THE EFFECTS OF A SHORT TERM PHYSICAL ACTIVITY INTERVENTION PROGRAMME ON BODY MASS INDEX, BLOOD PRESSURE, AND PERCENTAGE BODY FAT AMONG HIGH SCHOOL LEARNERS

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ABSTRACT

Introduction:
The increase in physical inactivity is thought to be one of the main risk factors for the development of diseases of lifestyle. This has highlighted the need for prevention and intervention programmes that are thought to assist in influencing the modifiable risk factors. Physical activity programmes have been proven to positively influence risk factors such us blood pressure and body mass index (BMI). Interventions by health professionals can assist in combating the problem. This study aimed to determine the effects of a short term physical activity programme on the BMI, body fat and blood pressure of high school learners in a local community in the Western Cape.

Methods:
The total number of learners who volunteered to participate in the study was 106. The study used a pre-test post-test design. The intervention programme was a 6 week programme run for 3 days per week for a period of 40 – 60 minutes per session. The intervention consisted of moderate to vigorous activities. Data was analysed by comparing learners who participated in the intervention and those who did not. Descriptive and inferential statistics were used in this study.

Results:
Prior to the intervention it was found that 18% were found to be obese and at least 10% were hypertensive. Following the intervention it was reported that blood pressure as well as BMI and percentage body fat was influenced in positive way.

Conclusion:
One can conclude that, a short term physical activity intervention programme conducted three times a week with moderate activities can affect the BMI and blood pressure levels of adolescents.

Key words:
Intervention, Learners, Schools, Physical Activity

Introduction

The increase in physical inactivity, over the last decades is thought to be one of the main risk factors for the development of diseases such as obesity, diabetes and cardiovascular disease (Andersen, Crespo, Bartlett, Cheskin and Pratt, 1998; Kruger, Venter and Voster, 2003; Woolf et al 2008). Despite widespread attempts to increase physical activity in the general population, only a minority of adults and children in developed

countries engage in physical activity to a degree sufficient to maintain or increase health and physical well-being (Saris et al 2003). Risk factors which enhance sedentary behaviour among young people include large amounts of time spent watching television and/or playing computer games, the inability to play outside, inactive role models or parents who do not support children to be active, and the lack of sufficient physical education at school.

In South Africa, chronic diseases of lifestyle accounted for 28% of deaths of all adults between the ages of 35 and 64 years and 56% of South Africans between the ages of 15 and 64 years have at least one modifiable risk factor for chronic diseases of lifestyle (Steyn, Fourie, Bradshaw, 1992). A decade later in a study conducted by Frantz (2006) among high school learners, it was reported that 31% of the adolescents had more than one modifiable risk factor for chronic diseases of lifestyle one of which was physical inactivity. The latest burden of disease study in the Western Cape, South Africa highlighted that non-communicable diseases are among the leading causes of death and conditions such as diabetes had shifted from 8th place in 2001 to 5th place in 2004 (Department of Health, 2007). Promotion of health enhancing activities is considered a key functioning role of health professionals such as physiotherapists to minimise these modifiable risk factors.

The one area where lifestyle modifications can be effected is among school children as part of their physical education programme. Various countries have attempted to implement physical activity programmes within schools. South Africa also attempted this with minimal success (Burnett, 2000). The co-ordination of physical activity initiatives for health promotion in South Africa has been fragmented. There is lack of basic infrastructure and facilities in many communities. In addition, physical education within the public school system is under threat and it is therefore imperative to look at the alternative methods to combat the increasing epidemic of physical inactivity that South Africa faces.

Institutions of higher learning train students who need to practise the implementation of health education or health promoting programmes into the communities where they work. The health professional students can be utilized, as part of their training, to contribute to the education of communities in order to improve health. Thus this study aimed to determine the effects of a short term physical activity programme run by physiotherapy students on the anthropometric and physiological measurements of high school learners in a local community in the Western Cape. If the programme is found to be successful, continuity in this school would be viable with the assistance of tertiary institutions.

Methods

The study was conducted at a high school in a community in the Western Cape. The school was considered for the study for various reasons which included it being a school located in a community which is demographically representative of the Western Cape. All the learners at the school come from the community. In addition, this public school also had no active physical education programmes in place as it had been replaced by additional academic subjects.

A pretest-postest design was used for this study. The study used a conveniently selected sample of 106 Grade 8 to Grade 11 learners who volunteered to participate in the study and were all assessed for the baseline measurements which included demographic data and anthropometric measurements of weight, height, BMI, skinfolds and physiological measurements of pulse rate and blood pressure. This data was captured following a presentation on the importance of physical activity to the learners and interested learners were invited to collect an information sheet explaining the aim of the research and consent forms were given to them to be signed by the parents and the interested learners. All relevant information was captured on a data capture sheet which was completed by the researcher and measurements were taken by trained biokinetics students.

