

THE EFFECTS OF A SOUTH AFRICAN BLACK YOUTH JIVE
ON SELECTED BIOPHYSICAL
PHYSIOLOGICAL AND PSYCHO-SOCIAL PARAMETERS

BY

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ABSTRACT

This study investigated the effects of a South African Black youth jive on selected Biophysical, Physiological and Psycho-social parameters, using 31 Black youths, males and females (mean age 19.29 yrs) as subjects. All subjects participated in the pre- and post-programme testing protocols (acting as their own control) and in a 7-week jive programme.

While the female subjects were significantly ($p < 0.05$) heavier with a greater percentage body fat than their male counterparts, a two factor analysis of variance revealed no significant changes in body composition ($p < 0.05$) of either sex group. However, significant improvements did occur in the cardio-respiratory parameters of working and recovery heart rates, predicted $\dot{V}O_2$ max, and the anaerobic capacity. Here, the males exhibited superior cardio-respiratory qualities and performed better in all motor fitness parameters except flexibility, where no significant sex difference occurred. Also, there were significant improvements in all motor fitness tests with the exception of power (as tested in the 18-Item Illinois test). No significant differences occurred between male and female psycho-social responses with no changes occurring after the 7-week programme.

It can be concluded that involvement in the 7-week jive programme improved physiological parameters but failed to bring about alterations in the biophysical and psycho-social domains.

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DEDICATION

To my sister Mosima, my daughter Mokgere and my son Mandla.

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CHAPTER 1

INTRODUCTION

The "Physical Fitness" revolution was given impetus through recognition of the deleterious effects of hypokinesia.

The attainment of health and fitness through physical activity is in part dependent upon purchasing expensive exercise devices, encouragement of participation through sponsorships and other such monetary measures. These have all contributed to the exercise boom in the struggle to counter the results of sedentary life styles encouraged by the advances of modern technology.

Huge sums of money are utilised to encourage adults who not only fear their deteriorating health conditions and the natural slowing down through ageing, but are also in a state of emotional turmoil. Mental stresses caused by decision making in the working situation, financial problems and the competitive spirit in modern Western society, results in today's adults being under continually stressful conditions.

Tyson (1987) studied adult behaviour in the last half of the 20th century and concluded that:

They become so set on achievement, and are in such a constant state of excitement and impatience that physiological changes occur in the body which eventually lead to the development of heart disease. (Tyson, 1987, pp.299.)

Montoye (1979) suggested that early and continued involvement in physical activities could be a prophylactic or preventive measure for adulthood problems, thus recommending encouragement at this age. Whenever attention is directed to the youth, focus rarely extends beyond the elite sport participants. If it does, the youths belonging to the more privileged groups tend to benefit, leaving the less privileged roaming in the streets with no facilities.

According to Sahlins (1976), Barlow and Silverberg (1980) and Blackburn (1983), man is still metabolically adapted to a hunter-gatherer way of life and continues to show ancestral behavioural practices with some genetically fixed inclinations. It is probably for the same reason that Hall (cited in Curtis, 1915) regarded the present human activities as now genotyped but modified by the environment. If the genetic fixation theory is true, then the less privileged non-elite South African Black youths carry around an activity potential that needs an outlet.

Because of a lack of equipment and facilities in many Black schools, unimaginative drills are sometimes encountered and pupils are involved in a military-type of exercise, or worse

still, given little or no organised activities at all. Both situations are very likely to have detrimental effects on the pupils' attitudes towards an involvement in any form of physical activity.

Man is anatomically designed for a great range of physical movement and generally there is an innate desire to explore and develop this potential, particularly in the early developmental stages. This spontaneous involvement in movement is often expressed by children in voluntary participation in unstructured play. With the less privileged children this usually results in street activities. Unorganised youth jives are some of the few improvised activities in the Black residential areas. Youths perform complicated but well co-ordinated gestures arranged into motor patterns that not only fascinate the observer but also totally absorb the performer. Movements are stimulated by music, which then determines the mode and intensity of action. The duration of this activity may extend several hours, depending on the "environment". Although no observed movements of warm-up and cool-down are markedly evident, at the beginning the tempo and involvement is usually low, while exhaustion and boredom will slow down the process at the end of this interval-type of activity. As far as these participants are concerned, there are no intentional benefits or goals concerning physical or physiological gains; it is a pure intrinsic involvement. The

benefits that may result from participating in this form of aerobic activity open up an interesting and worthwhile field of investigation.

While this unstructured involvement may just be a result of youthful exuberance, many such activities precede adult participation in more structured physical activities. For any physical activity to be educationally acceptable as a beneficial conditioning programme, the need exists for research into the effectiveness of the activity at whatever level of involvement.

An awareness of the follow-on from youth to adult programmes is documented (Snyder and Spreitzer, 1983). While there may be some similarities between adult and youth activities, it is also essential for adults to appreciate and accept the differences and to avoid imposing adult activities on young people. Adult organisers should accommodate the need to include activities which the young spontaneously enjoy, as part of the youth programme. Another problem associated with adult organisation of youth activities is, as Lamb (1985) stated, "the increased involvement of adults who attempt to force their individual aspirations and expectations on children in their charge."

This does not only refer to parents and coaches but also includes organisers and planners who, in their development of activity

programmes, fail to observe the behaviour of youths at various developmental stages of life. Lamb (1985) suggested that if recommendations are to be made for youth programmes then the known benefits of activities in general need to be matched with what the participant seeks to gain out of involvement. This could imply then, that researchers need to establish the effects of those activities which as yet do not appear to have been investigated, but are of interest to participants. Fleming (1976) argued that young people consider worthwhile that which they work out or discover for themselves. He continues to point out that the intrinsic gains are not less important than the known benefits. If these improvised activities carry in them an element of fun, which Gill et al. (1983) rated the most important reason for youth participation, it is sufficient reason to merit research.

Researchers of youth activities might profitably resort to an observational approach including consideration of the improvised activities developed by the children themselves. Improvements in such activities need not alter their inherent creativity but may well enhance the purposefulness of activities, allowing freedom of self-expression. Most such activities are free of the interference of formal rules which according to Noakes (1985) further promotes fun in the activity.

What matters most is not so much the type of exercise as the personal satisfaction experienced together with the physical and physiological benefits derived from an activity. Potentially, physiologically beneficial forms of exercise may be of great value if they are psychologically acceptable to the participants themselves.

In recent years research has been focussed on the benefits of aerobic dance in an attempt to demonstrate its value as a modality for cardio-respiratory conditioning and as an alternative to dietary habits for prevention of cardiovascular diseases (Legwold, 1982; Hoerr, 1984; Hooper and Noland, 1984). To a lesser degree, the same has been done to investigate whether movement performed to music may be preferred to other sporting activities.

Pantsola jive resembles aerobic dance in that the two activities both involve movement to music over a period of time, although the jive itself has less upper limb involvement. While the benefits of aerobic dance are well established (Pate et al., 1984), the benefits of the Black youth jive remain an enigma. Thus, an empirical study of the morphological, physiological and psycho-social effects of Pantsola jive merit investigation. The morphological and physiological findings will assist in the rating of the jive in terms of effects upon body composition and

cardio-respiratory response. The psycho-social findings, on the other hand, will be a step towards determining a way to keep the youth mentally and physically involved in beneficial activities, which are intrinsically enjoyable to them.

Should Pantsola jive have a positive attitudinal effect, and at the same time yield positive physiological benefits, it could contribute towards attracting the youth to centres of participation for further involvement. At such centres the need to become physically involved could be satisfied, the urge for artistic creativity encouraged, and the feeling of fun and enjoyment fulfilled. Furthermore, cognisance of the need to participate in physical activities might be enhanced. Once an interest and a commitment has been established and the benefits experienced, it may well lead to further participation in other activities.

The interdisciplinary holistic approach of Charteris et al. (1976) was an appropriate model for this study, in trying to evaluate effects of involvement and possible benefits of the jive. The biophysical and functional changes, if any, during the kinetic learning stage of the subjects under study would, in all probability, be affected by the psycho-social forces. These may not only contribute to the changes but may also affect study methods. Mathews (1978) stated that a subject's attitude towards

an activity would affect his motivation for participation and further argued that such factors as age, cultural behaviour and prejudice would also affect performance.

Statement of the Problem

This study was designed to determine whether there could be measureable benefits gained from participation in the Pantsola Jive.

In an attempt to elucidate the possible morphological, physiological and psycho-social changes that may occur as the result of an intensified seven-week programme, an holistic interdisciplinary analysis was made.

Formulation of the Hypotheses

It was deemed advisable in the present study not to expect trends in each of the subcategories of response in all three domains investigated (namely, the biophysical, physiological and psycho-social domains). This was done because of the likelihood of differences in some, but not all of the responses in each of the three domains, and because of logistical limitations, factors such as subject numbers, time available for the experiment. Thus the null hypothesis was considered to be more favourable to test. Moreover the formulation of a null hypothesis spreads the

probability of chance operating evenly at both ends of the normal distribution curve, rather than loading it at one or other end. Finally the choice of the null hypothesis was consistent with the advice of Weber and Lamb, to test the hypothesis you hope (expect) your data will falsify (Weber and Lamb, 1970).

Research Hypotheses

The research was designed to test the following null hypotheses:

1. That the biophysical, physiological and psycho-social measures made would show no significant differences between the pre-programme and post-programme tests.
2. That no differences exist between the male and female responses in the biophysical, physiological and psycho-social parameters evaluated in the study.

Statistical formulation of the Hypotheses

$$1. H_0 : \mu_{\text{pre}(bi;ph;ps)} = \mu_{\text{post}(bi,ph;ps)}$$

$$H_a : \mu_{\text{pre}(bi;ph;ps)} \neq \mu_{\text{post}(bi;ph;ps)}$$

$$2. H_0 : \mu_{\text{pre;post}(male)} = \mu_{\text{pre;post}(female)}$$

$$H_a : \mu_{\text{pre;post}(male)} \neq \mu_{\text{pre;post}(female)}$$

- Where: -pre = subject responses preparatory to initiation of the Pantsola jive training programme.
- post = subject responses following presentation of a 7-week programme of Pantsola jive.
- bi = biophysical measures (specifically of somatotype, percent body fat and body mass).
- ph = physiological measures (specifically of predicted $\dot{V}O_2\text{max}$, working and recovery heart rates, anaerobic power and Illinois 18-item motor fitness components).
- ps = psycho-social measures (specifically of body and self-concept ratings and attitudinal responses).

Delimitations

Since the purpose of the study was to test the effects of a Black youth jive, it was limited to Black youth participants. To avoid any influences of past experience, and in a bid to obtain non-experienced subjects the project was conducted in the Eastern Cape where the Pantsola jive is not commonly practiced. Thirty one pupils from the Nombulelo High School in Grahamstown were selected to participate in the study. This sample number was deemed large enough to reduce the chance of committing a type II error.

Test procedures used were selected to allow for mass testing and minimal equipment. Thus, the sum of four skinfolds was utilised to estimate percentage body fat, the $\dot{V}O_2\text{max}$ predicted from the universally accepted Cooper's 12-minute run and the Cureton 18-item Illinois motor fitness test scale were used to test the subjects' physical fitness. In the psycho-social analysis, questionnaires focussing on attitudes toward the self and participation in physical activity were included. The scales in the latter instance were constructed to suit the cultural background of the group under study.

Limitations

The study was delimited to an age group (18-20yrs) that was best suited to participate in the jive, and as such all subjects were in the final stages of physical development. This growth factor precluded possible problems in analysis of such factors which may be directly affected by the possibility of natural development.

The inability to control the diet patterns of the subjects was another limiting factor. It was thus not easy to establish whether the subjects had altered their eating habits during the 2 month period of testing. This factor could have complicated the study in the area concerning the effects of diet on the body composition.

Furthermore, because of logistical problems, environmental conditions under which the 12-minute run was undertaken were not standardised. It was unfortunate that some subjects participated on cool, wet days, while others ran on hot days. The physiological effect of environmental conditions cannot be overlooked.

The first two weeks of participation in the exercise programme were physically less demanding due to the necessity of teaching the basic steps. The greater period of inactivity resulted in a low intensity of work initially and this was highly likely to have affected the intensity of involvement. Unfortunately it was only possible to extend the duration of the programme by one week, resulting in a seven week programme in which five weeks were devoted to the full training programme discussed later.

In the psycho-social parameters, the attitude questionnaire was based on the results of an open-ended questionnaire given to 50 Black Rhodes University students. It must be realised that their attitude towards physical activity may already have been affected by a higher degree of exposure to the mass media as compared to Black Township high-school youths. In other words, there could have been an amount of literacy discrepancy between the two groups, together with the cultural influences on the university students. Another problem with the application of the questionnaire could

have been the fact that both researchers were, at this stage, unknown to the subjects. This may well have created a strained environment for the pre-programme testing which could in turn have affected the subjects' natural responses.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

The fundamentals of an analysis of benefits of a physical activity are based on an inquiry into the extent of stress that the activity imposes on the participant over a period of time. This places the body into what Charteris et al. (1976) described as a kinetic learning process which causes the body processes to "relocate" in order to keep the body in a state of optimal condition. The extent of shift or conditioning is affected by the extent to which the stimulus affects the body as well as the adaptability of the body to such stresses.

