifth), the average energy expenditure was significantly higher than that measured (p_value <0.0001).

The results suggest, therefore, to consider the teaching methodologies used by the teachers not suitable for the teaching of light physical activities such as warming up.

They also show that the performed activities, although described as "light" and "non-competitive," should require a further medical examination such as "effort test" used for specific sports and fitness competitions.

Furthermore, the lack of an effective capacity by the teachers to estimate the energy expenditure and the excessive physical effort required by the proposed activities at school highlight the risk that physical activities, considered to be "light" by the teachers, are actually intensive and therefore potentially risky for the students.

This provides evidence of the lack of awareness by teachers used as sample of the effects produced by the applied teaching methodology and the proposed physical activities, suggesting through this pilot study that the training in physical education for primary school teachers needs further scientific investigation and that nowadays, despite the new emphasis given to their training at academic level, it is still lacking in terms of methodology and evaluation competence in relation to the proposed ministerial objectives.

The performance of motor and sports activities, for the development of healthy and effective motor habits in children in the period of primary school, requires (Stewart et all., 2004; Bailey et all., 2009) the need to ensure in any curriculum for primary education, a portfolio of teaching skills including analysis, planning, realization and assessment abilities to propose physical activities of different intensities.

REFERENCES:

1. D. Arvidsson, F. Slinde , S. Larsson and L. Hulthén, "Energy cost of physical activity in children: Validation of senseware armband", Medicine and Science in Sports and Exercise 39 (2007): 2076-84, accessed January 2011, doi: 10.1249/mss.0b013e31814fb439.

2. R. Bailey, K. Armour, D. Kirk, M. Jess, I. Pickup & R. Sandford, "The Educational Benefits Claimed for Physical Education and School Sport: An Academic Review", Research Papers in Education 24 (2009), Issue 1, pages 1 – 27, doi: 10.1080/02671520701809817

3. Stuart J. H. Biddle, T. Gorely, David J. Stensel, "Health-enhancing physical activity and sedentary behavior in children and adolescents", Journal of sport science 22-8 (2004): 670-701, doi: 10.1080/02640410410001712412

4. Guidelines for the curriculum of the Italian Ministry of Education, 2007.

5. P. Hay, "Assessment for learning in physical Education", in D. Kirk, D. Mac Donald & M. O'Sullivan (Eds) International Handbook of Research in Physical Education (London, U.K., Sage 2006), 312-325.

6. John M. Jakicic, M. Marcus, Kara I. Gallagher, C. Randall, E. Thomas, Fredric L. Goss, Robert J. Robertson, "Evaluation of the SenseWear Pro Armband to assess energy expenditure during exercise", Medicine and Science in Sports and Exercise 36-5 (2004) pp. 897-904. http://journals.lww.com/acsmmsse/Abstract/2004/05000/Evaluation_of_the_SenseWear_Pro_Armband_TM_to.24.aspx.

7. C. Macchi, R. Molino Lova, F. Cecchi, "*Attività Fisica Dieta e Salute*", (Firenze: Master Università & Professioni 2008).

8. National Guidelines of the Italian Ministry of Education, 2007.

9. J. Seghers, K. de Martelaer, G. Cardon , "Young people's health as a challenge for physical education in schools in the twenty-first century: the case of Flanders (Belgium)", Physical Education and Sport Pedagogy, Vol. 14, No. 4, October 2009, 407-420, doi: 10.1080/17408980902729347.

10. M. Sibilio, F. Gomez Paloma, *"La formazione universitaria del docente di educazione fisica"*, (Napoli: Edizioni Simone 2004).

11. James A. Stewart, David A. Dennison, Harold W. Kohl, J. Andrew Doyle, "Exercise Level and Energy Expenditure in the TAKE 10! In-Class Physical Activity Program", Journal of School Health, Vol. 74, Issue 10, December 2004, 397–400, doi: 10.1111/j.1746-1561.2004.tb06605.x.