

# Can daily physical activity improve school performances?

## A project study.

**Lietta Santinelli and Paola Andreazzi, BSc HES-SO in Occupational Therapy**

The children's daily physical activity improves their health and prevents obesity (WHO, 2004).

Researches shows that physical activity improves learning and also causes a positive attitude toward schoolwork. It also improves student behaviour. (Keays & Allison, 1995; Dexter, 1999; Tomporowski et al., 2008).

An increase in the daily time devoted to physical education helps students to maintain and improve their educational performance, despite the reduction of teaching time devoted to other subjects in the curriculum (Shephard, 1997, Shephard & Trudeau, 2008).

Our pilot project explores the relationship between movement and executive functions in children fifth grade.

### Hypothesis

Subjecting to the students to an everyday, specially designed, physical program, will have an impact on global and fine motor skills, instrumental aspects, the executive functions and, consequently, on the learning of the students.

### Methodology

During 6 months the students of Class 1 of the fifth grade school in Monte Carasso have been subjected to a specific physical training, which included 20 minutes of daily exercises from moderate to strong intensity.

The training consisted of exercises aimed at developing postural control, motor skills and praxis. It was conducted in classrooms, corridors and the gym.

Participants were assessed before and after the procedure and the data obtained was compared with that of the control class, which followed the regular educational program. The data collected was analysed using the SPSS statistical program.

### Population

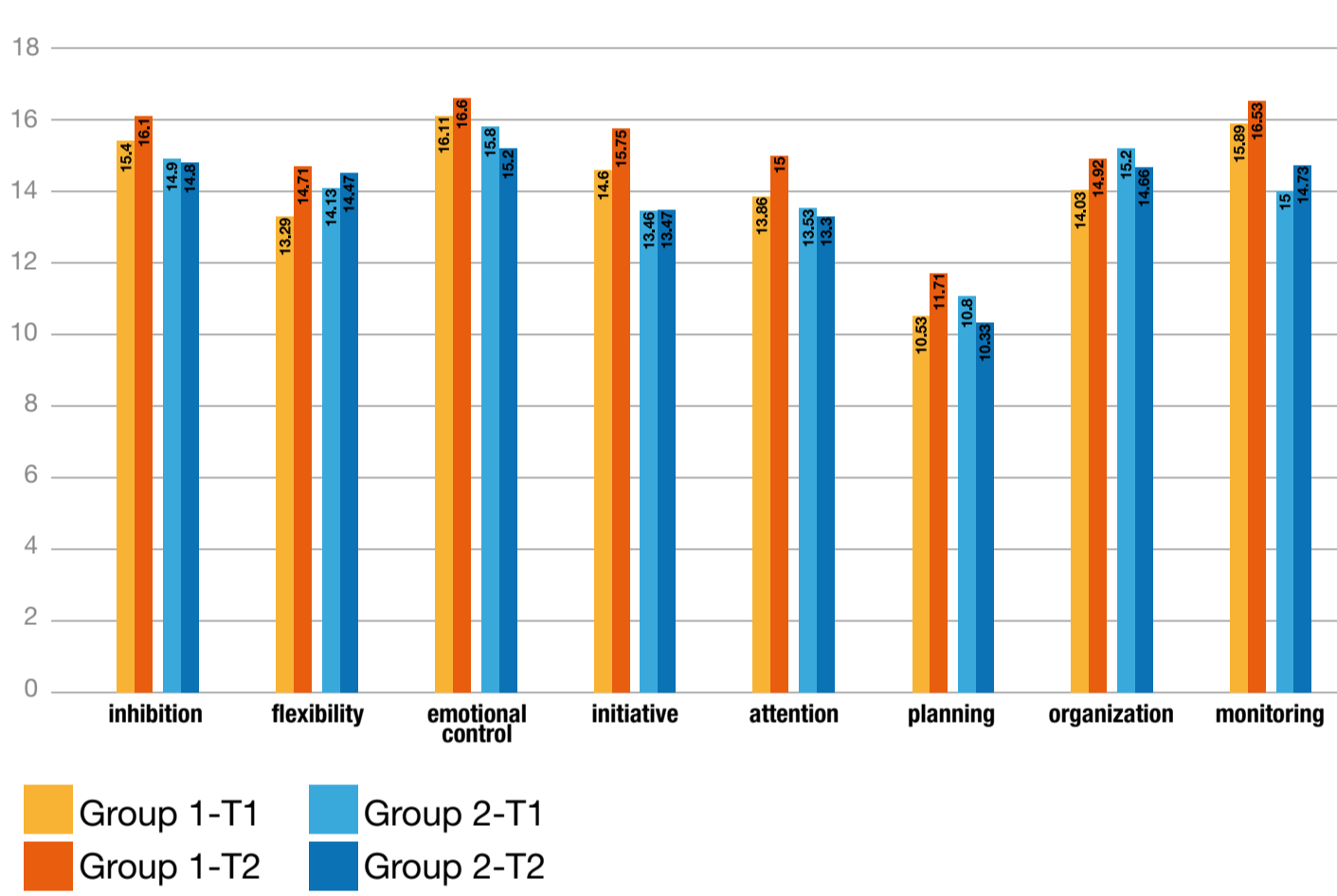
- Group 1: 15 students, following a daily physical program of 20 minutes during school lessons.
- Control group: 14 students, following the regular school program.
- Exclusion criteria: children who repeated the school year, are followed in occupational therapy or by other specialists.