This process occurs through phases that involve a complex interplay of a wide variety of components. The interdependent biophysical, physiological and psycho-social characteristics of man invalidates full understanding of one component without the inclusion of others. An holistic approach of Charteris et al. (1976) contributes towards a better understanding of this multi-factorial make-up of human movement.

An eclectic investigation is essential since the stress of physical activity directly affects the biophysical, physical and the

psychological systems. The whole interplay according to Bouchard and Lortie (1984) is a phenotype, influenced by both genetic and non-genetic factors. These same authors stated that genetic factors determine specific basic performance traits as well as the response to training. A highly endowed individual, for example, will overcome more stress than a supposedly less endowed one, thus reaching higher levels of performance than the counterpart. In other words, stress tolerance is essentially a genetic potential. This implies that the same stress is experienced differently by different people.

On the other hand, sex, age and the environment act as catalysts in the process of conditioning. Maturation, which is affected by the environment and sex-linked factors may, for instance, determine the readiness to cope with a given amount of work (Tanner, 1978; Oppliger *et al.*, 1986). Variables such as strength and endurance are directly related to maturation and training while flexibility shows some fluctuating tendencies during puberty, and a slow improvement towards adulthood that never achieves the level of early childhood again. According to de Vries (1980), dynamic flexibility apparently decreases with age. It is imperative therefore, that factors affecting an age group under study be considered.

The two factors, flexibility and strength, also display a sex-linked variability. For example, females show some superiority in joint looseness while males perform better in exercises demanding strength. Marshall et al. (1980) and Birrer and Levine (1987) related this to a lack of training of these components, basing their argument on their finding that both areas improve equally in both sexes under the same conditions.

Skeletal maturation provides substrates for physical development which in turn is responsible for the level at which one can perform motor skills. These factors, according to Ausubel et al. (1980) and Birrer and Levine (1987) also relate to somatotyping and body composition. According to Birrer and Levine (1987) however, a number of shortcomings are associated with any prediction of human performance from somatotyping studies, even though success in some sporting activities appears to correlate with a particular somatotype pattern. Mesomorphy, for example, is in general associated with better physical performance because of the moderate association with lean body mass. This is so because better performance in endurance activities is positively associated with lean body mass (Costill, 1967). Environmental and psychological influences like spontaneous, physical involvement and interest are essential in the neuro-muscular learning process which demonstrates a positive relationship with training.

Despite all internal and external influences all three components of man-in-motion may be affected through training programmes, depending on the type of the exercise programme, the intensity, frequency and duration of the training session. It is also essential to realise that intrinsic motivation and the creation of positive attitudes are very important in the attainment of exercise benefits.

Although these benefits are inter-related in the working situation, the different parameters will be addressed separately as a logistical necessity.

Biophysical Domain

The biophysical make-up of the human body is the frame-work for the basic movement patterns of man. Good performance nevertheless relies greatly on maturation, a stage at which stresses may be better tolerated. These stresses, may exceed limits in the young and when this happens an alteration of the hormonal profile could result in a delay of maturation (Bunt, 1986). This suspicion is, however, without empirical support and merits investigation.

Bowley and MacCalman (1963) stated that by the age 18 years, both sexes should have reached the last stage of growth, while, on the other hand, Ausubel et al. (1980) explained that growth in height

occurs in the first 20 years of life, but at a much slower rate from age 16 years onwards, the final ossification occurring earlier in girls than in boys.

The relationship between stature and conditioning is not clear. Even though Ausubel et al. (1980) and Bunt (1986) correlated stature and body mass with motor skill development, stature alone has very little effect on the ability to exercise since the possibility of physical and physiological imbalance is obviated by the proportional growth of the respiratory and vascular organs with skeletal growth (Ausubel et al., 1980; Zemel and Katz, 1986).

Extremes in stature may however pose some psychological problems, affecting the self-image which may in turn hinder eagerness and persistence, and therefore a high input of physical effort (Ausubel et al., 1980).

Body mass on the other hand is reported to show some direct relationship with exercise. Meanwhile, Ausubel et al. (1980) reported that there has been a secular trend increase in mass of the general population over the past seven decades. This has caused concern for the dietary and exercise specialists as exercise and diet are interacting components to be considered when dealing with overweight problems. The reason for the concern is because it

takes higher energy demands to carry the relatively heavy mass during exercise which then will affect both performance and results of a conditioning programme.

Overweight becomes a problem when resulting from obesity. According to Blair et al. (1983) obesity is the relatively higher percentage fat to fat-free body mass. Higher body mass resulting from muscle mass in a heavily trained individual will not pose the same excessive demands on the cardio-respiratory system. A higher percentage fat is not only a problem with regard to energy demands but is regarded as one of the risk factors leading to cardiac and metabolic disorders (Pollock et al., 1984).

Becque and associates (1986) correlated overall fatness with fasting insulin and $\dot{V}O_2$ max. Although the correlation was very low, it was nonetheless significant, showing some relationship between obesity and factors related to increased cardiovascular risk.

These reasons make the reduction of the incidence of obesity one of the prime objectives of training regimes. This is based on the general knowledge that fat patterning is a phenotype which is developed by eating habits and inactivity. When exercise is prescribed for this reason, it should be remembered that the reason for obesity may have been genetic factors combined with bad early

childhood eating habits and over-feeding, causing multiplication of adipocytes. This number may remain constant throughout life but it may be checked by early participation in physical activity (Wilmore, 1974; Allsen, 1978; Stunkard, 1980). If this is the case then exercise would be highly recommended for the reduction in size of the adipocytes at adulthood when the number of these fat cells is already fixed. Size reduction, according to Allsen (1978), occurs when the release of catecholamine, of which norepinephrine is part, is stimulated by exercise. The hormone then stimulates the release of free fatty acids from the adipose tissue. With enough oxygen to burn the fat, these free fatty acids may serve as energy sources if exercise continues, thus reducing the size and not the number of fat cells. The following conclusions may thus be drawn:

- that the setting free of free fatty acids through exercise does not reduce the number of fat cells at adulthood when the number is already fixed;
- that prognosis of body fat reduction in adulthood is reduced by the stable number of adipocytes;
- people who have been active in their youth develop fewer fat cells;
- that exercise reduces the size of the cells;
- that during deconditioning processes, adipocytes are likely to increase in size again and the previously obtained lean body mass be replaced by fat mass.

Habitual exercise will therefore generally reduce body fat. Participation in regular exercise has demonstrated such physiological advantages, including maintained lean body mass, insulin secretion reduction, a higher glucose tolerance and maintenance of a safer ratio of high density lipoprotein (HDL) to low density lipoprotein (LDL) by lowering the LDL believed to be more harmful, and elevating the HDL (Armstrong and Davies, 1982; Blackburn, 1983; Becque et al., 1986).

Most top class participants in athletic events maintain as little body fat as possible. This is related to mesomorphy, a body type which combines lean body mass and a musculoskeletal development. An extreme endomorph, on the other hand, will in all probability be disadvantaged in performance. In anaerobic activities for example, power output may be influenced by the thickness of the fat layer of the lower limbs and triceps which may act as a viscous constraint upon limb movement, thus affecting limb velocity (Watson, 1984). Although gross obesity shows some tendency to decrease $\dot{V}O_2$ max values, and a reported inverse relationship with performance (Armstrong and Davies, 1982), results have indicated that moderate amounts of body fat do not have much effect on the aerobic and strength capacities (Watson, 1984). Changes in obesity seem more apparent in those individuals who initially displayed very high blood cholesterol levels prior to training (Fox and Mathews, 1981).

Having discussed obesity in general, it is interesting to note that different areas of fat deposits seem to have different effects. Upper body fat patterning was found by Becque and his associates (1986) to correlate strongly with metabolic complications. This was confirmed by Bailey et al. (1987) when they reported that subjects with high trunk fatness would also have more circulating free fatty acids and tryglycerides available to stimulate cholesterol production, rendering upper trunk fatness a causative factor for biochemical dysfunction.

There is a general trend of gender differences in obesity. Females generally display an endomorphic body type by the final stages of growth, while males become more ectomorphic (Tanner, 1978; Beihler, 1981; Carlson and Cera, 1984; Becque et al., 1986; Bailey et al., 1987). This large percentage of body fat recorded in females may largely be the cause of performance inferiority of the female. Lewis and associates (1986) confirmed this when they discovered that when training under the same conditions, intensity, frequency and duration, both sexes produced the same relative increase in $\dot{V}O_2$ max.

Besides the above-mentioned physiological implications, obesity is in some cultures socially undesirable. A trim figure is not only associated with attractiveness but also allows an individual the

ability to continue with everyday activities effectively (Adamson and Wade, 1986). Overweight more often than not results in a negative body image which usually affects the perception of the self, affecting confidence, and interest in learning new skills, which are necessary for better performance. It may therefore be concluded, as Montoye (1979) maintained, that the correction of body composition is obvious and essential for the general physiological and psychological well-being of the individual.

Aerobic dance, like other endurance exercises, is a very useful modality for the reduction of obesity, while at the same time possessing a weight stabilising effect as long as performance is maintained on a regular basis. Favourable effects on percentage fat have been achieved, sometimes with or even without, change in body mass (Igbanugo and Gutin, 1978; Legwold, 1982; Blair et al., 1983; Hooper and Noland, 1984). On the other hand, Oppliger et al. (1986) found an increase in percentage body fat in a group of swimmers of ages 7 - 12 years and concluded that there might be a complex interaction between hormonal influences and training in play, which is responsible for the rise. The effects of exercise on obesity otherwise depend on the conditions of exercise, the intensity, frequency and duration and the level of the basic physical condition of an individual.

For assessment of any possible improvements in the morphological make-up of an individual, measurements need to be taken. Mass may be objectively measured from a standard measuring scale. An accurate measurement of body fat is not an easy one. Underwater weighing for measuring body density is to date the most reliable technique but is not without disadvantages. According to Watson (1984) this technical method needs well equipped laboratories and experienced technicians and these were not available for the present study. Direct measurements such as circumferences and skinfolds have however been developed and used to estimate body fat. Reliability of skinfold measurements is high and the technique is preferred for its relative ease of administration, as well as for its accuracy. Experience and good quality calipers are necessary for the reduction of errors (Nash, 1985; Mueller and Malina, 1987; Oppliger and Spray, 1987). The sum of the individual skinfolds have been used to estimate the total body fat of many sample groups (Watson, 1984; Jackson et al., 1980b).

Different researchers have postulated different sites as being appropriate for predictions of body fat. The factor of population differences in fat deposits determines the appropriateness of sites to be measured. Once the suitable sites have been determined the total body fat of an individual or group in different population groups can be established.

The abdominal, triceps and suprailiac skinfolds have been cited as the most reliable and most common, followed by the subscapular, front thigh and the medial calf. Measurements are obtained from the dominant side (Sinning and Hackney, 1986; Bailey et al., 1987). A total anthropometric conformation may be described by somatotyping, which, according to Carter (1980) is a quantitative description of the present total morphological make-up and body composition combined. A shift from endomorphy to mesomorphy is related to loss of body fat and a gain in lean body mass coupled with musculoskeletal development. The reverse is also true.

Carter (1981) indicated the difference in morphology among population groups and between sexes, as well as the relationship between maturity, body composition and physical performance, relating body structure to function. He further reported that an acquisition of an appropriate somatotype pattern which is a characteristic of the already successful individual participant in physical activity may possibly be indicative of successful performance.

Bale (1981) reported that regular training leads to a body with mean percentage fat which is less endomorphic and more mesomorphic. The advantages are not only related to physiological and psychological gains but a physically able body plays a major role in encouraging further participation in physical activities.

Physiological Parameters

The physiological parameters serve to supply fuel in order to set the anthropometric framework of the body in motion. Stresses onto these systems are directly detectable, making the cardio-respiratory system a popular and more objective measurement of work as well as a good test for conditioning activities.

Today's technological advances have almost eliminated the need for natural everyday physical activities. As human beings are still hunter-gatherers metabolically (Lee, 1979) the result of inactivity is a growing increase in hypokinetic diseases. A high level of cardio-respiratory function implies the ability to utilize relatively large amounts of energy over an extended time, giving rise to high working capacity (de Vries, 1980; Blackburn, 1983), and people with hypokinetic problems lack this ability. Unfortunately not many people of our sedentary western society show much concern for these metabolic diseases. It is only when either symptom is detectable or when physiological functioning is deteriorating that many individuals start worrying. However, these diseases have evoked much concern amongst the medical profession and human movement specialists.

The main focus today is, therefore, to improve cardio-respiratory fitness. As metabolic diseases have been found to be partly the

consequence of inactivity (Montoye, 1979; Hage, 1983; Pollock et al., 1984) resulting in weakened cardio-respiratory systems, it follows that improvements of this system through regular involvement in physical activities may be prophylactic.

