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Relationship between School Physical Activity and Academic Performance of Children

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Abstract: This paper investigated literature concerning the relationship between school physical activity and the academic performance of school children. Some of the past research has identified a positive relationship between physical activity and academic performances. However, several studies did not find that was the case. Further, the studies also had difficulties to ascertain if the association is causal and if so, the direction of the cause-effect. As a result several intervention programs have been conducted to answer the above problems. Some researchers allocated extra time for physical education, aerobic exercise or free play time and concluded that spending more time in physical education had some favorable effects on some of the academic achievement measures. However, some did not achieve positive outcomes. It would appear that most studies have a relatively short period of intervention program and there is an urgent need to conduct a longitudinal study. This paper alerts readers to and outlines the Commonwealth Institute Lifestyle of our Kids (LOOK) longitudinal study that commenced in 2005 in Canberra that seeks to address the shortcomings of the past research in this area.

Keywords: School Physical Activity, Academic Performance, Children

Introduction

HANNAFORD (1995) REMINDS people that “the human qualities we associate with the mind can never exist separate from the body” (p.11) because movement is an indispensable part of learning and thinking, as well as an integral part of mental processing. Thoughts concerning body and mind have long engaged philosophers, educators and governments throughout the ages.” Plato regarded body and mind as separate and disparate, and yet when he wrote of physical education, he insisted that the soul was the object of gymnastics as well as music.” (Williams, 1961, P. 103).

It is apparent that in Plato’s conception of education, body and mind are not simple opposites. For both Plato and Aristotle the aim of physical education was not the education of the physical alone but rather the development of personality qualities through the physical. Historically it may be truly said that organised physical education was born some 23 centuries ago in a civilization marked by intellect and understanding (Williams, 1961).

Today the search for greater understanding of possible body-mind connections continues, stimulated in part by health and education issues confronting much of the world (Blackmore, 2003; Phil, 2006; Vail, 2006;). The current obesity epidemic is one of the most obvious health outcomes associated with a lack of physical activity and poor nutrition among children. Over the past 15 years the prevalence of overweight and obesity has doubled in Australian

children. The evidence demonstrates that overweight and obese children suffer the same health problems as obese adults and suffer increased morbidity during adulthood. There is moderate to strong evidence to suggest that physical activity habits developed during childhood may track into late childhood and adolescence. Childhood is a key time within the lifespan to establish physical activity behaviours.

In many Australian primary schools there is competition amongst subjects for time allocation within an increasingly crowded curriculum. In recent years more emphasis has been placed on literacy and numeracy and the introduction of state and territory based tests means that schools’ achievements can be compared. Test results reflect both on the school status and the status of the teachers. This in turn has implications for school status, enrolments and ongoing viability of schools, given that numbers of children attending government schools is diminishing in many areas as children are enrolled in private schools. This is particularly true in Canberra where a number of government primary schools have been closed in late 2006. With increased emphasis and evaluation on academic work, the classroom teachers’ commitments to physical education may not be as strong, and very few primary schools in the government system employ the once common specialist physical education teachers.

Most teachers and parents would agree that both physical and intellectual education are critical to optimal child development, and that neither area should be compromised at the expense of the other.

What is less well understood is the influence physical education may have on academic work. There is evidence that physical activity and increased physical education will enhance learning abilities in literacy and numeracy, although the evidence has not been of sufficient strength to strongly influence politicians and school administrators; in fact a popular perception would be that the two abilities are almost entirely independent. However, should academic progress and physical activity and physical education be positively related, then teachers and parents who currently underplay the role of physical education as they focus their efforts on improving literacy and numeracy, may change their attitude toward physical activity and physical education. This paper researched available literature that investigates the relationship between school physical activity and the academic performance of primary school children. It aims to provide a full understanding of past discovery in this area.

An Historical Overview

As early as 1933, researchers attempted to identify the impact of physical activity on academic performances. A French study conducted by Professor Latarjet of the Faculty of Medicine at the University of Lyons reported details of an investigation in which a number of children were used to form an experimental group. Their daily schedule for academic study was reduced by two hours; these two hours were used for physical education activities. The experimental group improved physically in vital capacity, strength, weight, and height; their attendance records were significantly better; and their academic work showed an improvement. In 1951, this study was repeated at Vanves by the French Ministry of Education. Results were similar to those found at Lyons (Ministere de l'education nationale, de la jeunesse et des sports, 1957).

An Australian study (Clement et al., 1950) examined the effects of a planned program of physical education on the posture, general health and scholastic attainment of a group of primary school children. The results showed that the scholastic achievement of the children in the experimental group did not suffer as a result of the extra time devoted to physical education. Subjective observations of the class teachers favoured the participation in the physical education program, believing this dimension maintained keenness in the classroom.