### Assessment tools

- **Test of handwriting speed.** Measures the number of characters copied in 5 minutes.
- **Tower of London** (Shallice and McCarthy 1982). Assesses problem-solving and planning.
- **QFUE** (Marzocchi, in press). Executive Function Questionnaire, filled by teachers and parents; measures executive functions (flexibility, inhibition, planning, organization, attention, emotional control, initiative, and monitoring).



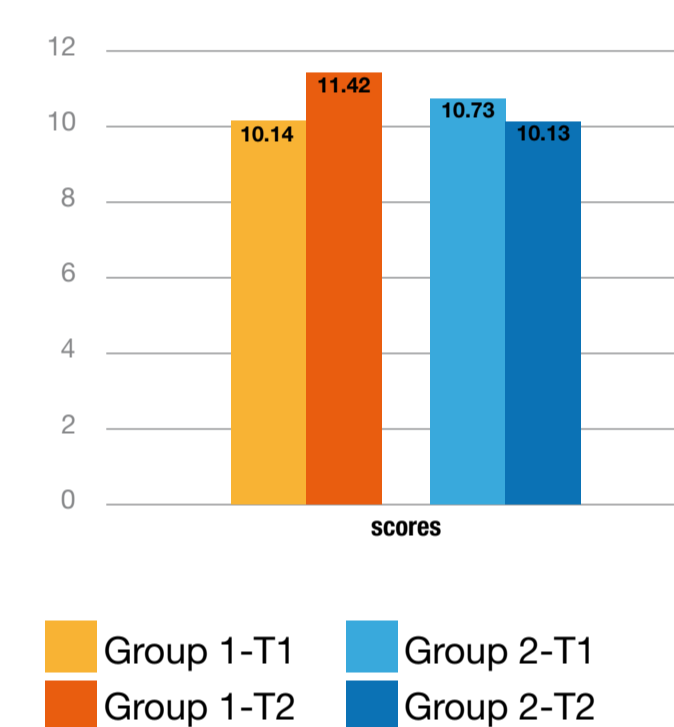
### QFUE Teachers



At the beginning of the year, the 2 groups were similar in all the executive functions. At the end of the year, group 1 had a significant progress in inhibition, flexibility, initiative, attention, planning, and organization. The control group didn't have a significant progress in any categories. The progress of group 1 was statistically significant in initiative ( $p < 0.05$ ), attention ( $p < 0.05$ ), planning ( $p < 0.01$ ), and organization ( $p < 0.01$ ). There was also a tendency in emotional control ( $p = 0.05$ ) and flexibility ( $p = 0.05$ ).

These results confirm the results of the test of the Tower Of London on the problem solving.

