

EFFECT OF A PHYSICAL FITNESS INTERVENTION PROGRAM WITHIN A  
PHYSICAL EDUCATION CLASS ON CARDIOVASCULAR ENDURANCE  
AMONG MALAYSIAN SECONDARY SCHOOL BOYS

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**Abstract**

The aim of the study was to investigate the effect of a physical fitness intervention program within a physical education class on cardiovascular endurance among Malaysian secondary school boys.

A quasi experimental design was adopted for the study. Two schools in a district were randomly selected. In each school, two classes were randomly selected and one was assigned intact to the experimental group (n=45) and the other was the control group (n=42). Pretest data was collected by administering the 12 Minute Cooper's Test. Both the experimental and the control groups underwent regular physical education class twice a week for ten weeks. Apart from the regular physical education class, the experimental group underwent the treatment in a form of a circuit immediately after the warm-up session. After ten weeks, posttest data was collected.

ANCOVA was computed using the pretest mean score as covariate and the posttest mean score as dependent measure. The results showed that there was a main effect  $F(1, 84) = 11.10$ ,  $p < 0.05$ , and it was in favour of the experimental group.

The study indicates that a physical fitness intervention program within a physical education class was effective in enhancing cardiovascular endurance among the Malaysian secondary school boys.

**Keyword:** cardiovascular endurance, Fitness, Intervention

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## Introduction

Structured physical education classes are aimed at enhancing aerobic fitness among school children (Corbin 1987; Corbin and Pangrazi, 1998). Reports indicate that state of health related fitness among school going children is not very satisfactory (Tomkinson, *et al.* 2003; Corbin, 1987; Gutin *et al.* 1990; Hartano *et al.* 1997; Department of Health & Human Services, 1996[USDHHS]. Many physical educators are of the opinion that, being physically inactive is one of the reasons for being overweight, thus attributing to risk factors for cardiovascular diseases in adults and even among children (Young and Steinhardt, 1995 and Gutin *et al.* 1990; USDHHS, 1996).

Cardiovascular mortality rate in Malaysia which was the third cause of death in the 1950's, became the number one killer in the country since the 1970's (Ministry of Health, Malaysia, 2002). Evidence that is available indicate there is a rising trend for risk

factors among Malaysian in cardiovascular diseases such as total cholesterol, blood glucose, hypertension, obesity and the trend is rising with advancing age (Lim *et al.* 2000; Khoo *et al.* 1991; Kasmini *et al.* 1997). At the school level, data collected from selected schools in Malaysia, among the 17 years old boys and girls indicate their times in their 1500 meters run was below average indicating aerobic fitness was low. Rengasamy. (2006). Malathi (2003) reported that the mean distance in the Cooper's Test among their subjects was about 1270 meters. Rengasamy (2003) also reported a mean of 1340 meters among college students in Cooper's Test. The decline over the years in health related fitness that many argue is due to the fact that many are not engaging in any physical activity and further they do not have the knowledge to translate the health related fitness concepts into practice (Lim *et al.* 2000; Corbin, 1987; Tomkinson *et al.* 2003; Ratliff & Ratliff 1994; Corbin 1987; Jayamalar, 1991). It is suggested that to overcome the above mentioned problems, a sound and effective physical education programme, emphasizing the teaching of health related fitness concepts, educating the students of the importance regular exercise should start in schools (Ratliff & Ratliff, 1994; USDHHS, 1996; Council for Physical Education for children [COPEC], 1998).