Learners were then invited to participate in a physical activity intervention programme which lasted for 6 weeks and was run 3 times a week for 40 – 60 minutes. 53 learners voluntarily agreed to participate in the intervention programme and the 53 learners for the non-intervention group were randomly selected from the class list and matched

for gender to the intervention group. The programme was run at the end of the school day i.e. 14h30-15h30 by physiotherapy students. Ethical clearance to conduct the study was obtained from the University of the Western Cape and Department of Education. Learners were included if they had parental consent, had passed the Physical Activity Readiness Questionnaire and had given written consent. The intervention programme was discussed with the learners and included activities that interested the learners such as dancing for aerobic exercise, ball exercises, strength and flexibility exercises. Thus the intervention consisted of moderate to vigorous activities for at least 40 minutes of the time. This was based on the United States Centre for Disease Control and Prevention (1996) guide for moderate-vigorous physical activity. Pre and post intervention measurements were taken in a central venue at the school of those who participated in the programme and an equivalent group of learners who had previously been measured but had not participated in the intervention programme were then also evaluated.

Intra-rater reliability for skin fold measurements and blood pressure measurements were tested and the results using the intraclass correlation co-efficient shows a Chronbach's alpha of 0.836, 0.786 and 0.991 for systolic blood pressure, diastolic blood pressure and skinfold measurements respectively. Data was analysed using SPSS and descriptive and inferential statistics was used to report the data.

Descriptive statistics using frequencies expressed as percentages were used to obtain information on the categories of BMI, Blood pressure and % body fat. The formula for body fat percentage was determined according to the American College of Sports Medicine (2000) where the skinfold area for men are chest, abdomen and thigh and for women are triceps, suprailiac and thigh. Percentage body fat of the participants as well as blood pressure measurements for hypertension was classified according to percentiles (ACSM, 2000). According to Himes and Dietz (1994), it is recommended to classify BMI for age at or above the 95th percentile as overweight and between the 85th and 95th percentile as at risk of being overweight. Inferential statistical analysis was used to determine the associations between demographic information and BMI, blood pressure and % body fat. This was done in the form of cross-tabulations. Results were significant at $P<0.05$ level.

Results

The mean age of the convenient sample of 106 learners was 14.9 years (SD=1.42 years) and a range of 14 years to 18 years. Both the intervention and non-intervention group consisted of 21 male learners and 32 female learners. Among the 106 participants, 76% had a normal BMI, with 5% classified as underweight (BMI < 5th percentile) and 19% were at risk of obesity (BMI > 85th percentile = >30kg/m^2). The association between the BMI and gender was found to be statistically significant (p=0.00) with females being more at risk for obesity. According to the blood pressure readings, 10.6% were at risk of hypertension based on the systolic blood pressure and 6.2% were at risk based on the diastolic blood pressure. The association between the systolic blood pressure and age and gender was found to be statistically significant with p=0.03 and p=0.00 respectively.

Comparison between the intervention and non-intervention group showed that there did not appear to be much difference between the groups prior to the intervention (Table 1). The mean age for the intervention group was 14.6years (SD=1.3) and for the non-intervention group was 13.9 years(SD=1.3). However, more detailed analysis within groups indicated that prior to the intervention 18% of the intervention group was classified as overweight (BMI >25kg/m2) and 22% of the non intervention group was classified as overweight according to their BMI. Within the intervention group 8.4% were classified as being hypertensive and 10.8% in the non intervention group. Based on the percentage body fat and BMI, 24% were classified as being overweight in the intervention group and 26% of the non-intervention group.

Following an intervention of 6 weeks the following was reported. Table 2 highlights the difference in the groups post intervention.

The learners classified as overweight in the intervention group dropped from 18% to 13.2%. In addition, 9% decreased their overall BMI and 4% increased their BMI. In the non-intervention group

Table 1: Mean baseline anthropometric and physiological measurements of learners in the intervention and non intervention group prior to intervention

	Intervention Group (N=53)		Non-intervention Group (N=53)	
Variable	Mean	SD	Mean	SD
Weight (kg)	55.0	14.2	53.3	12.2
Height (m)	1.6	0.1	1.6	0.1
BMI (kg/m2)	21.1	4.5	21.0	4.2
% body fat(%)	24.9	12.7	26.2	13.3
SBP (mmHg)	111.5	14.4	111.1	12.1
DBP (mmHg)	70.0	7.9	72.7	10.5
Pulse rate(bpm)	79.7	13.4	83.4	16.0

BMI = Body Mass Index
SBP = Systolic Blood Pressure
DBP = Diastolic Blood Pressure

22% were initially classified as overweight and post intervention this number had increased to 32%. In this group 13% decreased their BMI however, 30% increased their BMI. Fig 1 shows the effect of the physical activity programme on BMI among learners.