According to Montoye (1979), when coronary heart disease and other such related metabolic diseases set in around age 40 - 45 years, the underlying disease is highly likely to have originated as far back as school age. Some of the risk factors such as obesity are already detectable at this age. This suggests that for preventative measures to be effective, they should be started early.

In aerobic activities, capacity of work may be expressed relative to the movement of one's body mass, in short to muscular activity. Aerobic capacity is therefore often expressed relative to body mass which accomodates more utilisation of oxygen per unit time by larger individuals.

Central and peripheral cardio-respiratory responses to exercise occurring at submaximal and maximal levels have been reported. Some of the benefits may not be obvious if a test protocol lasts only a few weeks, depending on the physical state of an individual. The first responses of an extremely obese individual to exercise will for example be the conversion of fat to lean muscle tissue.

According to Pollock and his associates (1984), this process occurs over a long period of time, from about 3 months upwards. This will directly affect the reliability of any research study. Under such conditions therefore the length of any programme will have to be of a substantial duration for benefits to be observable.

With moderately obese types, benefits of aerobic exercise may appear early in the programme. Changes such as improvement of $\dot{V}O_2$ max and cardiac output, caused by an increase in stroke volume, reduction of resting and working heart rates and lower blood pressure have been reported (de Vries, 1980; Fox and Mathews, 1981; Pate et al., 1984; Pollock et al., 1984; Birrer and Levin, 1987). The resting heart rate is probably reduced by the more efficient and stronger pumping heart with a greater stroke volume. Pollock et al. (1984) reported that a drop in blood pressure becomes more obvious with hypertensive individuals.

A low task related oxygen consumption has also been reported with trained athletes (de Vries, 1980; Fox and Mathews, 1981; Pate et al., 1984). This allows for a more efficient transport of oxygen to the working muscles, facilitating the ability to expend relatively large amounts of energy over an extended time; commonly expressed as a greater work efficiency. In this regard, Cooper (1970) and Birrer and Levine (1987) have reported that subjects run further in the 12-minute run after training.

Haemodynamic improvements are directly related to the energy cost of an exercise protocol, its duration, frequency, mode of activity, status of health and fitness, age and, to some extent, the sex of an individual (Tanner, 1978; Ausubel et al., 1980; Fox and Mathews, 1981; Pollock et al., 1984). The above named factors do not contribute independently but show some interdependence in the overall effect. However, an important factor to be considered is that there is a basic threshold of energy cost which must be reached for any improvement to take place.

Improvements in work capacity are directly related to intensity. Although a minimum of 130 beats per minute or 50-60% of $\dot{V}O_2$ max have been recommended by most researchers as an intensity sufficient to produce a training effect, the level of a person's initial fitness plays a very important role. This has been demonstrated by Pollock et al. (1984) when they reported improvements at an intensity of 120 beats per minute with a low fitness group. This then supported the thesis of a minimum threshold value for every individual which must be exceeded in the energy expenditure for benefits to take place. This energy expenditure threshold is also directly related to the length of time taken to carry out the physical activity. A very short period may not be enough to stimulate energy stores responsible for aerobic work. It is important that the activity should be such that it does produce changes in cardio-respiratory fitness.

Researchers have demonstrated an inter-relationship between intensity, duration and benefits accrued. Improvements have been obtained with programmes of lower duration and high intensity as well as ones with lower intensity and longer duration. Regularity of involvement is another important factor. Results show that 5 days training per week yielded better results in cardio-respiratory fitness than 3 days per week. But depending on intensity and duration and the trainability of an individual, a 3-times-a-week programme is also reported to bring about beneficial results, with the order of the 3 days in a week not being an important issue (Goode et al., 1976; Pollock et al., 1984; Koszuta, 1986; Ong and Sothy, 1986).

It is essential to note that different levels of basic physical fitness affect benefits from an activity. At around the age of 20 years, the $\dot{V}O_2$ max has proportionally increased to the maximum. This, according to Tanner (1978), Pollock et al. (1984), and Birrer and Levine (1987) is dependent upon the individual's physiological characteristics. Involvement in a training programme at this age may show some moderate improvements. The reason for this may be the already elevated $\dot{V}O_2$ max which makes the body more stress-tolerant. In other words, the fit individual may not show high gains from a moderate training programme; on the other hand, a moderately obese individual as already indicated, gains lean body

mass from exercise, which results in improved efficiency of the muscles. Such gains are determined by expressing $\dot{V}O_2$ max relative to the body mass.

Pollock et al. (1984) discussed the complicated maturation processes that may affect improvements in $\dot{V}O_2$ max in the young. This may be stimulated by the interaction of exercise, stress and environmental influences together with genetic endowments.

Sex-linked variability is an issue of much interest. Many researchers agree that males show superiority in cardio-respiratory fitness over females. Pollock et al. (1984) stated that differences may be the result of differential opportunities for involvement in high energy consuming activities. Ausubel et al. (1980) argued that despite the factor of opportunity, there is a marked difference in vital and cardiac capacities, which are sufficiently great to account for marked differences in tolerance. Coupled with superior muscular hypertrophy, this puts males at an advantage in most physical activities. In the last stages of development ectomorphic body type of males renders a lighter body to be carried when performing activities, which makes the difference between male and female performance more pronounced.

Cardio-respiratory benefits, as already mentioned, may be affected by the length of an exercise programme. In every-day examples of

exercise programmes the activities are simply controlled or checked by such factors as age, fatigue or even disease, depending on the individuals themselves, as well as the type of exercises included. When the benefits of an activity are to be empirically tested, the length of the programme, should be determined on the basis of previous research findings as well as upon the time available to the researcher. The number of sessions adopted should be influenced by findings from similar studies that have yielded worthwhile results. Some programmes have produced benefits in a short period of time, and when the same number of sessions are adapted to a new programme, this may mask some of the benefits that would otherwise occur in programmes of longer duration.

It is for this reason that Birrer and Levine (1987) prepared a list of some physiological factors affected over a period of time. Even though the mode of activity had not been specified it was stated that:

Short term (<6 months) training programmes produce significant increases in maximal work capacity, cardiac output, stroke volume, mixed arterial O_2 and $\dot{V}O_2$ max and reduction in submaximal heart rate in both girls and boys (Birrer and Levine, 1987, p.218).

It is not clear in the above mentioned case how short the term could be. As little as 6 to 8 week programmes have produced beneficial effects in aerobic activities. On the other hand, the long term period (>6 months) of aerobic training, according to

Birrer and Levine (1987), may result in an increase in absolute $\dot{V}O_2$ max levels, increased systolic and diastolic blood pressures with maximal activity, and increased blood volume coupled with slightly increased total haemoglobin, increased lean body mass and a decline in adipose tissue. These consequences give an indication as to benefits to be expected when a programme is planned.

The same problem of length of a protocol was noted by Pollock and his associates (1984). They stated that for changes in an extremely obese subject to be apparent, more time is needed for fat to be reduced and muscle to be developed. This suggests that very little alteration in cardio-respiratory dynamics is likely in the first 6-8 weeks under such conditions. The moderately obese individual does show signs of improvement after such a period. It is important therefore, that contributing factors such as intensity, duration, frequency, the type of activity and the trainability of subjects be properly controlled for better detection of changes in the subjects at the end of the programme under study.

Anaerobic capacity may not be easily measurable but it does show some relationship to aerobic activities. Birrer and Levine (1987) noted that the positive gains in anaerobic activities by the young, following training in aerobic activities, could be responsible for their improved performance despite the changes in $\dot{V}O_2$ max. This

marked the increased ability of the muscles to store more phosphocreatine and the increased ability to anaerobically produce more energy.

At different levels of intensity, duration and frequency, aerobic dance has demonstrated effects on the cardio-respiratory system, depending on the energy cost of the dance. Igbanugo and Gutin (1978) found that at a high level of intensity, a cardiovascular threshold level was reached, while medium intensity had more impact on sedentary groups. This suggests that the influence of an aerobic dance intensity also depends on the level of the initial fitness of the subject.

As in other aerobic activity studies, Hooper and Noland (1984) and Watterson (1984) agreed that cardio-respiratory and metabolic benefits can be obtained in a 6 to 8 weeks aerobic dance programme. Other physiological changes such as reduction in resting heart rate and improvement in Cooper's 12-minute run, were evident after 6 and 8 weeks respectively.

Although effects of aerobic dance on the anaerobic system seem possible, little if anything appears to have been reported on this matter.

Different test protocols have been designed to test the effectiveness of aerobic programmes. Because of the larger numbers used in aerobic dance tests less time-consuming and less sophisticated evaluative measures have tended to be used, especially in test-retest designs. To assess the effect of conditioning, both Cooper's 12-minute run and the 2.4km run have been used to predict the $\dot{V}O_2$ max and their reliability has been reported to increase with highly motivated subjects. The disadvantages of the two methods are that they are reported to over-estimate actual values for the highly trained athletes and to under-estimate values for the untrained (Thiart et al., 1978; Pollock et al., 1984; Ong and Sothy, 1986). Nevertheless, Goode et al. (1976) suggested that the measure could effectively be used as an index of a group performance. What is more important is the degree of motivation since high correlation of the 12-minute distance run with $\dot{V}O_2$ max is derived from longer distances covered. It should be noted that running in this case does not take place in an "artificial" (laboratory) environment and is not regulated as on a motorised treadmill. Therefore, such factors as pacing and motivation play an important role (Baumgartner and Jackson, 1982).

Heart rate responses are also used to test the level of fitness of an individual. Resting heart rate is one of the variables directly affected by training. Benefits involving the lowering of resting heart rate have been reported after six weeks of training.

Results of a working heart rate, according to Åstrand and Rodahl (1970) rely on all-out effort since it may be difficult to determine whether maximal levels in the process had been attained or not. Although measurements taken during work are usually approximations, the first 1 to 1.5 minutes of recovery have been shown to correlate highly with working heart rates (Åstrand and Rodahl, 1970). Although correlations between work and recovery periods decrease when a group is tested, they are still high enough to use in detecting changes occurring in a group (Baumgartner and Jackson, 1982).

Recovery heart rate has also been used for the determination of fitness levels. According to Berger (1982), individuals with better cardiovascular fitness usually exhibit faster recovery after a working bout. With submaximal exercise, return to normal is faster and may be attained within 2 minutes (Åstrand and Rodahl, 1986; McArdle et al., 1986). Recovery, therefore, is dependent on intensity and duration of exercise and the level of fitness of the subject.

Measurements of anaerobic capacity, as has already been mentioned, are not easy. There is a close relationship between power and the anaerobic capacity, linked by the energy supply in the two instances. Although most of the power tests utilise the phosphocreatine system for energy release and not the adenosine

triphosphate cycle of the anaerobic system, the former tests have been used to test the latter. There is a similarity between the two systems which use the "immediate" energy stored in the muscle and an improvement of this ability signifies improvements in both systems. Results may be affected by the number of subjects and time available to test. A Wingate test (Mac Dougall et al., 1982), although having anaerobic properties better than the Margaria-Kalamen test (Mac Dougall et al., 1982), requires sophisticated laboratory equipment and can, therefore, not be used in field testing or in a school situation. The Margaria-Kalamen test only requires a flight of stairs and a stopwatch which is the reason why it was preferred in this study.

Motor Ability Components

Although muscular activities are directly related to metabolic functions, for a clearer understanding of this section motor abilities will be discussed separately.

The sensory-motor system is subject to maturational influences and is fully developed by the end of adolescence. It is this system that is largely responsible for the level of performance in motor skills. Basically, there is a general muscle involvement, which implies that the motor fitness components, muscular strength and endurance are fundamental to all physical performance skills. Other motor skill components such as balance, agility and power may

be seen as modifiers of these basic facets. For example, muscular strength and endurance are, according to Jackson et al. (1980) and Pollock et al. (1984), basic to the development of power. Agility involves gross motor tasks including such complex factors as speed, co-ordination, and balance. Also included are muscle strength and endurance, as well as flexibility, which brings in the supportive leverage of the skeletal structure. Discussion of these motor skill components will therefore revolve around the most fundamental ones for a better understanding of the more specialised ones.

Improvements in the motor skill components may be affected by such factors as innate ability, body composition, age, trainability, motivation and practice specific to the component factor (Åstrand and Rodahl, 1970; de Vries, 1980; Marshall et al., 1980; Roger, 1985; Birrer and Levine, 1987).

Muscular strength and endurance, and flexibility are important characteristics of motor performance. While strength is indicative of the amount of force produced by a muscle or group of muscles, endurance is more a measure of cardio-respiratory and gross muscular activities, while flexibility determines the range of motion within a joint or joints (Lamb, 1978; de Vries, 1980). The inter-dependence of these three components is essential for the efficiency of man-in-motion.