Health related fitness is the ability of the individual to carry out daily activities without undue fatigue, and have enough energy to enjoy leisure time pursuit (American College of Sport Medicine, 1998 [ACSM]). The components of health related fitness are cardiorespiratory endurance, muscle strength and endurance, flexibility and percentage of body fat. To have a measurable training effect one must participate at least 2 to 3 times or more days per week, 20-60 minutes of continuous or intermittent manner (minimum 10 minutes bouts accumulated through the day) per session at 50%-60% at heart rate maximum (ACSM, 1998). It is based on the notion that individuals undergoing physical activity should have the overload or the stress within the time stipulated so that adaptation occurs to the systems which is based on the General Adaptation Syndrome (GAS) theory by Selye (1956). Studies have indicated that if the system is stressed, adaptation does occur and the body's functional capacity increases (Paffenbarger *et al.* 1986; Tolfrey *et al.* 2000; Gilders *et al.* 1989; Sharkey, 1970; Wenger & Bell, 1986; Blair *et al.* 1995). Physical education has been regarded as a significant contributor to achieve their daily volume of physical activity to enhance aerobic fitness among children (Biddle *et al.* 1998; Corbin and Pangrazi, 1998). In line with this, one of the objectives of Malaysian secondary physical education programme is to enhance health related fitness components through the teaching of game skills (Ministry of Education, 1998). To have a measurable training effect, children should be involved in physical activity on most days if possible 2-3 days in a week for 30-60 minutes with sufficient intensity so that the health benefits can be achieved COP EC (1998). The rationale is that, physical activity has a potential to tract into adulthood, and by starting them early in life would enable them to practice it later in life (Dennison *et al.* 1998; Janz *et al.* 2000; Sallis & McKenzie, 1991).

Related studies conducted in school environment have indicated that regular physical education classes have insufficient intensity and have failed to enhance health related fitness among students (McKenzie *et al.* 2000; Stratton, 1997; Ignico & Mahon, 1995; Simons-Morton 1988; Malathi, 2003; Rengasamy 2006; Sinnapan 2006; Volpe *et al.* 2002; Baguet *et al.* 2002; Fairclough 2003). In a related study by Ignico & Mahon (1995) reported that the subjects in the regular physical education, after ten weeks, only improved by 0.5% in their mile run. Barquet *et al.* (2002) reported a mean heart rate was

about 134 among subjects undergoing regular physical education. Simons-Morton (1988) found low levels of physical activity in school physical education classes. Faucette *et al.* (1990) found that only 5% of the class time had fitness activities as major focus. Due to the decline in health related fitness components, some have suggested that it is important carry out intervention programs in school to instill positive attitudes towards physical activity at early stage (Ignico & Mahon 1995). The development of positive attitudes towards physical activity fitness during the early stages may affect and have a positive impact on attitudes towards physical activity during adult life (Dennison *et al.* 1998). Studies towards Malaysian school or college population regarding cardiovascular endurance have shown similar results like abroad. Findings in Malaysia reported by Malathi (2003), Rengasamy (2006), Rengasamy (2003) and Sinnapan (2006) indicate low levels of cardiovascular endurance among school going children. With this in mind, this study was undertaken to investigate the effect of a physical fitness intervention program within a physical education class among Malaysian school secondary school boys towards cardiovascular endurance. The need to do this research was viewed important as this could fill in with some quantitative data in the nature and extent of Malaysian school physical education classes in promoting cardiovascular endurance among Malaysian school students.

## Methodology

### Subjects

Eighty seven boys ( $N=87$ , *Mean Age*=17.1; *SD* 0.4), undergoing a compulsory physical education class at two schools were selected for the study. All subjects were informed of the nature of the study and signed consent was obtained by the researcher before the initiation of the study.

### Design and Procedure

A quasi experimental with a pre-posttest design was adopted for the present study (Gay, 1992). Two schools were randomly selected in a district. In each school two classes were randomly selected for the study. In each school one class was randomly assigned to the experimental group ( $n=45$ ), and the other class was assigned as the control group ( $n=42$ ). A common pretest of 12 minute Cooper's Test for cardiovascular endurance ( $r=0.95$  and a validity coefficients of .65 to .90) as reported by Bargumgartner & Jackson (1992), was administered to the group prior to the initiation of the treatment. Further the subject's height, weight and resting heart rate was recorded by manual palpation as carried out by Volpe *et al* (2002). Both the experimental and the control group underwent regular physical education class twice a week for ten weeks following a module prepared by the researcher. The experimental group after the warm-up session participated in an intervention program. After ten weeks of regular physical education, a posttest was administered using the same protocol.

