

SMART MOVES: PHYSICAL ACTIVITY'S CONTRIBUTION TO EDUCATIONAL ACHIEVEMENT

– *Written by Richard Bailey, Germany*

THE PROBLEM WITH CHILDREN'S PHYSICAL ACTIVITY

It is now beyond doubt that regular physical activity during childhood is an important part of the foundation of a happy, healthy and longer life. The serious dangers associated with inactive lifestyles are equally clear, such as heart disease, diabetes and obesity. It is not surprising that scientists, medical professionals and public bodies have expressed grave concerns that current levels of physical activity among children are inadequate and that most children around the world fail to meet recommended daily levels of activity¹. Some studies suggest that the pattern of childhood activity in the developed world and at an increasing rate, in the developing worlds is getting worse². In the words of one recent consensus statement, there is a 'pandemic' of inactivity³.

Among the list of strategies to address this predicament – increasing participation in sports and other active leisure pursuits, reducing time spent in sedentary transport and using electronic recreations such as computer games and so on – there is little doubt that schools have a central role to play. Children in most countries spend about 15,000 hours in compulsory schooling, which makes schools the first and most sustainable settings for the promotion of physical activity. In fact, the school day is the only period during the human lifespan when everyone is in a position to be introduced to physical skills and activities. Unfortunately, there is now considerable evidence that many schools fail to fulfil this vital role and those that do often struggle within unsupportive systems. Physical education (PE) lessons have been marginalised around the world for many

years and when lessons are offered they are frequently under-resourced and taught by under-qualified teachers⁴.

There are many explanations for this predicament, but one of the most plausible is the widespread presumption that time dedicated to physical activity is time taken away from more pressing demands, such as performance in classroom tests and national assessments⁵. Many schools have found themselves under pressure to squeeze out non-core subjects including the arts and sports, not because they are unimportant, but because they are of a lower priority. These practices are reinforced by parents who fear the consequences of time away from classroom subjects. So, physical activities, such as sports and dance, are often relegated to the positions of frivolous recreations that distract from the main business of schooling. Girls tend



to be particularly affected by these changes, which is concerning as they are typically less active already⁶. There are considerable variations between countries and states and over time, but the evidence is quite clear: quality physical activity experiences in their various forms often become pushed to margins, offered as a trivial escape from the main business of school or squeezed out of the school timetable completely.

This is a frustrating state of affairs: physical inactivity endangers children's health and development; and the most obvious setting for promoting physical activity – the school – is often unable to provide a secure place for it, at all. Recent research, however, has suggested a solution to this impasse, by questioning one of the assumptions that caused it to arise in the first place. Evidence from neuroscience, psychology and their related fields has shown that the common assumption that physical activity interferes with academic achievement is mistaken. On the contrary, it is becoming increasingly evident that it improves it!

PHYSICAL ACTIVITY AND GRADES

Serious academic interest in this issue dates back to the 1960s and 1970s, when scientists began to undertake simple experiments assessing the relationships between levels of physical activity, intellectual performance and educational

achievement. However, the landmark study was carried out a decade earlier, on the outskirts of Paris, France; researchers replaced 15 hours a week of traditional classroom lessons – maths, French, history and so on – with sports, gymnastics, swimming and hiking. A control group continued to take part in the standard curriculum, including just 2 hours a week of physical activities. The results of the Vanves study were remarkable: despite the loss of more than a quarter of their classroom teaching time, the academic grades of the experimental group did not worsen and in many cases improved. In addition, the teachers reported fewer discipline problems, greater attentiveness in class and less absenteeism.

Scientists have subsequently returned to this issue, with the advantage of more rigorous methods and much larger groups of children. The first of these studies took place in the Canadian city of Trois-Rivières in the 1970s, tracking more than 500 elementary students for 6 years⁷. The experimental classes took an hour a day of physical activity classes, leading to a 14% reduction in time for the other school lessons, while control classes took the standard 40 minutes of PE per week. According to teachers' assessments, the overall educational performance of the daily activity group was significantly better than their less active peers. They also scored higher on a standard

intelligence test and achieved higher grades in mathematics in examinations (although they did less well in English tests).

There have now been many studies exploring the relationship between physical activity at school and educational performance and they have come to broadly similar conclusions: replacing a sizeable amount of time for classroom-based subjects with physical activities does not harm performance in those subjects and in some circumstances seems to result in improvements in grades for some children⁸.

A parallel set of studies approached the matter from a different angle: how does physical fitness affect educational achievement? According to a recent meta-analysis of 59 studies, increased fitness is associated with better grades in mathematical, reading and IQ scores⁹ – which are the measures most likely to be affected by improved cognitive functioning.

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Support for this view comes from a number of studies from around the world, including an empirical study of 757 children that examined the relationships between academic achievement (measured by test grades), physical fitness (using a multistage run) and physical activity levels (using pedometers)¹⁰. The researchers analysed findings at both school and individual levels and found that both activity levels and fitness scores correlated with children's scores on government tests and that an even clearer difference was found between schools. In other words, the schools with fitter children outperformed the others. The Australian researchers interpreted these findings as evidence that physical activity and the development of fitness are elements of schools that tend to have 'atmospheres' that are supportive of educational achievement and success.