Contributions of the three components (strength, endurance and flexibility) to the general health of an individual cannot be overlooked. Blair and his associates (1983) stated that problems concerning the low back and posterior thigh are related to poor muscular strength, endurance and flexibility. Lack of flexibility in the low back and hamstrings plus the weak abdominal muscles result in these problems which, according to de Vries (1980) and Blair et al. (1983) could be prevented or corrected with exercise. Clearly, therefore hypokinetic syndromes are related to weak responses in motor fitness tests, and improved motor fitness ratings necessarily mean improvements in these components.

In some cases, overtraining of one component without due training of others may result in antagonistic behaviour of the trained to the untrained. Hypertrophy of muscles has been related to impairment of flexibility because of the bulk of intervening muscles (de Vries, 1980; McArdle et al., 1981; Roger, 1985). The same condition may also be observed in an obese individual where fat may also act as an obstacle to the full range of movement in a joint or joints. Flexibility is also affected by over-shortening of disused muscles, more especially if the antagonists have been in use imposing strain on the tendons which may lead to injury.

In order to fully understand the responses of the components to exercise, each one will be dealt with independently.

Strength

As has already been indicated, muscular strength and endurance are important ingredients of power which Pollock et al. (1984) described as maximum strength production expressed relative to time. The stronger the muscle, the more force will be generated and the faster the body can be propelled or carried through a required movement. This also relies on the extent to which the muscle or group of muscles can endure the particular stress. In such cases, the contracting muscles use the phosphocreatine stores to perform power activities. It may be for this reason that some of the anaerobic activities are regarded as power activities.

It is not easy to separate muscular strength, power and endurance. For example, MacDonald (1983) suggested such tests as push-ups, sit-ups and leg raises for muscular endurance testing, while the same activities were used by Cureton (1947) as tests for power. Cureton's muscular endurance tests involve more energy supply which could be linked with anaerobic capacity.

Muscle development is related to the improvement of other systems such as the heart and respiratory systems, although the muscular structure reaches its final stage of natural development after the skeletal structure is fully developed by the end of adolescence (Beunen et al., 1979; Ausubel et al., 1980). It is at this final

stage of development that fat replacement by the lean muscle tissue is more obvious in boys than in girls, giving males the benefit of a more muscular body than their female counterparts (Carlson and Cera, 1984; Lewis et al., 1986). This is true if muscle mass is directly related to strength, which has been reported by Pollock et al. (1984) and Oppliger et al. (1986), who emphasised the importance of size in the determination of strength. The cause for the dimorphism in muscular hypertrophy is the secretion of an androgen in males which contributes to the difference even after training. Tanner (1978) related this dimorphism to the superiority of males in such other variables as the heart size, a lower resting heart rate, a greater oxygen carrying capacity, and a greater ability to neutralise chemical waste products.

Under conditions of equal training opportunities, sex differences in strength are diminished, especially when muscular strength is measured relative to body mass (Tanner, 1978; McArdle et al., 1981).

Muscular training is essential and disuse of a muscle may lead to atrophy which is the shrinking of the muscle tissue (Roger, 1985). Regular use of the muscles is thus not only important for everyday movements and manipulation but also in the development and maintenance of the muscles themselves, for further and future use. Karpovich and Sinning (1971) saw the more active nature of a child as a need for the development of the musculature.

Muscular strength and endurance respond positively to exercise (Hichson et al., 1980; Heyward et al., 1986). According to Roger (1985), Lewis et al. (1986) and Oppliger et al. (1986), progressive resistance training is an important contributing factor to strength gains. The rate of gain depending on both the inherent ability, persistence to stressful conditions and the progressive nature of the exercise programme. Benefits of muscular strength and endurance also show some relationship to both the level of fitness and lean body mass. MacDonald (1983) reported greater improvements in situations in which the subjects were less fit at the start of the exercise programme. This improvement was related to the fat or weight loss with training, with the body fat being replaced by muscular tissue development (MacDonald, 1983; Heyward et al., 1986).

Endurance

Muscular endurance is directly linked to the cardio-respiratory system since the ability to sustain contractions over a period of time is dependent on the energy supply. Training improves the pathways of the stores of energy and the muscles' ability to utilise the accumulated lactic acid as it continues to contract and relax. Such training includes repetition of maximal or near maximal contractions (Falls et al., 1965; MacDonald, 1983).

Meanwhile, Hichson et al. (1980), reported a direct relationship between muscular endurance increases and the increase in muscle girth, but did not find the result to be accompanied by a $\dot{V}O_2$ max increase. Run time to exhaustion was increased on a treadmill and performance on a cycle ergometer showed four times greater benefits.

It should be borne in mind that muscular strength and endurance both involve muscular contraction, usually using the body as resistance and involving more than one muscle or even muscle group. Any measurement of a body segment may thus have to involve both strength and endurance of a group of muscles. Since contraction of some muscles depends on the prior recruitment of others, a single muscle test may not be a fair measurement of gains that result from muscle group involvement. This interdependency is not only obvious with muscles of one limb, but may also occur between corresponding muscles of the contralateral limb.

In relating strength gains to anthropometric make-up, Karpovich and Sinning (1971) discovered that ectomorphic individuals reach high limits of muscular strength sooner than more stocky subjects with large bones. McArdle et al. (1981) reported that tests of muscular strength are in terms of maximal tension generated by a muscle or group of muscles and that although strength gains are

related to the bulk of a muscle, girth may not necessarily be an indication of strength gained. The improvement of force generation may be a better indication (Heyward et al., 1986).

Flexibility

Several sub-components of flexibility may be identified: static, which reflects the range of motion; and the dynamic, which reflects stiffness in a joint (de Vries, 1980).

Unlike muscular strength and endurance, over-training for flexibility may cause excessive mobility around a joint which may undesirably limit stability around that joint. This then reduces the stabilising and leverage effects of that joint, a factor which is necessary for movement (Glaister, 1980; Pollock et al., 1984). Therefore, while flexibility responds positively to stretch exercises (Pollock et al., 1984), they should not be done to the exclusion of strengthening exercises.

The superior flexibility of some joints in females is a controversial issue. As for muscular strength, some researchers believe that this dimorphism relates to the regular involvement of these joints by women rather than an innate trait. This would then allow the difference to be bridged by involvement of the same joints in males, which would show similar results. Birrer and

Levine (1987) explained that relative improvements have been demonstrated, yet this does not explain the apparent original difference. De Vries (1980) on the other hand reported that this superiority exists at all ages of life and is innate. This was supported by the findings of Oppliger and his associates (1986).

Calisthenic types of exercise are reported to increase flexibility (Pollock et al., 1984). It is important to note that flexibility of one joint does not imply flexibility of the rest of the body. Flexibility is joint-specific and thus programmes and tests need to be planned to include several joints. In an exercise programme it should be noted that stretch exercises in the warm-up and cool-down programmes may contribute to gains in flexibility resulting from the stretch exercises included in the main programme.

In the present project, static measurements were included due to their ease of measurement. The measurements determine how close one body part could be brought into opposition with another or some point of reference. The tests are those included in the Illinois 18-item test. De Vries (1980), Blair et al. (1983), MacDonald (1983) and Oppliger et al. (1986) agreed on the following tests: trunk flexion and extension, shoulder elevation and hyperextension, and average ankle flexion. While the Illinois 18-item test includes trunk flexion and extension, it does lack a test for ankle flexibility.

For the purpose of this study, Cureton's Illinois 18-item fitness test (Cureton, 1947) was adopted because of its ease of administration and minimal requirements in respect of equipment, while testing many components of physical fitness at the same time. The test may therefore be administered anywhere, and enables one to test large numbers at the same time, as long as careful control measures are taken. The six major components of motor activity are included and a variety of tests are used for each component.

The Psycho-Social Parameters

As already indicated, man-in-motion should not be perceived or studied without consideration of all three domains suggested by Charteris et al. (1976). Participation in a physical activity does not only depend on the physical and physiological abilities of the body to carry out an activity, but also on mental factors such as willingness, which may be affected by the attitude one has about either that particular activity or physical involvement in general. For example, a non-motivated individual without any knowledge of the benefits of regular physical exercise may not perceive physical participation as essential, and thus will not get involved. If he does, the level may be low, reducing the chances of achieving any substantial benefits. This situation may result in negative attitudes towards physical activity, which may lead to inactivity, depriving the body of all gains mentioned in the previous sections.

The morphological and physiological make-up of man also contributes to the general well-being of an individual. As mentioned previously, excessive obesity may affect the body and the self-concept (Ausubel et al., 1980), which may be corrected with physical involvement (Blair et al., 1983). This will in turn reinforce a positive attitude towards participation in physical activities.

In this section a review of attitudes and how they may affect or may be affected by the self, the body and physical activity will be covered. One's self-concept is, according to Zion (1965), a kind of a self-regarding attitude which may be influenced by factors such as the body concept or even life-style. Although these concepts function inter-dependently, they will be discussed separately for a better understanding.

Before expanding on the details of the body and self-concept, it is essential to have a clearer understanding of their general meanings and to clarify the different terminology used in the literature.

Tajfel and Frazer (1978) defined self-attribute as inferring one's own feelings and attitudes. This definition allows the self to be attributed externally by an observer but admits that a discrepancy may exist between the self-judgement and the judgement of an

observer, because of the prevailing situational influences perceived by the observed, but not obvious to the observer. Tyson (1987), on the other hand, wrote about a self-attribute being a way to acquire information about one's self, concerning such aspects as attitude, motivation and emotion. This is regulated by the way we imagine ourselves to be perceived or evaluated by others. In this regard one takes others as objective standards of comparison to arrive at a self-concept. Both authors agree on the influences of the environment in the interpretation of this self. Tyson (1987) gave an example of a culture, showing how the Western and African cultures differ in the focus on the individual. He indicated that in Western cultures the self is a centre of focus, while African cultures relate a self to society.

Fieldsend (1980) has suggested different terms and different meanings of the concept. He referred to the self-image as the consciousness that one has about one's self, and discussed self-cathexis as involving the evaluation of a self. This makes it difficult to determine how reliably the consciousness can be explained without being influenced by such variables as evaluation or comparison factors. Zion (1965) bridged this problem of terminology by regarding self-concept as an inclusive term, laying emphasis of meaning on generally what a person thinks he is, regardless of what he is in reality. This allows for a broader perspective of self-evaluation but increases the discrepancy

between the observer and the individual judgement, explained by Tajfel and Frazer (1978). It also increases the chances of observing alterations if any, in one's self, whenever the situation in which the former judgement occurred alters.

With body image on the other hand, a body concept may determine the body cathexis. Body cathexis has been defined by Vincent and Dorsey (1968) as the satisfaction or dissatisfaction that a subject expresses with respect to the various parts and processes of the body. As a self description is usually evaluative it will be influenced by feelings of satisfaction or dissatisfaction. The result is that the conception of a body image is unavoidably a configuration of highly subjective psychological experience (Vincent and Dorsey, 1968). As with the self-concept, the expression of how one perceives one's own body may allow for detection of any differences that may result when situations change. The body concept is also affected by comparison, previous experience and the way other people view us.

It is evident that one's body and self-concept also influence the way in which one perceives the environment, putting one's own self as a point of reference to judge the environment. This, according to Tyson (1987) results from previous experiences and situations that led to the existing perception. What one has experienced as having contributed to the make-up of one's self-image in the

past is usually perceived as always possessing those particular qualities. In other words, qualities that are possessed by an individual are usually set as a standard against which evaluations are based.

For the purpose of this study, a self-concept will be regarded as a highly subjective mental construction about one's self, expressed through the evaluation of such personal qualities as the intellect, the body, behaviour, attitudes and feelings, and guided by previous experiences, thus occurring as a function of the situation in which it occurs. By the same token, body image as used in this study will involve evaluation of one's own body with consideration of experience, comparison with others and previous self and the situational requirements.

The influence of others and the environment on a self-image have been regarded by Tyson (1987) as being significant. As is usually the case, evaluation is executed with reference to a focal point and in the case of the body and self-concept according to Tyson (1987) other people are referred to as objective standards. He further elaborated on "individuation" that may be caused by such factors as anonymity, a high level of excitement, sensory overload and being in a group which may result in lessened self-awareness. Such behavioural inclinations as theft and cheating may result, since one is inclined to behave in a way that one normally would not.

It has been previously indicated that the body and the mind are critical factors considered in self attribution. It is therefore essential to find out if any relationship exists between the body and the self-concept. According to Johnson (1962), the body concept plays a very important role in a child's determination of self, since attribution at this age depends largely on the physical make-up. Self attribution with adults relies more on such factors as achievement in society, the intellect and life-style, in addition to the body, thus making the body concept a subset of the self-concept. Fieldsend (1980) supported this contention when he wrote that:

Important as bodily sense is, it is not the whole of one's self, and the sense of the self depends on more than just the body (Fieldsend, 1980, p.70).