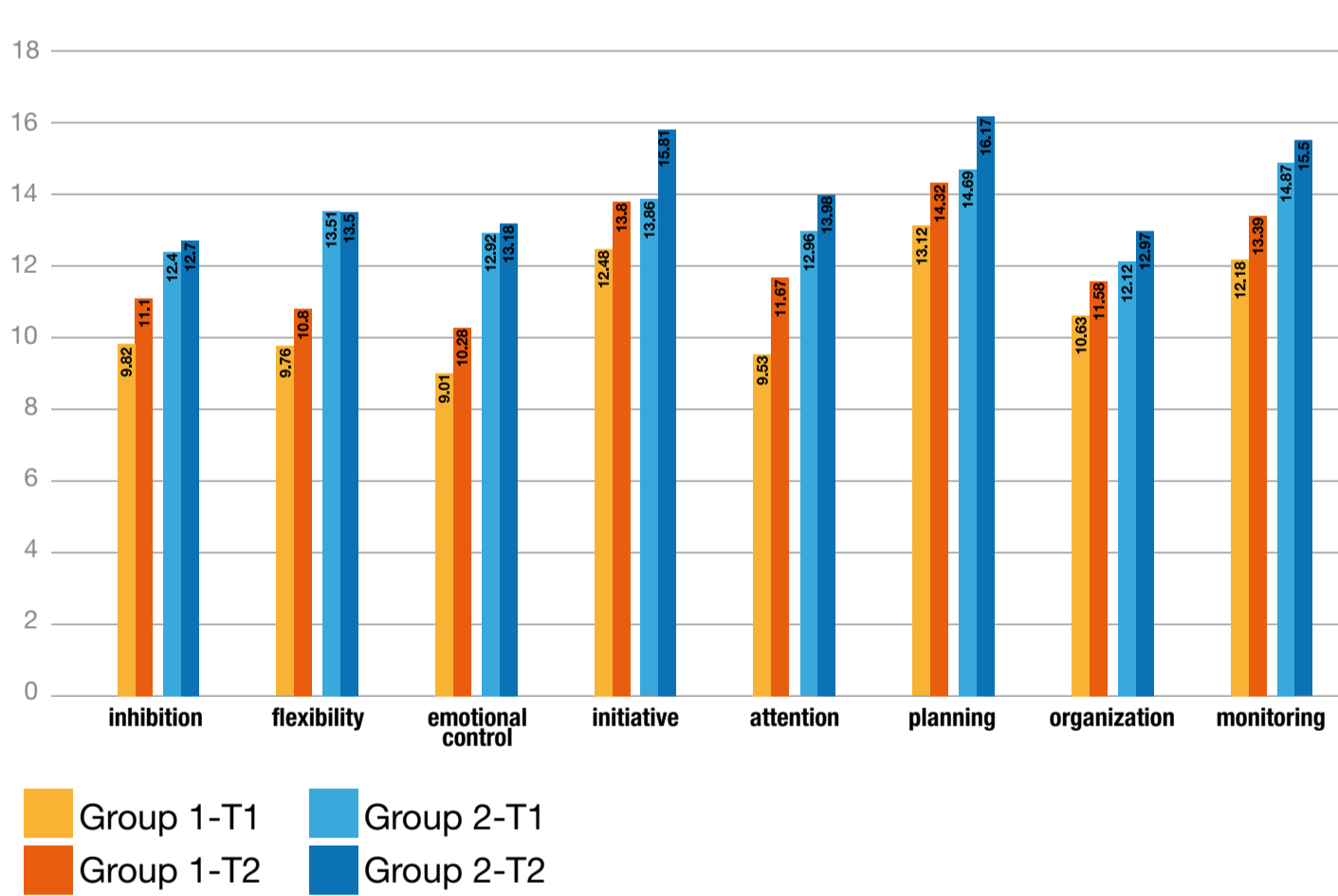
### Tower Of London



At the beginning of the year, the 2 groups had similar results. After 6 months of physical activity, group 1 had a significant progress ( $p < 0.01$ ) compared to group 2, which had a small decrease.

The results indicate that students who had a daily physical stimulation, improved planning and problem solving, compared to the control group. This result confirms the results of teacher's QFUE.