HEALTHY BRAINS

While researchers' interest in the relationship between physical activity and educational achievement dates back more than 50 years, it is only recently that they have been in a position to understand the role played by brain in this process. Advances in the development of new methods of measuring the effects of brain activity have paved the way for a new field of science – exercise neuroscience¹¹.

Rigorous investigations of the relationship between the brain and physical activity began in the early 1980s. It was around this time, for example, that researchers discovered that physical activity led to an increase in the secretion of endorphins that was linked to a variety of psychological changes, such as positive mood state changes and improved concentration, as well as physical changes to the brain, such as increased blood flow, growth of nerve cells in the brain's centre of learning and memory, increased density of networks of nerve cells and increased brain tissue volume¹².

Numerous tests and measures have emerged since this time and the development of these technologies has offered a new perspective. It now seems clear, for example, that increased cardiorespiratory fitness positively effects

children's cognitive functioning in a number of ways. Research has shown that regular physical activity leads to improvements in a wide range of children's cognitive functions, including information processing, attention and executive function. One study tested the theory that regular physical activity has its greatest effect in terms of executive function, which are processes used to perform activities such as planning, organising, paying attention to and remembering details and managing time and space. It found that physical activity correlated with performance in all of these tasks (as well as in math test scores)¹³. A meta-analysis of published research in the area also reported a positive relation between physical activity and cognitive performance in school-age children (aged 4 to 18 years) in eight measurement categories, including perceptual skills, IQ, verbal tests, mathematic tests and memory¹⁴.

Even brief bursts of physical activity can contribute to improved cognitive functioning. In fact, residual effects of short bursts of activity can continue for some time after activity has halted. For example, a single burst of 20 minutes of physical activity enhances cognitive functioning for up to 1 hour afterwards¹⁵ and a single 30-minute physical education lesson led

to an improvement in children's focus, suggesting that physical activity should be scheduled "before important subjects like maths and not at the end of the school day"¹⁶.

One more study deserves mentioning, if only for its enormous sample size! Swedish scientists examined physical fitness, intelligence performance, school achievement in a statistical analysis of a huge sample of data (from 1,221,727 people), from every man born from 1950 through 1976 who enlisted for military service at age 18¹⁷. Analysis of this dataset revealed a positive association between cardiovascular fitness and performance in intelligence tests at age 18 and that changes in physical fitness measures between 15 years and 18 years predicted cognitive performance at 18 years. It was also found that cardiovascular fitness during early adulthood predicted socioeconomic status and educational attainment later in life. So the contribution of increased fitness on cognitive functioning seem to initiate a 'domino effect' that led to improved performance in other aspects of life.

ACTIVE SCHOOLS?

The Swedish study described above suggests that people with greater cardiorespiratory fitness yield most

WHAT THIS RESEARCH MEANS IN PRACTICE

1. *Many children around the world are not physically active enough to experience its full health benefits. This has considerable costs, both for them and for their communities.*
2. *Girls are at greatest risk of being physically inactive. Strategies addressed to meeting their needs are particularly necessary.*
3. *All children should have daily physical activity experiences. These experiences should be varied and enjoyable.*
4. *Physical activity does not interfere with education, it enhances it. An hour a day dedicated to physical activity will not harm, and may improve, performance in other school subjects.*
5. *All schools should be 'active schools', where physical activity is a normal feature of the day, including before and after school, during recess, during PE lessons, and during classroom lessons.*

Table 1

cognitive benefit in terms of enhanced brain plasticity and cognitive function. In other words, fitter people's brains really do seem to work more effectively. But the role played by activity in supporting educational achievement cannot be explained entirely by its effects on the brain. Physical activity affects the whole developing system and changes to cognition will occur at the same time as a host of others. Positive physical activity experiences have been associated with an extraordinary range of psychological and social outcomes that are likely to enhance educational performance, such as self-esteem, self-efficacy, friendship, positive attitudes to school, teachers and

learning, improved mental health and a range of other measures¹⁸.

These sorts of findings make a compelling case, since they go to the heart of learning and achievement in school. The improvements to attitudes and self-perceptions enhance what could be called the mindset of learning, because fitter, more active children tend to approach academic tasks with a more positive attitude and greater attention than their peers. At the same time, the changes to the efficient functioning of the brain relate to the mechanisms of learning. In other words, the evidence from these studies suggests that physical activity can improve students'

mental state while learning and the efficiency with which they learn.

So, perhaps the time has come to stop limiting the 'case for children's physical activity' to discussions of physical health and ill-health. There is no denying the importance of this aspect, but the continued focus on what is now clear to be only one among many potential benefits of an active lifestyle seems to unnecessarily limit the argument and its potency. Of course parents, principals and politicians care about children's physical health. Adding cognitive and educational benefits to the discussion makes the case even more compelling and – rightly or wrongly – more urgent.

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Richard Bailey Ph.D., F.R.S.A

Senior Researcher

International Council of Sports Science and Physical Education

Berlin, Germany

Contact: baileyrichard1@me.com