A more objective approach to the relationship between the two components has been established by researchers. Zion (1965) reported a significant relationship between body esteem and self-esteem in college women. Her body esteem scale involved a perceptual evaluation of body parts and their function. Both the body and self-esteem scales were self constructed. She emphasised the interdependence of the two variables when she mentioned that a person's attitude concerning the self-concept will influence and be influenced by that person's self attribution of appearance and physical ability. The same positive relationship was



demonstrated by Gussis (1971), Rohrbacher (1973) and Wilmore (1974). In all three cases the authors used physical activities to test the relationship, which at the same time indicated the relationship between the two concepts and activity.

The relationship between motor performance and body esteem was further substantiated by Sloan (1963) and Kreither (1970) both cited by Fieldsend (1980). The latter noted a decline of body concept with a decline in general activity level and deduced that the opposite is also possible, which could mean that improvement in body concept is positively related to the benefits derived from participation in physical activity.

On the other hand, Vincent and Dorsey (1968) found no significant relationship between body concept and participation. They concluded that either the lack of objectivity of the scale they used or the inclusion of too few physical activity tests could be responsible for the lack of a relationship. Such distortion factors need to be taken into account when analyses are made.

Self-esteem is also reported to have some relationship to physical fitness. It must be remembered, however, that self-esteem is not only dependent on physical make-up. We may therefore differentiate between a general self (when all aspects are included) and a physical self (when only the physical make-up is involved). The

relationship between physical fitness and self-esteem was reported by Graves (1972), White (1974) and Vincent (1976), with this relationship affected by both age and the type of exercise and its contribution to the improvement of a self. In his research, Albinson (1985) discovered a positive association between physical activity and a particular life-style, characterised by a better self-concept.

Improvement in self-concept, according to Tucker (1983) depends on its original level. He stated that individuals with a low self-concept in the beginning inevitably must improve, whereas those who started with a high level have little room to improve as a result of the ceiling already achieved.

One major problem with body and self-concept is the issue of assessment. This, according to Balogun (1987), is a result of the unclear relationship between what could be regarded as actual and the perceived self as related to physical parameters and self interpretation of the body state. In his test for this relationship, Balogun (1987) involved undergraduate subjects (mean age 22.5 years) in a body cathexis scale, before and after providing them with objective information on their level of fitness in situations where results showed improvements in the post test. This indicated that the subjects underestimated their body image before they fully understood the concept. In his conclusion,

Balogun (1987) indicated that the discrepancy resulted both from physical changes in conditioning and from a shift in their feelings of worth. Perceived attributes may therefore either underestimate or overestimate the real state of affairs, which according to Tucker (1983) may be corrected by objective feedback. This is an indication of the difficulty encountered in trying to quantify psychological variables empirically.

The age of the subjects may also contribute to the difficulty in assessment. This has been demonstrated by Sonstroem (1978) who discovered that adolescents are more ready to deny physical inability than they are to confirm it, which may result in an over-estimation of that variable. The reason for the denial may be the fact that athletic inclination and fitness contribute to gains in prestige in this age group. Fortunately the denial usually has a motivating effect in that the individual may be encouraged to improve his perceived abilities which may contribute to a further feeling of security.

The actual test scale is one other important aspect to be considered. When an affective response is tested by a questionnaire, there are many factors to be considered. Beside the issue of age, Coldicott (1979) further suggested other measures to be taken. He found that the type of language used in an already

developed and validated scale may have to be altered, along with the type of questions, in order to suit subjects from different cultural environments.

Reports have indicated that participation in aerobic dance contributes positively to the improvement of a self-concept (Shifron, 1982). Similar results were obtained in 1987 by Plummer and Koh using a Tennessee self-concept scale on an aerobic group, with activity lasting 10 weeks. Their findings revealed positive results in the training group as opposed to the control group. Of interest is that no difference was established between those who had participated in aerobics previously and those who had never participated. This led them to conclude that:

Improvement in self-concept is temporary and that cessation of participation in aerobic activities may allow self-concept to return to the individual's norm (Plummer and Koh, 1987, p.276).

There is lack of information on the above statement since most authors have not made a follow-up of the developed self-concept. We may conclude from the information that the improvements in self-concept will last as long as the benefits from which they are derived. Further investigation is needed in this regard.

It should be noted that not all research findings exhibited a positive relationship. For instance, Poretz (1982) did not find any improvement in body image with continued involvement in modern

dance, whereas a positive relationship was established with a group participating in physical conditioning. The reasons for the lack of improvement were difficult to establish. Despite the similarity in the kinesthetic feedback between the sport and dance groups, the latter group had generally been viewed as possessing extra psychological benefits, providing such opportunities as creativity and self-exploration through improvisation (Puretz, 1982).

In the same way as in the body and self-concept, a clearer understanding of attitudes in general is necessary before a specific attitude towards an activity is studied. A few definitions will be reviewed before one is developed to suit the purpose of this study.

According to Kenyon, as cited by Coldicott (1979) an attitude may be defined as a latent or non-observable, complex, but relatively stable disposition, which reflects both the direction and intensity of feeling towards a particular object, whether it be concrete or abstract. Another definition by Allport, as cited by Tajfel and Frazer (1978) states that an attitude is a mental or neural state of readiness organised through experience, exerting a direction or dynamic influence upon the individual's response to all objects and situations with which it is related.

It is difficult to reach an agreement as to the most suitable definition. In this study, an attitude will be referred to as some mental (neural) and emotional state of readiness, which may be influenced by experience and the environment.

The important question is: can attitudes be changed by behaviour?

Tyson (1987) came up with his own understanding of the interactional influences of behaviour, attitude, and experience which he presented in a circular argument best illustrated schematically as follows:



In considering the idea of a circular interaction, one should note that behaviour may mean action or even feeling that "teaches" the mind about a new situation so that the self then decides what to think about the new experience.

If the above is the case, then there are two possibilities:

1. That new experiences may bring alterations to the existing attitude.
2. That the new attitude may result in a new feeling or behaviour that may be experienced differently by the self.

The overall picture is that new experiences guided by some behaviour are likely to bring change in attitude, whether positive or negative. For such an alteration to take place new information must act upon the existing attitude with such an influence that it is either accelerated in its course or forced to change direction, analogously with Newton's first and second laws of motion. In any situation, the process may be affected by different factors such as the power of source over the receiver, the resistance of the receiver as the stimulus is received, discrepancy between the new and the already existing attitude, the extent to which the message is understood and interpreted and the extent or power of the intervening messages or experiences (Tajfel and Frazer, 1978; Tyson, 1987).

After considering all possible factors, Tajfel and Frazer (1978) explained that the attitude of the receiver after communication is the weighted sum of the originally held attitude and that attitude advocated by the source. Changes may be small depending on the discrepancy, with a neutral attitude yielding a close shift to the newly expressed message.

As in all other instances, attitudes in physical activity are shaped by experience (Coldicott, 1979) acting upon the existing attitudes. Such aspects as the type of programme and the knowledge and experience in the area, as well as the physical and emotional condition of the subject are to be considered for a clearer detection of influences of a programme. In some cases not all factors are applicable at the same time. Although it is not easy, some factors need to be controlled, to expose the influence of others, and consideration of all possible effects should be made in an analysis. In a research finding Hellison (1970) located attitude change as a function of an intensified conditioning experience. His results show significant improvements in attitude towards self, body and physical activity in the four day per week training group, than the two day per week participants.

Duration of exposure to an activity also plays a role in the change or reinforcement of attitude. Ruskin and Oren (1979) explained the

danger of exposing subjects to too short a period. They indicated that as the programme continues, positive attitudes may be developed. Cessation before full development of the experience process exposes the subjects to the previous environment which does not continue in the reinforcement of the newly acquired pattern, reversing the whole process.

Subjects in an already conducive environment such as those with a highly involved physical activity history, show less changes in attitude when exposed to new exercise programmes. This was confirmed by Hellison's (1970) findings which indicated that those subjects with an inactive history and a related initial negative attitude experienced significantly greater improvements than subjects with an active history. The direction and strength of an attitude change, according to Coldicott (1979), may be influenced by the level or gains in self-esteem resulting from the level or gains in physical fitness.

Exposure of an attitude is a complex occurrence and this makes assessment very difficult. The real question, according to Tajfel and Frazer (1978), is whether verbal and other behavioural responses are true expressions of the same underlying implicit response or disposition.

If all things could be equal, and an attitude could be expressed through feelings or behaviour, it would imply that what one feels

or how one behaves should be indicative of the attitude that one has towards an object or a situation. This could then mean that an observation of behaviour or a verbal or written indication of a feeling could be a reflection of an attitude change.

Since behaviour is determined by factors other than just attitude, a true feeling may not be expressed verbally or through behaviour because of other situational or personal factors in play (Tajfel and Frazer, 1978; Coldicott, 1979). This creates the possibility of a discrepancy between a real attitude and behaviour.

Situations and environments in which individuals find themselves should be normal and familiar to elicit exposure of real attitudes, otherwise individuation, as explained by Tyson (1987), may set in, which gives people the capability of giving responses that are directly opposite to their attitudes.

Another problem that needs to be eliminated in the assessment of attitudes is ignorance. In the drafting of a questionnaire, for instance, care must be taken not to expose subjects to situations they are less informed about. Ruskin and Oren (1979) recommended that when tests are administered it should be borne in mind that:

an attitude always implies an object about which one has information, towards which one has feelings, and in regard to which one wants to act in a certain way (Ruskin and Oren, 1979, p.76),

If knowledge which leads to experience is missing, then the wrong attitude may be tested. For example, to ask a Black, rural, South African about his attitude to skiing, when the subject does not even have access to the mass media, will be asking for the attitude he has about what he imagines skiing to be.

The most important aspect of attitude measurement, therefore, is validity, otherwise a test scale may fail to express what is required of the test.

The development of an attitude towards physical activity follows the process of change like all other instances. Knowledge and experience in the field play a very important role. The experience will be influenced by both natural and cultural factors with the pattern depending on the cultural differences as well as the sex and the age of the respondent. Values within a society may be passed from one generation to another as Coldicott (1979) explained that a generation exposed to danger and war has its vertigo subdimension stimulated and may develop positive attitudes towards adventure and dangerous activities, and will then pass this on to the next generation. It is not clear whether it is for the same reason that White male subjects in Mullins' (1969) research fared better in the pursuit of vertigo than the Black males. She also discovered that age tended to influence the direction of this attitude, stating that as age increased there was a decline in

vertigo pursuit, which she observed in her subjects of ages ranging from 16 to 53 years. This could be linked to the decline in natural ability to perform which is experienced as one grows older.

Variations in attitude towards physical activity between males and females may be attributed to the factors of opportunities, which according to Onifade (1985) seems to be influential in promoting and maintaining positive attitudes toward physical activity in males. When conditions and opportunities are the same, the difference narrows (Gill et al., 1983; O'Brien, 1987). On the other hand, Greyson and Colley (1986) discovered that possession of muscular traits was a strong predictor of participation in adolescent females, which would then put participants on approximately the same level as males.

According to Coldicott (1979), Kenyon's six dimensional scale does not measure action tendencies, but rather the preconditioning of behaviour. The scale is nevertheless a useful tool in that it directly addresses the main objectives of physical activity. As already indicated, the value of a scale will depend entirely on the subjects' knowledge of these objectives. Reinforcement of such knowledge therefore may be implemented through education to reduce ignorance. An exercise programme that carries a message of its benefits will contribute to a positive attitude. It is essential to note that no single type of exercise or exercise programme can

suffice to meet the needs of everyone in any society (Ruskin and Oren, 1979). A test retest of the same group of subjects may be a better indication of a change, if any, resulting from an exercise programme.

CHAPTER 3

EXPERIMENTAL METHODS AND PROCEDURES

Subjects

Pantsola jive is very popular in the Black residential areas of the Transvaal, South Africa. As a result, research conducted in these areas would be highly likely to include subjects who are already involved in the jive, which might lead to biased experimental results.

The present research project was conducted in the Eastern Cape, South Africa. Although people in the study area are not totally naive about the jive, it is performed minimally, reducing the possibility of involving previously conditioned subjects. On questioning it was found that none of the subjects participating in this project had ever been involved in this particular jive or any similar activities.

Standard programmes were obtained with special permission of the director of Lapologa, a television programme on Channel 3 of the South African Broadcasting Corporation. All programmes were choreographed by Black youths in the Transvaal, South Africa, and were used to develop a programme for the study.

For reasons of management and control, pupils of a local secondary school for Blacks in Grahamstown were approached about becoming involved in the project. The response was overwhelmingly supportive and a group of 41 pupils from the Standard IX classes was selected on a voluntary basis. When 10 of them dropped out due to lack of interest or poor attendance the number stabilised at 31. The mean age of the remaining 31 subjects was 19.29 yrs, which is above the critical age of growth, thus minimising interference of growth factors to the study. 19 males and 12 female subjects were included in the sample.

Most subjects did not participate regularly in physical activities, yet a few (mainly males) were involved in non-professional rugby and soccer, with weekly practices of up to 6 hours. The subjects were encouraged to continue their day-to-day activities as usual. Personal information about extra-mural physical participation was recorded (Appendix C). A more detailed subject description including anthropometric, physical, physiological and attitudinal characteristics of the subjects appears in Chapter 4.