During the 1960's and 1970's, a number of studies attempted to document the effects of increasing the physical activity component of the school week. Nettleton (1980) reviewed some of these studies (Gorbunova, 1967; Bednarova, 1968; Rogers, 1968; Friedman, 1968; Johnston, 1969; Snell et al., 1976; Klemper et al, 1975; Anderson, 1977; Coonan, 1979;

Maple, 1979; Bailey, 1979) and concluded one overall generalization appears to be tenable- "the results suggest that the groups receiving extra physical activity at the expense of classroom subjects do not show any deterioration in academic performance. The results showed a positive but not significant improvement in academic achievement. Further, the majority of these studies showed an improvement in physical performance".

From the 1980's until 2006 many of the studies were descriptive retrospective studies that compared reports on physical activity levels with reported academic achievement in a defined population. Some studies addressed the impact of physical education programs, others involvement in sports and other extracurricular activities. For the most part, the studies showed either significant but weak associations between activity level and better academic performance or no correlation at all (Taras, 2005).

Recent Research on Relationships between School Physical Activity and Academic Performance

During this period of time, a number of studies investigated the relationship between the type or level of physical activities or physical abilities and academic performances of school children. These included academic performance and balance skills (Knight & Rizzuto, 1993), dietary behaviours and physical status (Oh et al., 2003), participation in physical activity programs (Symons et al., 1997; Daly & Ryan, 2000; Lindner, 2002; Blakemore, 2003), exercise volume (Field et al., 2001; Pate et al., 1996; Harper, 1992), sports participation (Fisher et al., 1996; Harrison & Gopalakrishnan, 2003; Sanders et al., 2000; Lindner 1999), sport knowledge and sport performance (Dexter, 1999), physical activity and motor ability (Oja & Jurimae, 2002), motor performance (Kirkendall, 1986), enhanced physical education (National Association for Sport and Physical Education & Council of Physical Education for Children, 2001), physical activity and self-esteem (Tremblay et al., 2000), physical activity and fitness (Dwyer, et al., 2001; Grissom 2005; California Department of Education, 2002), enhanced physical activity (Scheuer & Mitchell, 2003),

The method of data collection ranged from single questionnaires (Oh et al., 2003; Sanders et al., 2000; Daley & Ryan, 2000; Field et al., 2001; Fisher et al., 1996; Harrison & Gopalakrishnan, 2003; Lindner, 1999; Lindner, 2002; Pate et al 1996), to parent and teacher report (Oja & Jurimae, 2002), motor skills assessment (Knight & Rizzuto, 1993), teacher scores (Dexter, 1999), literature review (Kirkendall, 1986; Blakemore, 2003; The President's Council on Physical Fitness and Sports, 1999). Several studies further

examined relationships between physical activity, self-esteem, body-mass index and academic achievement (Tremblay, 2000; Harper, 1992), scholastic performance, physical activity and fitness (Dwyer et al., 2001). Other studies investigated daily physical education and academic achievement (National Association for Sport and Physical Education & Council of Physical Education for Children, 2001),

The outcomes of these descriptive retrospective studies investigating the relationship between physical activity and academic performances of school children can be categorized into two categories. A large number of studies have identified positive relationships between physical activity and academic performances (Kirkendall, 1986; Harper, 1992; Pate et al., 1996; Dwyer et al., 2001; Grissom, 2005; Field et al., 2001; Harrison & Gopalakrishnan, 2003; Oh et al., 2003; Knight & Rizzuto, 1993; National Association for Sport and Physical Education & Council of Physical Education for Children, 2001; Symons et al., 1997; The President's Council on Physical Fitness and Sports, 1999). Some research outcomes have shown an indirect increase in students' academic performance when students engaged in higher level of physical activities (California Department of Education, 2002; Blakemore, 2003). Lindner (1999) identified a significant but low relationship. Dexter (1999) also acknowledged a weak but positive correlation. It should be acknowledged that some of the studies after the turn of the 21st century have engaged an extraordinary large number of school students. For example the 2002 research conducted by the California Department of Education involved 954,000 grade 5, 7 and 9 students. The study matched student academic scores with their physical fitness tests results and found that a distinct relationship between academic achievement and physical fitness. The study concluded that higher academic scores were associated with higher level of fitness at each of the three grade levels (California Department of Education, 2002).

Blackmore (2003) attributed these positive relationships to a close connection between mind and body. It is believed that exercise has positive effects on neurological system, for example, facilitating an increase in blood, oxygen and nutrients to the brain. Repetitive movements also stimulate the production of mood-enhancing neurotransmitter. Exercise can further improve alertness and create faster reaction time.