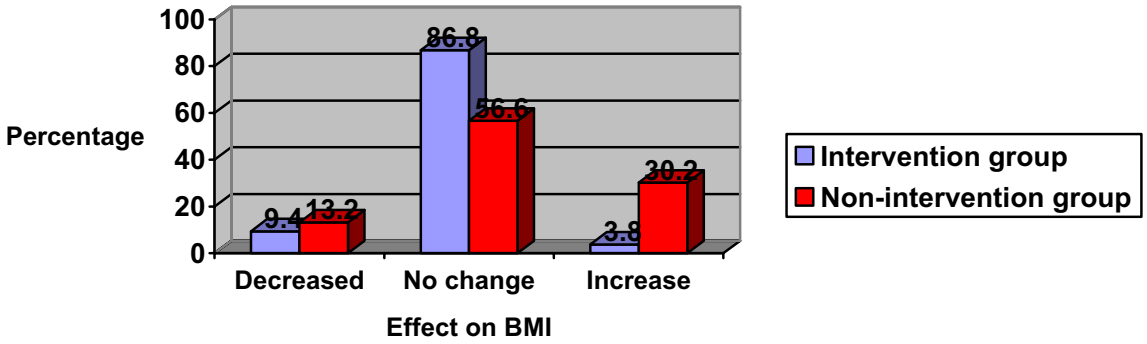
The effect of the intervention on percentage body fat indicated that 32% were classified as overweight in the intervention group and 36% were classified as overweight in the non-intervention group.
Analysis of the blood pressure post intervention indicated that in the intervention group, 23% of the group normalized their blood pressure and 9% moved to having a higher blood pressure. Within the non-intervention group, 30% normalized their blood pressure but 64% moved towards having a higher blood pressure. Using the paired sample t-test within the intervention group it was found that both systolic blood pressure and diastolic blood pressure were statistically significantly influenced by the intervention programme, p=0.03 and p=0.01 respectively. Within the non-intervention group, the paired sample t-test showed a statistically

Table 2: Mean baseline anthropometric and physiological measurements of learners in the intervention and non intervention group post intervention

	Intervention Group (N=53)		Non-intervention Group (N=53)	
Variable	Mean	SD	Mean	SD
Weight (kg)	55.6	15.3	55.7	12.6
Height (m)	1.6	0.1	1.6	0.1
BMI (kg/m2)	21.1	4.5	21.3	4.2
% body fat(%)	22.0	12.7	27.2	13.3
SBP (mmHg)	110.2	14.4	114.5	12.1
DBP (mmHg)	71.0	7.9	75.1	10.5
Pulse rate(bpm)	79.7	13.4	83.4	16.0

BMI = Body Mass Index
SBP = Systolic Blood Pressure
DBP = Diastolic Blood Pressure

Fig 1: Effects of intervention on BMI



significant change with regard to weight and BMI (p=0.00).

At the end of the intervention, the learners who participated in the intervention programme highlighted the need for continuity and the need for support from outside stakeholders as teachers did not have the time.

Discussion

This study focused on a short term physical activity intervention programme and the results of the study concur with previous studies that indicate that physical activity can influence BMI and hypertension (Pate et al, 1995). In the current study, the presence of emerging risk factors for chronic diseases of lifestyle was evident in the form of learners being at risk for obesity and hypertension. Lauer and Clarke (1989) emphasized that children identified as having high blood pressure are at great risk of becoming hypertensive adults. Although the effects of this programme may be minimal, it highlights the importance of encouraging physical activity among young people. The results provide evidence that a 6 week intervention programme can influence certain risk factors such as obesity and hypertension. The results are also supported by other studies (Nielsen and Andersen, 2003).

School based interventions can assist learners in becoming more active by providing support for active lifestyles. Even though the outcomes of intervention programmes may differ, the impact on health can influence the public health concern of the increasing physical inactivity among young people. Questions raised from the study included: If these learners continued with the programme, would they have seen more substantial changes? Would these learners continue with the programme outside of the controlled environment of the study and influence others? Perhaps most importantly, does a short-term intensive intervention such as this have an impact on overall mortality?

In addition, though schools may be finding it difficult to incorporate physical activity interventions into their school programme, schools can be assisted by students from tertiary institutions who are training health professionals. A limitation of the study was the small sample size and the need to monitor the effects of the programme over a longer period of time.

Conclusion

One can conclude that, a short term physical activity intervention programme conducted three times a week with moderate activities can affect the BMI and blood pressure levels of adolescents postively. Such interventions should thus be encouraged on a regular basis in schools.

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