Informed Consent

A detailed briefing (Appendix A), including information on the nature of the research project, requirements, risks,

precautions and benefits related to the study, was handed to the Head Mistress of the selected secondary school, prior to the onset of the project. A consent form (Appendix B) was also submitted to the Head Mistress to sign as legal representative of the pupils.

Experimental Period

Pre-exercise programme data collection was conducted for three weeks, from the 23rd May, 1988, to the 11th June, 1988, four weeks prior to the commencement of the exercise programme. The reason for the early collection of data was to accommodate the exercise programme and the post-exercise programme data collection in one school term. The latter started immediately after cessation of the exercise programme in order to forestall any possible deconditioning process. The actual programme lasted seven weeks, with a total of 21 sessions.

The post-exercise programme data collection was conducted within a period of eight days to insure against detraining.

The Pre-Pilot Test

Due to the fact that the bulk of the tests were previously validated on caucasian men, it was deemed necessary for this study

that a pre-pilot test be administered to Black males and females, to examine the applicability of the methods used on Blacks. Two separate tests were conducted for this purpose; one testing the attitudinal parameter and the other testing the anthropometric, physical and the physiological parameters.

The Attitudinal Pre-Pilot

Two tests were administered to ten Black Rhodes University students, males and females, on two successive weeks. The reason for the administration at this level was to determine whether the statements used in the questionnaire would be comprehensible to persons of a similar background to that of the target population. The time taken to complete the questionnaire was also established in these tests. As some of the statements were perceived as somewhat vague or not easily comprehensible, these were altered. Such statements were, for example:

- "I would gladly put up with necessary hard training", was altered to: "I prefer those sporting activities that require very hard training".
- "Physical activities that are purely for social purposes like college dances are sometimes a waste of time", was altered to: "Physical activities that are primarily for social purposes like disco and jive are a waste of time".

- "Physical activities having an element of daring or requiring one to take chances are desirable", was altered to: "Physical activities requiring one to take a chance and to be exposed to risk are best".

The Biophysical and Physiological Pre-Pilot Test

Tests on the anthropometric, physiological and physical performance parameters were performed on five Black Rhodes University Netball players. The aims were to test if the methods were correctly applied, to familiarise the researcher with testing techniques and methods, to assist in the allocation of time and to confirm that the subjects understood what was required of them.

The Pilot Test

A final pilot study was then performed for preciseness of the research methodology, proper allocation of time and to test the reliability of the tests used. The validity of the tests, all of which have been in use in fitness research for decades, was not questioned.

Three first year Human Movement Studies students - a male and two females - were tested on a test-retest basis. The second test was

administered 3-5 days after the first. A related Students' t-test (Ferguson, 1981) was then performed on the two sets of data, including all parameters, for any significant difference ($p < 0.05$).

The intended conditioning programme was initially taught to two Rhodes University male students and then to three high school boys, in an attempt to establish the best approach and the ideal breakdown of the programme into appropriate sub-sections.

The Experimental Protocol

Methods used in this study involved the use of minimal, low technology equipment which enabled collection of data in a school where laboratory equipment was not available. Recording and scoring were done on data collection sheets. (See Appendix C for an example.)

Personal particulars, items 1 to 5 were furnished by the subjects themselves. Item 5, participation in sporting activities, was included in order to estimate the level of involvement for comparisons with the subjects' objective level of fitness.

Data Collection

The same battery of tests was used in both the pre- and post-exercise programme data collection. Results of the two tests were then statistically analysed in order to identify what, if any, changes occurred as a result of participation in the programme. Data was collected on the following parameters:

Anthropometric Measures

Stature

The parameter was measured on a calibrated tape measure affixed to a smooth wall. Subjects stood with their backs against the tape on the wall. They were barefoot with heels, buttocks, upper back and rear head in contact with the wall and oriented in the Frankfort Plane (Carter, 1980). Subjects were then requested to take a deep breath, and a firm board held flat on top of the subjects' head was used to mark the height on tape. Measurements were read to the nearest 0.1cm.

Body Mass

Minimal clothing was recommended for this measure. A lab-calibrated bathroom scale was used to record the mass of the subjects, read to the nearest 0.1 kg.

Skinfold Measure

A Harpenden skinfold caliper with jaw pressure of 10 g/mm² was used and measurement recorded to the nearest 0.5 mm. The skinfold was lifted away from the underlying muscle, two centimetres above the site where the caliper jaws would be placed (Copley, 1983) at a depth of one centimetre.

Three measurements were recorded in each skinfold and the mean used as final score (Appendix C). All measurements were taken on the dominant side.

The following five skinfolds were measured following the protocols suggested by Smit (1979), Carter (1980) and Copley (1983).

Biceps Skinfold

This was measured on the anterior surface of the upper arm about mid-way between the acromion and the olecranon processes. Measurements were taken with the subject standing erect and upper limbs pendent.

Triceps Skinfold

Measurements were taken from the back on the posterior surface of a pendent arm, mid-way between the acromion and the olecranon processes, with the subject standing in an erect position.

Subscapular Skinfold

This skinfold was measured with the subject standing erect but relaxed and arms at the sides. The skinfold was raised lateral to the inferior angle of the subscapular running obliquely downward and outward at an angle of 45° to the horizontal.

Suprailiac Skinfold

This was measured with the subject standing in an erect and relaxed position. The skinfold was raised above the anterior-suprailiac spine running forwards and slightly downwards at an angle of 45° to the horizontal.

Calf Skinfold

This measurement was taken with the subject seated, knee flexed at right angle and feet on the ground. The skinfold was raised on the medial side of the calf at the level of the greatest calf girth with the skinfold running vertically.

The sum of Skinfolds

The sum of the skinfolds was obtained from summing the values of the biceps, triceps, subscapular, and the suprailiac skinfolds, thus giving an absolute value for each subject.

Percentage Body Fat

Percentage body fat was calculated using the following formula:

$$1) \text{ Density} = 1.1620 - 0.0630 \times \log (4 \text{ skinfolds})$$

$$2) \text{ Percentage Body Fat} = \left(\frac{4.95}{\text{density}} - 4.50 \right) \times 100\%$$

Bone Diameter

A Harpenden sliding steel caliper was used for these measurements. The discs of the caliper were applied against the epicondyles of the distal extremities of the humerus and the condyles of the femur, lying in the same plane as the limb in a manner as to bisect the joint angle. The epicondyles and condyles were palpated with the fingers for placement of the caliper discs and measurements were taken on both left and right limbs. A firm pressure was applied to the caliper discs and the measure was recorded to the nearest 0.1 cm.

The Humeral Bi-epicondylar

The humeral bi-epicondylar were measured with the subject's arm raised forward to the level of the shoulder and forearm flexed upward at a right angle to the arm. The discs of the calipers were applied in the same plane as the arm and the forearm, on the epicondyles, bisecting the angle of the elbow.

Femoral Bi-condylar

The femoral condyles were measured with subject seated on a chair, legs vertical and feet on the floor. The discs were applied to the condyles with calipers in a plane parallel to the thigh and leg bisecting the knee angle.

Muscle Girths

A flexible steel tape was used for this measure. The tape was passed around the limbs in the region where muscle was largest, at a right angle to the long axis of the limb. Measurements were taken with tape in light yet firm contact with skin. The maximum girth was recorded to the nearest 0.1 cm.

Flexed-Arm Circumference

This was measured with the arm in a horizontal plane, forearm supinated, elbow fully flexed, fist clenched and biceps

contracted as strongly as possible. The tape was placed in right angle to the long axis of the arm. Maximum girth was recorded.

Maximum Calf Circumference

Measurements were taken with the subject standing with legs slightly apart. The tape was passed around the leg on the calf muscle at the point of maximal girth and at right angle to the long axis of the leg. Maximum girth was recorded to the nearest 0.1 cm.

Somatotype

The values obtained from stature, mass and the four skinfolds (triceps, subscapular, suprailiac and calf), the bone diameters (humeral bi-epicondylar and femoral bi-condylar) and the muscle girth (flexed-arm and maximum calf) were used to calculate the Heath-Carter anthropometric somatotyping (Carter, 1980).

Physical Performance Measures

In order to determine the effect of the programme on the physical condition of the subjects, the Cureton "Illinois" 18-item fitness test (Cureton, 1947) was administered. Six fitness

parameters are included in this test, viz: balance, flexibility, agility, strength, power and muscle endurance. Components of the test are indicated in Appendix D.

Scoring

This test was specifically selected because of its simplicity in administration and scoring methods, where the subject either passes or fails each component.

In the conducting of this test the subjects worked in pairs, thus assisting in the scoring. However, to ensure a rigorous control on the standard of scoring, only five pairs were tested at a time so that the investigator could closely monitor the performance of the subjects.

While the total scores were recorded, it was also deemed important to analyse the six sub-sections independently. Thus, in addition to the normal total score for the 18 items, six sub-scores of the specific motor components were also recorded (see Appendix D).

Physiological Measures

Predicted Maximal Anaerobic Power

Here, the methodology was adopted from the Margaria-Kalamen

power test (MacDougall et al., 1982) and a stopwatch used instead of timer pads.

A staircase with a vertical distance of 1.85m was used. Subjects started running approximately 2 m from the staircase. Time was recorded from the second to the final stair with the subjects instructed to step on every stair. Each subject was given three trials with rests in between and the best time was substituted in the following formula from McDougall et al. (1982) in order to calculate power output:

Max Anaerobic Power (w) = Body mass (kg) x gravity (N.kg⁻¹) x Velocity

Relative Max Anaerobic Power (W.kg⁻¹) = $\frac{\text{Max Anaerobic Power (W)}}{\text{Body Mass (kg)}}$

Predicted Maximum Oxygen Consumption

Cooper's 12-minute run (Cooper, 1970) was administered to the subjects in this study as a measure of predicted maximal oxygen consumption. Each subject was instructed to walk/run as far as possible within 12 min. A soccer field was used where subjects ran along the outer lines; a total length of 375 m constituted one lap. At the end of the 12 minutes the distance covered was measured to the nearest 0.5 cm. During the run, subjects were encouraged to run at maximum capacity and reminded of time elapsed and minutes remaining as each lap was completed. The

distance, in meters, was recorded for each subject and then used in the following formula for predicted maximum oxygen uptake:

$$\text{Max } \dot{V}O_2 \text{ (ml.Kg}^{-1} \text{ min}^{-1}) = 33 + 0,17 (\text{velocity} - 133)$$

Heart Rate

The relationship between work and heart rate is well documented and improvements are related to conditioning programmes. Resting heart rate was therefore measured in this study before and after the seven week programme for any detectable alterations.

The working heart rate is an alternative method for determining intensity of work (Fox and Mathews, 1981) and was therefore used in this study to determine whether there was any improvement in the working capacity of the subjects at the completion of the programme.

It is well established that well trained subjects have a faster recovery rate as displayed by a quicker drop of heart rate following exercise (Pollock et al., 1984). In the present study, therefore, recovery heart rate was used to detect any alterations in the recovery rate of the subjects.

The Resting Heart Rate

Measurements were obtained with a cardiometer after the subject had been seated on a chair, relaxed for 60 seconds. Two leather strips dipped in a saline solution and held in position with an elastic band were placed on both sides of the chest at the level of the heart apex and connected to two electrodes which picked up the heart sounds and transmitted them to the tachometer through a connecting cord. In this manner, the heart rate could be monitored directly.

The Working Heart Rate

Subjects ran with the cardiometer electrodes in place around their chests so that at the end of the 12-minute run the extension from the electrodes was connected to the cardiometer as soon as possible and heart rate recorded. Due to the slow reaction of the cardiometer, the working heart rate was in fact not taken immediately, but was recorded within the 30 seconds of the completion of the run. Subjects were required to sit on the ground as readings were taken.

Recovery Heart Rate

Subjects remained seated as heart rate was recorded every 30 seconds from the first to the fifth minute. The 30 second

recording was to assist in the detection of abnormalities. The first, third and fifth minute readings of rest were used for statistical analysis.

Psycho-social Measures

Attitudinal Tests

Participation in an activity is related to the willingness of an individual to take part. This is largely influenced by how the individual views the type of activity to be undertaken relative to how the person perceives the 'self'. This self-image may be greatly influenced by one's body image (Zion, 1965), as well as the body's capabilities. Thus the perception, if positive, promotes a motivation to participate, and involvement in that activity is enhanced.

The attitudinal tests in this study were included to investigate the attitude of the subjects towards themselves and towards participation in physical activity. The tests were drafted according to:

1. The body image and self-concept scale, and
2. The attitude towards physical activity scale.

Scoring

A four-point Likert-type scale was adopted. The even numbering was used in order to avoid a reluctance to offer a definite response to the statements. Subjects would therefore have to respond either positively or negatively. To improve reliability and to avoid any possible influence or bias in responses, both negative and positive statements were included in the two questionnaires on a 50-50 basis.

For each positive statement the subject's score was subtracted from 5. For negative statements the subjects score constituted the final score. Score sheets (Appendix G and J) were constructed for the purpose of scoring in this study. The scores were summed and worked in percentages for statistical analysis.