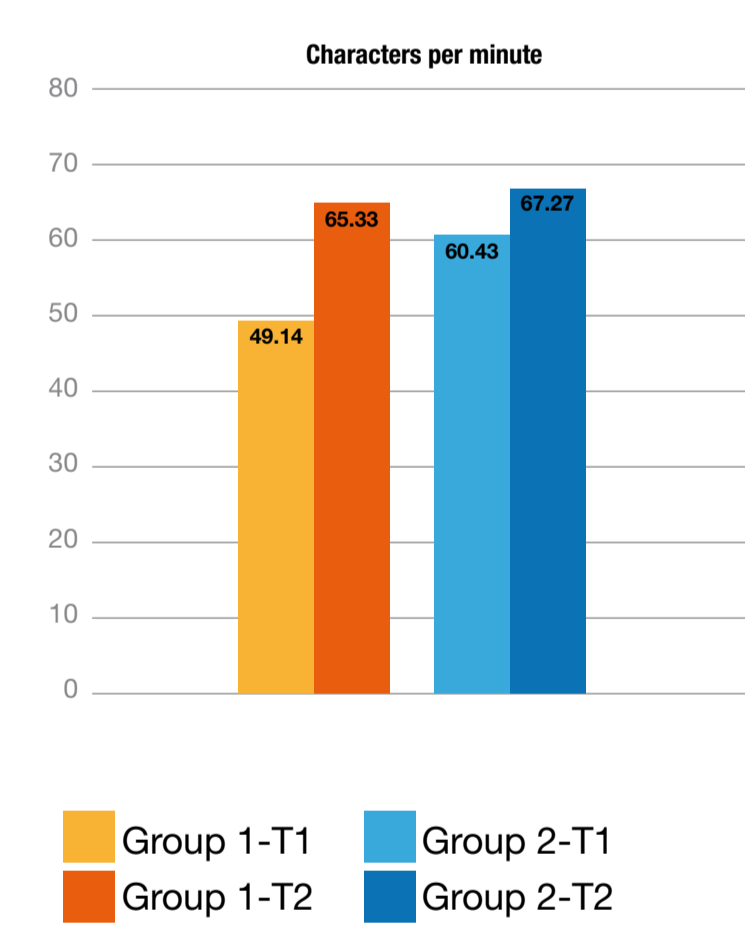
### QFUE Parents



The analysis of the parents' questionnaires must be considered with precautions: it is based on 10 out of 15 questionnaires, and the results of both groups were not similar at the beginning of the project.

The two classes had a positive evolution, however class 1 had a greater increase of executive functions than the control group.

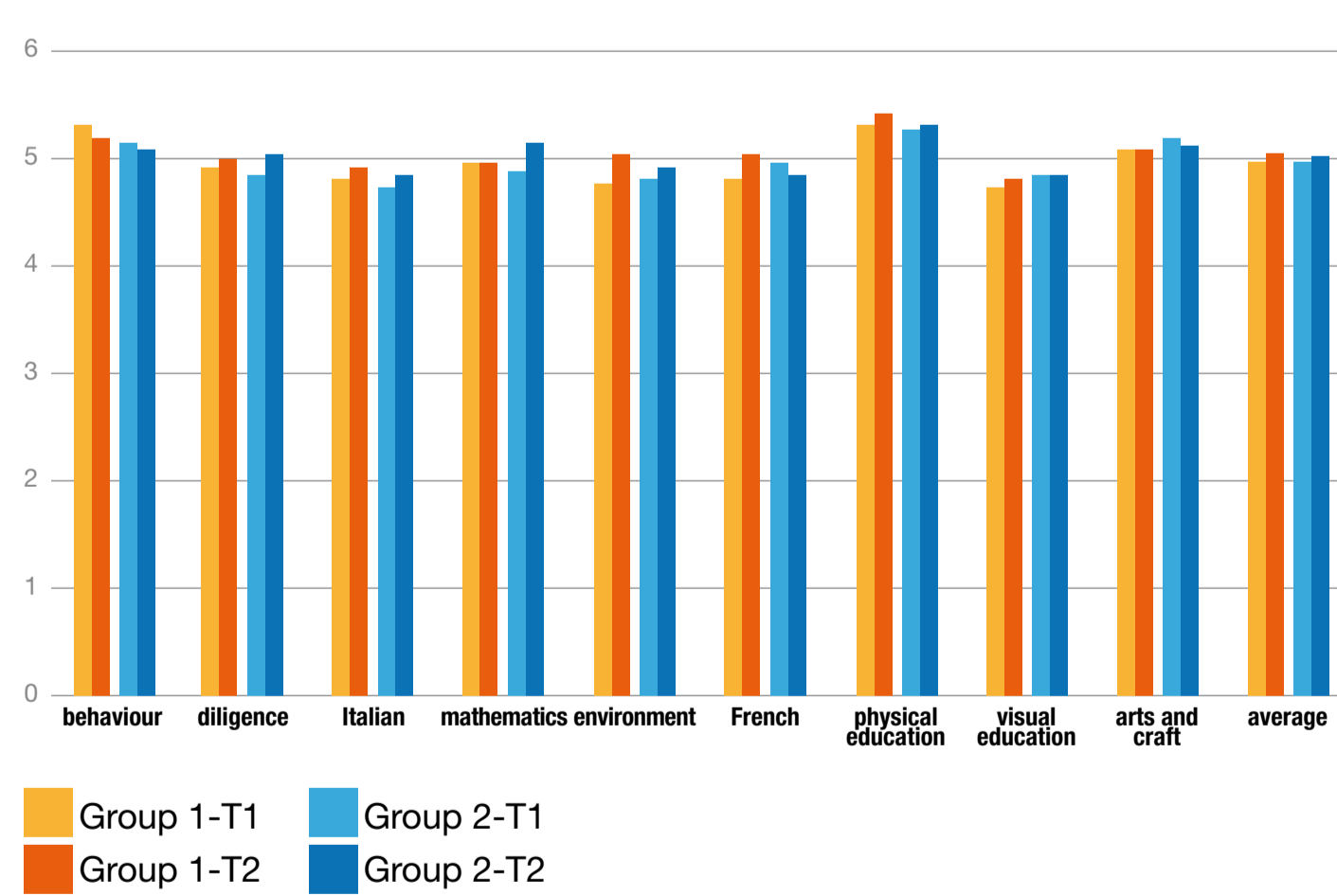
### Handwriting speed



At the beginning, group 1 was slower by 11 letters/minute than the control group. After 6 month of physical activity, group 1 recuperated its delay and is now at the same level of the control group.