## Physical Education Class

Physical education is defined as a “learning process that focuses on increasing knowledge and affecting attitudes of the students” (Pangrazi & Darst, 1990, p5) The teaching is divided into sections and each section plays an important role in achieving the daily objective of the lesson. The lesson starts with a warm-up session. Here some calisthenics exercises would be carried out and followed by some stretching exercises. This is followed by the activity section. Here the actual learning of a skill takes place. The teacher demonstrates the skill for the day. Drills are introduced to enhance the skill. This is followed by the group activity. Here the students are divided into groups and practice skills taught the previous week and also the skill for the day. After this it is followed by application or minor game section. Here the students would play and apply the day’s skill into a game like situation. Finally it is followed by a cool down session. Here some tapering exercises are done to bring down the heart rate and for removal of lactic acid and waste products (MacArdle *et al.* 1996).

In the present study, once the students have assembled, a warm-up session was carried out for about 8 minutes. A slow jog around the volleyball court is carried out and is followed by some stretching exercises. This is followed by the activity section. Here the skill is introduced and drills are conducted. A total of four different drills for the dig and the underarm skill were carried out from individual base to group base. A total of 10 minutes was allocated for this activity. Drills were formulated which included some movement patterns to stress the cardiovascular system. In the drill session, a 1:5 ball student ratio maintained to reduce the turnover effect (Rengasamy, 2000). This is followed by group activity section. A total of 5 minutes is allocated for this activity. Immediately after this is the minor game or the application section. Here the students spent about 10 minutes and this is followed by the 5 minutes cool down session. Heart rate was recorded immediately after the warm-up and the treatment session. Five students were randomly selected and their pulse for ten seconds was recorded manually. The particular unit for the ten weeks period was a volleyball unit comprising of two skills that is the underarm dig and the underarm serve. Each physical education class was for forty minutes twice a week. After ten weeks, a posttest was carried out. Data collected was analysed for between group differences using analysis of covariance (ANCOVA) and the significant level was set at 0.05.

## Treatment

The treatment consisted of four exercises such as burpee, modified sit-up, 20 meter shuttle run and jumping jacks. The four exercises were carried out in a form of a circuit. The treatment was carried out immediately after the warm-up session. Each exercise in the circuit was designed for 30 seconds with a 30 seconds rest interval between exercises. After the fifth week, the rest interval was reduced to 25 seconds. This was to factor in the gains or improvements made by the subjects as suggested by Morgan & Adamson (1972). These exercises were chosen because it used large muscle groups and it stressed the cardiorespiratory system (MacArdle *et al.* 1996). Once the experimental group has assembled in the field, they would carry out the warm-up session. Immediately after the warm-up session the experimental group would participate in the

treatment. After the treatment the experimental group would follow the regular physical education prepared by the researcher.

## Results and Discussion

ANCOVA for between groups was carried out as the pretest mean scores indicated group differences. ANCOVA was computed using the pretest mean score as covariate and the posttest mean score as dependent measure between the experimental and the control group for boys. The results showed that there was a main effect  $F(1,84) = 11.10, p < 0.05$  and it was in favour of the experimental group.