The Body Image and Self-Concept Scale

The body and self-concept scales were intended to investigate the personal feelings and attitudes each subject had towards the body and the self. Eight body concept statements were adapted from Sonstroem's (1978) Physical Estimation and Attraction Scale (PEAS) on the basis that they best suited the subjects in the present situation. For the self-concept, eight statements were derived from Coldicott's (1979) Self Estimation Scale (SES). The 16 statements were then mixed to

form a single questionnaire (Appendix F). A score sheet (Appendix G) was used to determine the total response for each subject. Although the two scales were separately developed, they were then integrated to establish an holistic profile of the subjects.

The Scale of Attitude Towards Physical Activity

Drafting the Questionnaire

An open-ended questionnaire (Appendix H) was drafted and sent to 50 Black Rhodes University Students, the objective being to acquire a general idea of reasons for South African Blacks participation in physical activities, and to determine the extent of acquaintance of South African Blacks with the general objectives and benefits of physical involvement. The responses obtained would thus enable the researcher to draft a questionnaire that would be more appropriate as an attitude test for South African Blacks.

Of the 50 students approached, 45 responded. Although the results could not be regarded as a representative sample of South African Blacks as a whole, this approach contributed considerably to a more appropriate questionnaire being drawn up.

The following points were of particular benefit:

1. A general idea about the understanding of the benefits of physical activity was established.
2. A comprehensive terminology was arrived at, that could be understood by Blacks in South Africa, where English is a second language for the vast majority of Black people.
3. The activities of interest, together with reasons for participation indirectly lead to objectives for participation.
4. The top ten activities of interest listed (in order of preference) by the students included in Chapter 4 (Table 2) may well be the result of lack of facilities for these subjects when they were school children. The results could, nevertheless, have reflected a degree of Western influence.

The Attitude Scale

Kenyon's six-dimension model (Baumgartner and Jackson, 1982) was adopted. Only those statements deemed suitable for this study, as guided by the result of the open-ended questionnaire, were selected to make a total of 24 statements. Although Baumgartner and Jackson explained the variability in reliability of males' and females' scales, one questionnaire (Appendix I) was drafted for both sexes with the aid of the Black students responses. A score sheet for this questionnaire was also drafted (Appendix J).

Statistical Analysis

Related Student's t-tests (Ferguson, 1981) were performed on the test re-test results of the various sections of the Pilot Study to establish the reliability of the testing procedures.

Following the exercise programme, a two factor analysis of variance with repeated measures on one factor (Ferguson, 1981) was used, in order to establish if there were any significant differences between the pre- and post-programme data and whether there were any differences in responses between the male and female subjects. Both factor one (sex) and factor two (condition) had two levels, namely males and females for sex and pre- and post-programme results for factor two.

To minimise the possibility of committing a type I error without unduly increasing the probability of committing a type II error, a 0.05 level of significance was chosen for all above statistical analyses.

The Exercise Programme

The fundamental purpose of this study was to investigate whether or not participation in Pantsola jive over a period of time would

bring about changes in the biophysical, physiological and/or psycho-social parameters of the selected sample.

The Programme Routine

This programme followed a common routine for aerobic activities with four levels of participation, including first the warm-up, then the calisthenics, followed by the main activity and finally the cool-down procedure. The warm-up, the stretching exercises and the cool-down were included because although they are not directly observable in situ, a finer analysis of different programmes of a similar nature exhibit non-intentional short warm-ups or some stretching activities initially and a slowing down or cool-down performance at the end.

At the beginning of the first session, subjects were taught how to monitor their own heart rates. This was done by placing two fingers on the carotid artery at the base of the neck and counting the pulse for 15 seconds. This number was then multiplied by 4 to get the pulse per minute count. The purpose of this was to check if there was any change in intensity, during the different sessions as the jive was progressively mastered. This was done by comparing the mean working heart rates in the first 30 seconds of recovery after the jive programme, that is, before the cool-down procedures. The heart rates were recorded on the last day of the 1st, 4th and 7th week of participation.

To control attendance, a register was marked at the end of each session, and where possible, an extra day in the week was arranged for those subjects who missed a normal practice session because of some unforeseen school activity or absenteeism. The duration of a session over the entire programme ranged between 30 and 45 minutes per session. The whole programme lasted for seven weeks with a frequency of 3 sessions per week, which amounted to 21 sessions.

An outline of the routines and exercises is described in Appendix K.

CHAPTER 4**RESULTS AND DISCUSSION****Pilot Testing Results**

The purpose of the pilot test was to familiarize the researcher with the evaluation tools to be used as well as to assess the reliability of the testing procedures applied in the research protocol.

While universally accepted morphological and physiological tests were used in the present study, most of the readily available attitudinal tests appear to have been focussed on caucasian population. It was therefore deemed necessary to make minor adjustments to these tests in order to obtain a more meaningful assessment of the South African Black population's attitude towards participation in physical activity.

Attitudinal Responses

An open-ended questionnaire (Appendix H) was given to black university students in an attempt to gain a clearer understanding regarding the participation of Blacks in physical activities. Since the students came from different parts of South Africa, the results, it was felt, would assist in the drawing up of a questionnaire best suited for Blacks. For standardisation and

simplicity of analysis, the responses were grouped into Kenyon's six sub-dimensions to enable the research to evaluate the various attitudes towards physical activities. The results are summarised in Table I below, and in Figure 1.

Table I: Black student responses to reasons for participating in physical activities.

Subdimensions	Scores
Health and Fitness	37
Social Aspects	35
Catharsis	21
Aesthetic Experience	5
Pursuit of Vertigo	1
Ascetic Experience	8

It should be noted that objectives for involvement in an activity rely greatly on the knowledge and acquaintance of a situation, while attitudes toward that involvement will influence the ranking order of importance which may be affected by environmental influences. It is therefore necessary to recognise that university students are exposed to greater media coverage than high school pupils. It is not surprising therefore, that the health and

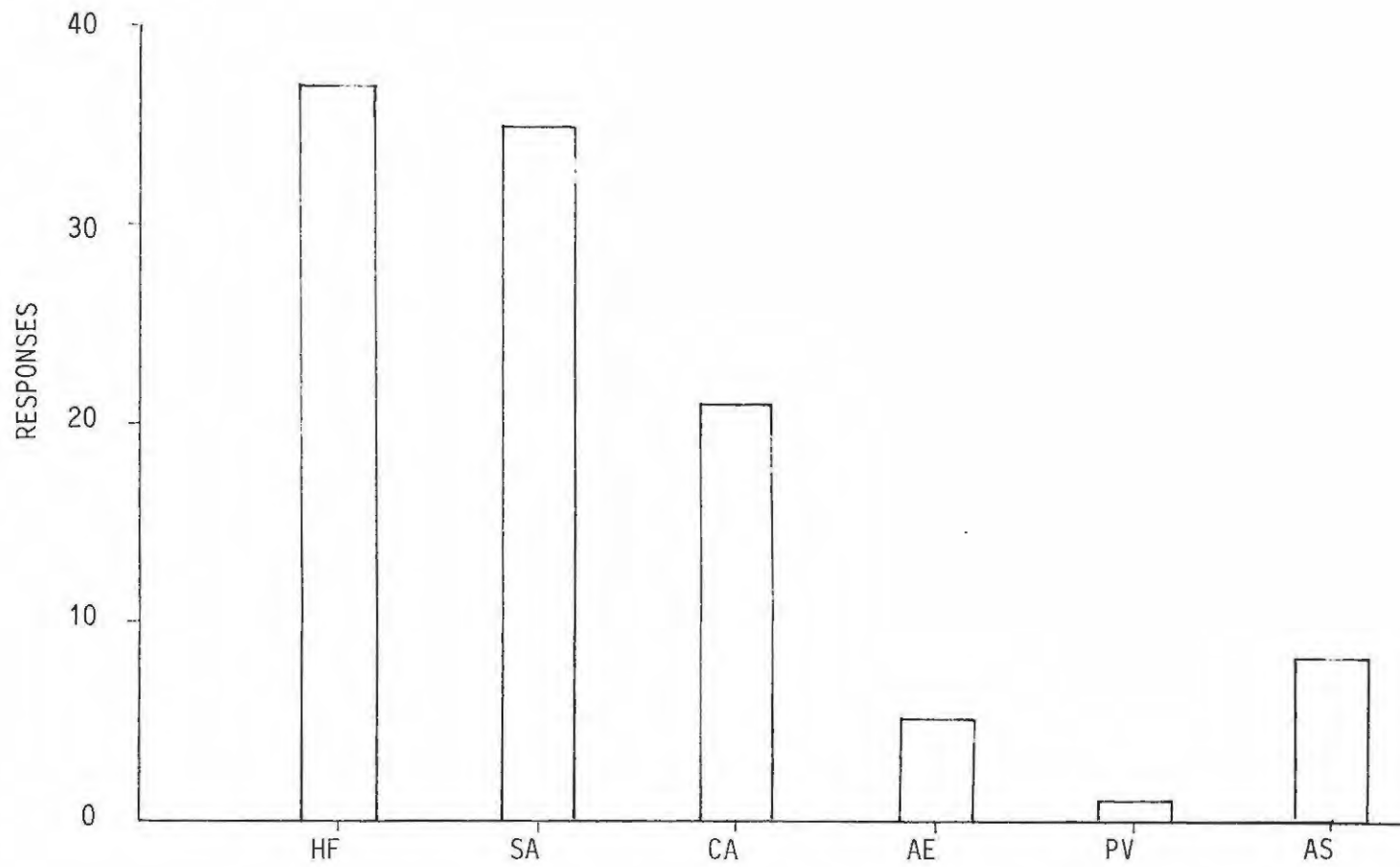


Figure 1 - Responses of Black university students grouped into Kenyon's six sub-dimensions of attitude towards physical activity.

fitness sub-dimension was placed the highest objective since the direction of the newspaper and screen influences is mostly diverted towards this sub-dimension. Nonetheless the subjects in the final research sample, (ie., the school pupils) were not totally naive or cut off from the media.

Social aspects ranked second and were followed by catharsis, the two objectives which could be expected to rank high at a university because of the high stresses resulting from academic load. A need for regular relief from the demands of academic study unless physical activity is not highly regarded as offering such relief. This does not by any means underestimate the academic workload at secondary school level. Competitive participation may not be the most important reason for involvement at university level but may well be higher in the life of a high school child particularly if the school promotes it. Beauty and artistry are mostly cultural aspects among Blacks but may be totally destroyed by deculturation in cases where the intrinsic culture of groups is not observed.

The low score for the pursuit of vertigo cannot easily be accounted for. It was expected to be ranked high by the Black students since the respondents belong to the generation which is exposed to riots in South African Black townships. Vertigo, according to Baumgartner and Jackson (1975) is linked with exposure to dangerous situations which may result in

enjoyment in risk participation. On the other hand, it should be noted that the incidences in the townships are recent and are still continuing which may be so stressful that some release from the frustrating situation may be the cause, resulting in high catharsis scores and low vertigo needs.

The questionnaire further requested the Black students at Rhodes University to indicate their physical activities of choice. The purpose for this was to give the researcher a clearer understanding and direction of the reasons for participation in physical activity. It should be noted that preference or enjoyment does not necessarily mean participation, yet the preference could affect or be affected by objectives for participation. The top ten most enjoyed activities are listed in Table II in order of majority preference.

Among the Black populace soccer has undoubtedly been a very popular sporting activity in South Africa for some time now, with a high commercial profile and good media coverage. Another important factor to note is that this sport does not need sophisticated equipment and facilities, and may be played anywhere where there is an open playing area. On the other hand, the high tennis scores may not be as easily accounted for since very few Black schools have the facility. It is, however one of the popular sports on television at the present time, and clearly appealed to the sample group questioned.

Table II: The top ten physical activities in order of preference by black students at Rhodes University

<u>Order of Preference</u>	<u>Activities</u>
1	Soccer
2	Tennis
3	Jogging, Jive
4	Swimming, Netball, Table Tennis
5	Squash
6	Ballroom dance, athletics
7	Volley ball
8	Taking a walk
9	Aerobics
10	Boxing, Basket Ball

Jogging and jiving are individual activities usually performed without financial gains and mostly for enjoyment. It is interesting to note that these two are ranked high (3rd) despite the availability of many sporting facilities on campus. The results tally with those of Malakalaka (1984) in which disco jive ranked among the top three activities of choice by the Mahwelereng youngsters in the Northern Transvaal, South Africa. It may, therefore, be concluded that besides the lack of

familiarity with facilities caused by their scarcity in Black schools, there is apparently an important element of joy derived from the "rule free" activities, a factor proposed by Noakes (1985).

The roots of jogging could be traced back to the genetic inclination of the African society for running which evolved from the hunting activities of the past. Similarly Sahlins (1976) and Lee (1979) indicated that jive has been used as an extramural activity since the time of hunter-gathering, and is still favoured today. The high rating of the two activities could be said to play a significant role in the high scores of the health and fitness and social sub-dimensions. These results were then utilised to develop a questionnaire which would be culturally appropriate for the population group of the present study.