However, not all studies support this positive relationship. Several studies did not find any statistically significant correlations (Daly & Ryan, 2000; Fisher et al., 1996). A number of research studies could not establish a positive association between academic performance and physical activity (Lindner, 2002; Oja & Jurimae, 2002; Sanders et al., 2000). Yu et al

(2006) researched 333 Hong Kong children and revealed that physical activity level was quite an independent entity. It neither related to academic achievement nor school conduct.

Researchers acknowledged that correlation does not allow us to infer causality (Grissom, 2005)). Further, even if a correlation can be established, it is difficult to investigate whether it is the physical activity that affects the academic achievement, or the academic achievement that facilitates or hampers the physical activity participation, or a third factor that determines both academic achievement and physical activity participation (Field et al., 2001)

Can School Physical Activity Intervention Programs Make a Positive Impact on Children's Academic Performance?

Generally, it is believed that implementation of physical education or physical activity intervention programs could identify causality, if any, through comparisons between experimental and control groups. However, during the period of 1980 to 2006 there were not many controlled experimental intervention studies designed in this area.

The few experimental intervention studies were quite diverse. They include health-related physical education (Dwyer et al., 1983), enhanced physical education (Shephard, 1984; Sallis et al., 1999), aerobic exercise and free play time (Crist, 1995), daily physical education (Pollatschek & O'Hagan, 1989; Shepherd, 1996; Shepherd, 1997; Frauhiger, 2002), physical activity (Caterino & Polak, 1999), variable aerobic exercise (MacMahon & Gross 1987), physical education and science (Raviv & Low, 1990),

Program implementation varied between 10 weeks (Frauhiger, 2002), 12 weeks (Crist, 1995), 20 weeks (MacMahon and Gross 1987), 12 months (Shepherd 1996; Shepherd 1997), 24 months (Sallis et al., 1999). Only two of the above studies had a longitudinal element.

Outcomes of the experimental intervention studies varied considerably. In Dwyer et al., (1983), Pollatschek and O'Hagan, (1989)'s studies, they devoted an extra hour per day to physical education. This resulted in deduction of academic study time, however, did not diminish academic performance. In the studies conducted by Shephard, (1984) and Sallis et al., (1999), spending more time in physical education had some favourable effects on some of the academic achievement measures. Later, Shepherd (1996), and Shepherd, (1997) discovered that the rate of academic learning per unit of class time is enhanced in physically active students. Crist (1995) suggested that aerobic exercise and free play time improved academic grades. Caterino and Polak, (1999) claimed

that physical activity improved concentration for grade 4 students but not for students in grades 2 and 3.

However, not all physical activity intervention programs produced a positive outcome in student academic achievement. Frauhiger (2002), MacMahon and Gross (1987), could not identify a significant difference between the control and experimental groups in academic achievement. Raviv and Low (1990) also concluded that receiving physical education or science class had no bearing on education. Coleman (1985) blames sport for draining children's energy and causing them to ignore their academic fulfilment.

Summary

Some of the past research has revealed a positive relationship between physical activity and academic performances. However, not all studies supported this relationship. Further, It is difficult from these studies to know if the association is causal and if so, the direction of the cause-effect.

Clearly the past research has not unanimously agreed on the impact of physical education or physical activity programs on academic performances. Some intervention programs did not achieve positive outcomes. Most studies have a relatively short period of intervention program. Many intervention programs used intensive daily physical education programs, which is very difficult to achieve in the current school environment. There were no other cross-section data available for analysis after the intervention except academic performance indicators. It would appear there is an urgent need to conduct a longitudinal study with cross sectional measurements available to address the shortcomings of the previous studies.

The Lifestyle of Our Kids (LOOK) Study May Provide Some Answers

The Commonwealth Institute Lifestyle of our Kids (LOOK) project commenced in 2005 in Canberra. It would appear it is the first study in this area to investigate the long term impact of a well designed, three day a week, physical education program suitable for implementation in current school reality in Australia. The intervention period is initially three years with the long term aim of monitoring students throughout their lifespan. The longitudinal study will ascertain the impact of a physical education program designed according to current Australian school environments on children's long term academic performances.

This study as a whole will also measure not only academic achievement, but also many other factors including:

- Cardiovascular structure and function
- Blood markers of degenerative diseases
- Psychological influences on lifestyle and health namely self-esteem, stress, anxiety
- Motor control
- Anthropometry and body composition
- Components of bone strength
- Fitness assessment
- Measurement of physical activity
- Family involvement and medical history
- Nutritional intake
- Pubertal assessment and skeletal age

The outcome of the study will be the first in this field to utilise cross sectional analysis to identify the factors or reasons that may contribute to the outcome of the academic performances. It is possible the study will make a unique contribution to better understand the impact of physical activity and physical education on children's academic performances. The impact of this research could be profound in this field and to the future design of school education curriculum in the Western world.

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