**Table 1**  
*Descriptive statistics for the experimental and the control groups*

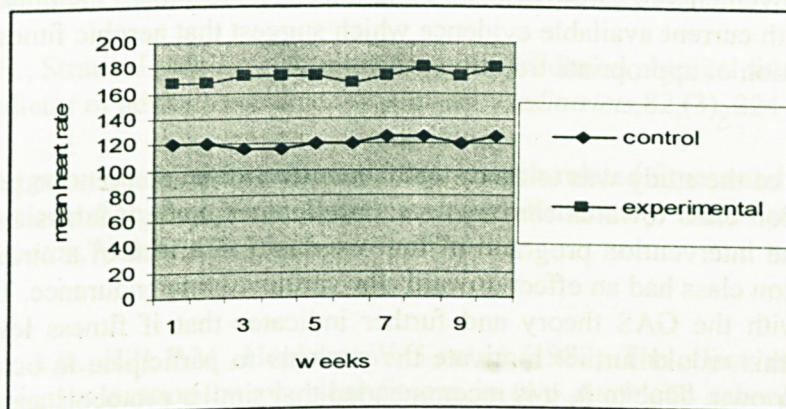
| Physiological Measure |      | Experimental (n=45) |         | Control (n=42) |         |
|-----------------------|------|---------------------|---------|----------------|---------|
|                       |      | Pre                 | Post    | Pre            | Post    |
| Cardiovascular        | Mean | 1867.11             | 2043.77 | 1692.26        | 1698.80 |
| Endurance (M)         | SD   | 366.34              | 498.05  | 461.99         | 409.97  |

**Table 2**  
*Summary of ANCOVA on posttest mean scores*

| Source of Variation                            | df | SS        | MS        | F      |
|--|----|-----------|-----------|--------|
| (Covariate)<br>Cardiovascular<br>Endurance (m) | 1  | 743155.56 | 743155.56 | 11.10* |

\* $p < 0.05$

**Graph 1: Graph depicts the mean weekly heart rates for the comparison Groups**



Overall mean weekly heart rate for experimental group = 177bpm  
 Overall mean weekly heart rate for control group = 122bpm

In the present investigation the selected groups underwent regular physical education twice a week for forty minutes a session and the experimental group underwent the treatment twice a week for ten weeks. Results indicate that there was a significant difference ( $p < 0.05$ ) between the groups in cardiovascular endurance and as shown in Table 1, it is in favour of the experimental group.

As shown in Table 1, the results indicate there was an increase of 176.6 meters or 9.4% among the experimental group and a decline of 6.54 meters or 0.4% among the control group. Other findings also reported similar results (Ignico and Mahon, 1995; Derri *et al.* 2004; Sallis *et al.*, 1997).

The overall mean weekly heart rate for the boys in the regular physical education was 122 bpm per minute immediately after their warm-up, compared to 177 bpm for the treatment group (Graph 1). This was about 61% and 86.7% heart rate maximum ( $HR_{max}$ ) respectively for the control and the experimental for their age group as suggested by (ACSM, 1998). The warm-up and the treatment had elevated the mean heart rate of the experimental group to 177 bpm or 86.7%  $HR_{max}$  among the treatment group. This elevated heart rate was maintained throughout the warm-up and the treatment period. As suggested by ACSM (1998), to have a measurable training effect, individuals must participate at least 2-3 days in week, 20-60 minutes of continuous or intermittent activities at 50%-60% at heart rate maximum. The sufficient intensity over a warm-up and the treatment period and with minimum frequency of having physical education twice a week did stress the cardiorespiratory chain sufficiently. The sufficient application of training principles of intensity on a continuous period of time and with minimum frequency probably could have contributed to the significant results in the present study.

A study by Ignico and Mahon (1995) lend support to the results of the present study. They reported that after ten weeks of regular physical education three times a week,

and following an intervention program for one hour for three days a week reported a significant increase of 9.3% in the one mile run/walk. They attributed the significant results to variety of exercise routine carried out during the intervention period. Similar findings were also reported by Sallis et al. (1997). In their study the intervention group following a 15 minutes of exercise session within a physical education class indicated significant improvements in cardiovascular endurance. The results of the present study is in agreement with current available evidence which suggest that aerobic fitness increases with the application of appropriate training principles.

### Conclusion

The aim of the study was to investigate the effect of an intervention program in a physical education class towards cardiovascular endurance among Malaysian secondary school boys. The intervention program of four exercises in a form of a circuit within a physical education class had an effect towards the cardiovascular endurance. The result is in agreement with the GAS theory and further indicates that if fitness levels can be improved then this would further motivate the students to participate in outside school program on their own. Due to it, it is recommended that similar protocols are followed in Malaysian schools so as the Malaysian physical education objective may be achieved.

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