This result shows that physical activity contributes to the development of handwriting speed.

### School report



At the beginning and at the end of the physical program, the groups are similar in school performance.

The two groups have got the same school program, but the group 1 has made 20 minutes of physical activity during the school day instead of mathematics and Italian. This results confirm that the physical activity can be integrated into the school day without decreasing the school performance.



### Conclusions and limitations

After the first experience with this pilot project, we can say that the physical program helped to improve balance, motor skills and executive functions of the class that participated in the project, compared to the control class. All this without causing a decline in school performance, despite the time devoted to academic lectures have been lower. The results, with recognized limitations, confirm those of recent scientific evidence.

There should be further investigation into classroom behaviour, motivation and attention of students.

However this is an exploratory study, conducted on a specific population and on a small number of children. A more extended study, if possible on the basis of probability, is needed to confirm and generalize the results.



**Bibliography**  
 Barkley R., 1996. Linkages between attention and executive functions. In: Lyon GR, Krasner NA, editors. Attention, memory, and executive function. Baltimore: Brooks, 307-325.  
 Case-Smith J., O'Brien J., 2010. Occupational Therapy for Children. Philadelphia: Mosby Elsevier.  
 Dexter T., 1999. Relationships between sport knowledge, sport performance and academic ability: Empirical evidence from GCSE Physical Education. Journal of Sports Sciences 17(4), 283.  
 Hughes C., 2002. Executive functions and development: Emerging themes. Infant and Child Development, 11, 201-209.  
 Keays J., Allison K.R., 1995. The Effects of Regular Moderate to Vigorous Physical Activity on Student Outcomes: a review. Revue canadienne de santé publique, 86, 1, 62-65.  
 Larnau A., 2000. Social class and the daily lives of children: A study from the United States Childhood. A Global Journal of Child Research, 7(2), 155-171.  
 Ministère de l'éducation de l'Ontario, 2005. Activité physique quotidienne dans les écoles : Guide pédagogique pour les 4, 5 et 6ème années.  
 Reilly D.S., van Donkelaar P., Saavedra S., Woolacott M.H., 2008. Interaction between the development of postural control and the executive function of attention. Journal of Motor Behaviour, Mar, 40(2), 90-102.  
 Sallis J. F., Prochaska J.J., Taylor W.C., 2000. A review of correlates of physical activity of children and adolescents. Medicine & Science in Sports & Exercise, 32(5), 963-975.  
 Santé Canada, 2002. Guide d'activité physique canadienne pour une vie active saine : Guide pédagogique d'activité physique pour les enfants du Canada (de 6 à 9 ans).  
 Schilling D.L., Washington K., Billingsley F.F., Daitz J., 2003. Classroom Seating for Children with ADHD: Therapy balls versus chairs. American Journal of Occupational Therapy, 57, 534-541.  
 Shephard R.J., 1997. Curricular Physical Activity and Academic Performance. Pediatric Exercise Science, 9, 113-125.  
 Sibley B.A., Etnier J.L., 2003. The relationship between physical activity and cognition in children: A meta-analysis. Pediatric Exercise Science, 15, 249-256.  
 Sigfusdottir I.D., Kristjansson A.L., Allegrante J.P., 2006. Health behaviour and academic achievement in Icelandic school children. Health Education Research, June 9.  
 St Clair-Thompson H.L., Gathercole S.E., 2006. Executive functions and achievements in school: Shifting, updating, inhibition, and working memory. Quarterly Journal of Experimental Psychology, 59(4), 745-759.  
 Tomporowski P.D., et al., 2008. Exercise and Children's Intelligence, Cognition, and Academic Achievement. Educational Psychological Review, June 1, 20(2), 111-131.  
 Trudeau F., Shephard R., 2008. Physical education, school physical activity school sport and academic performance. International Journal of Behavioral Nutrition and Physical Activity, 5, 10.  
 WHO, 2004. Global strategy on diet, physical activity and health. Geneva, World Health Organization.