A Students' t-test (Ferguson, 1981) revealed no significant differences on the test re-test results among all the physical components, the physiological and the psycho-social parameters ($p < 0.05$). Therefore, the test battery and testing procedures were regarded as reliable.

General Characteristics of the Subjects

Personal information provided by the subjects (Appendix C) revealed that only a few males participated in soccer and tennis,

and one female in karate. Thus, in general the average male appeared to have participated in more physical activities than the average female.

Concerning the number of subjects, 41 pupils initially volunteered as subjects for the programme and attrition reduced the number to 31. Although the reason for dropping out could not be well established, it could possibly be linked with the age factor, in that all drop outs were above 21 years of age (mean 22.8 years SD 0.6), a relatively mature young adult age. Therefore the learning of new skills, especially in front of the younger, more agile subjects, may have been a social embarrassment, and the main reason for dropping out. This reasoning is one suggested by Montoye (1979).

Morphological Characteristics of the Subjects

The results in Table III depict the morphological findings of the sample group of young Black males and females (mean age 19.3 yrs), living in the Eastern Cape, South Africa. Although the ages of the two sex groups differed, both groups were in their final stages of development.

Table III. Summary of the morphological characteristics of the sample.

Components	Males		Females	
	\bar{X}	SD	\bar{X}	SD
Age (yrs)	18.6	1.1	20.3	2.6
Stature (cm)	168.6	13.4	160.1	5.6
Humeral epicondylar (cm)	6.9	0.6	6.3	0.5
Femoral bi-epicondylar (cm)	9.5	0.6	9.3	0.9
Flex arm circumference (cm)	28.1	2.96	30.9	4.2
Maximum calf circumference (cm)	34.0	3.4	36.3	2.7

The males were significantly taller (\bar{X} 168.6 cm) than the females (\bar{X} 160.1 cm). As expected, a comparison between the pre-programme and post-programme data (the latter collected after seven weeks of participation in the Pantsola jive) revealed no alteration in stature, or the humeral bi-epicondylar and femoral bi-condylar measurements. In other words, measurable growth in these components did not take place during the seven week period. Alterations of both circumferences measured were minimal and were not statistically significant.

The fat deposits were found to be fairly evenly distributed in both sexes, that is, no upper body fat patterning was observed. Nevertheless the percentage body fat was higher in females than

in males and the highest skinfold measure in males (Subscapular = 8.6 cm) was lower than the lowest of the average skinfold in females (Biceps = 9.9 cm). Results of the body composition are summarised in Table IV. It may be concluded that body fat was therefore primarily responsible for the vast difference in mass between male and females in the study group (Figure 2). It is interesting to note, however, that no significant difference was found between the pre- and post-programme mean body mass.

This finding does not correspond with those obtained by Hooper and Noland (1984) who observed a significant decrease in body mass of their subjects in the first four weeks of their aerobic

TABLE IV: Summary of pre- and post-programme body composition results.

Components	Males				Females			
	Pre		Post		Pre		Post	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
Biceps	3.9	1.3	3.9	1.3	9.9	7.7	9.2	4.7
Triceps	7.6	2.8	7.6	2.6	21.4	10.2	21.9	9.1
Subscapular	8.6	3.5	9.1	4.6	15.6	6.96	14.9	6.0
Suprailiac	5.3	2.5	8.2	11.8	12.1	6.3	12.4	7.2
% Body fat	10.5	3.5	11.4	5.0	19.9	5.3	20.0	4.9
Mass	58.8	10.2	58.8	10.9	62.9	10.95	62.9	10.8

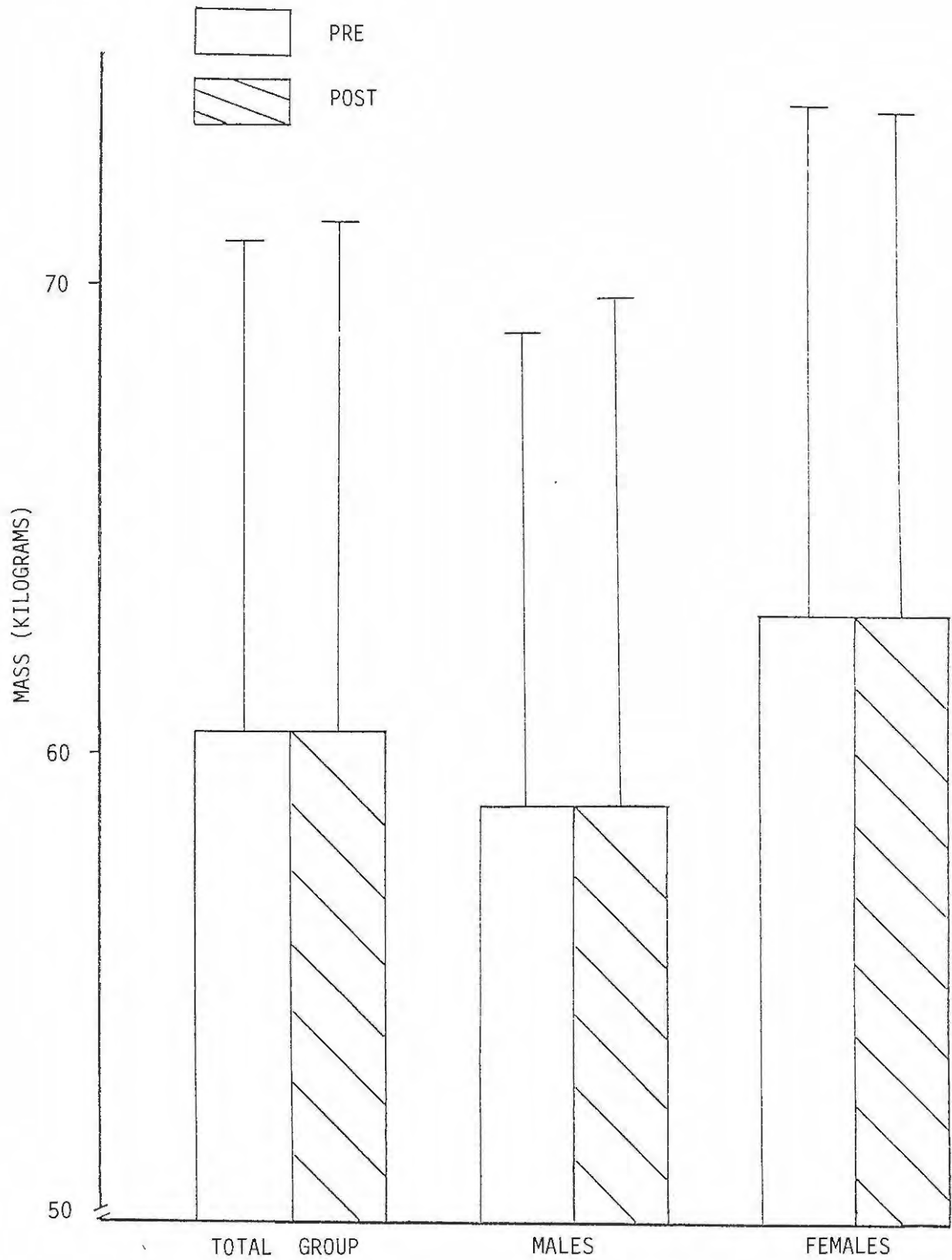


Figure 2 - The mean and standard deviation of body mass of the total group, the males and the females.

dance programme. Nonetheless the literature suggests that in a short term programme, body mass may either increase slightly or remain stable, as a result of such factors as alteration of body composition. This did not appear to be the case in the present project as a statistical analysis did not reveal any significant change in percentage body fat after the seven weeks programme in either sex.

Although subjects were requested to conform to their normal dietary patterns this aspect was neither monitored nor controlled. One of the factors which may have contributed to the increase in body fat was the irregularity of participation. In this study the increase was most noticeable in those subjects who attended less than 16 out of 21 sessions. The results were otherwise similar to those observed by Oppliger *et al.* (1986) with a sample population of swimmers. Although their subjects were in their early stages of adolescence, the same suspected complex interaction between hormonal influences and strenuous training may have been in play within the population group of the present study.

The morphological data collected was used to calculate the somatotype (Carter 1980) of the subjects and it was evident that the females in the study were more endomorphic (mean 4.7 SD 1.8) and the males more ectomorphic (mean 3.5 SD 1.5) as indicated in Figure 3. This is in keeping with the findings reported by

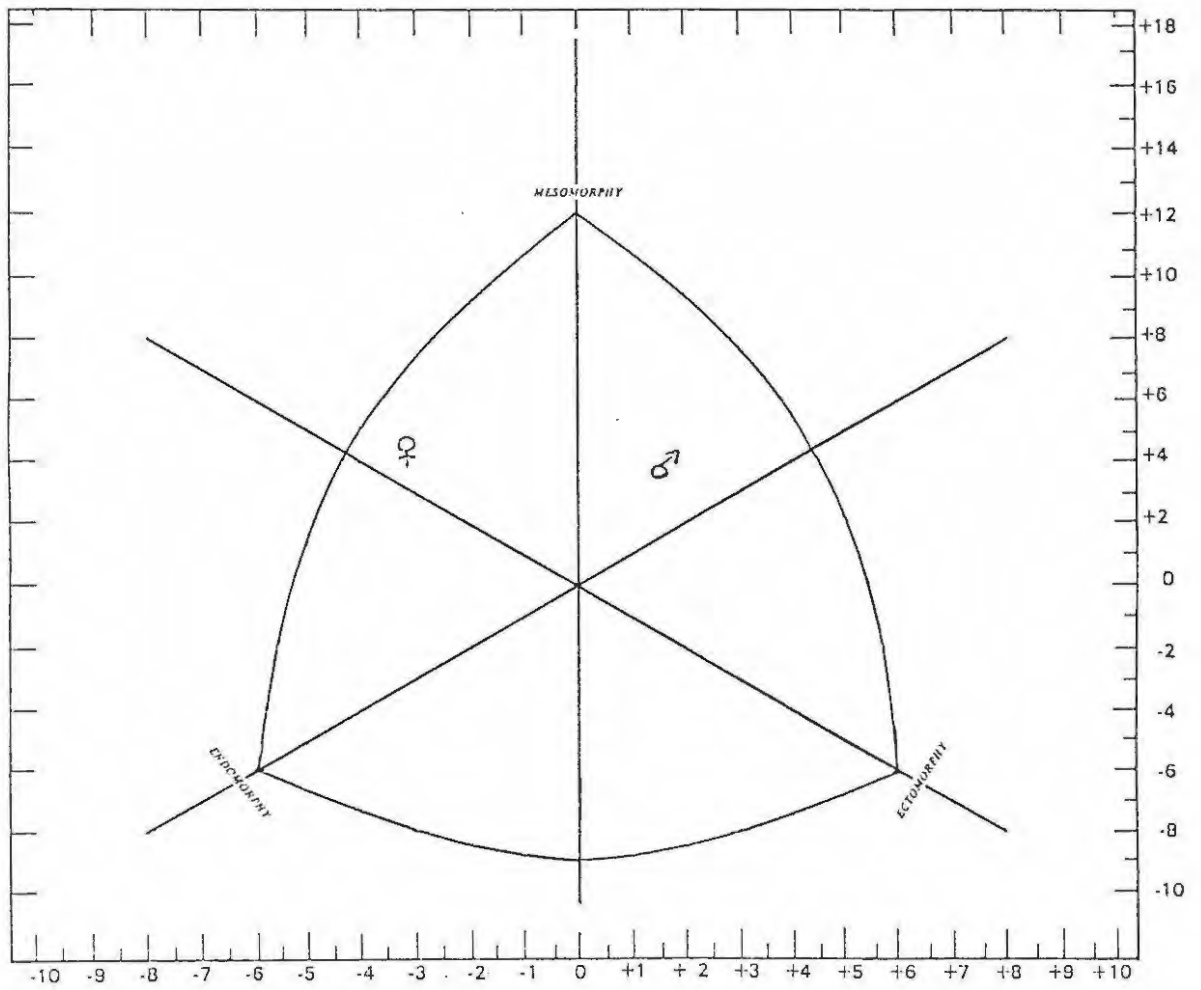


Figure 3 - Mean results for male and female somatotypes.

Tanner (1978), Biehler (1981), Carlson and Cera (1984), Becque et al. (1986) and Bailey et al. (1987). As in other body composition variables, no significant changes were observed among the somatotype variables.

Results of the Physiological Parameters

The Predicted $\dot{V}O_2$ Max

Both males and females in this study were at their peak age of maximal aerobic power, which is reported by Åstrand and Rodahl (1977) to occur between ages eighteen and twenty years. These generalised values, as stated by the authors, are about $71.4 \text{ ml.kg}^{-1}.\text{min}^{-1}$ for the trained males and $50.6 \text{ ml.kg}^{-1}.\text{min}^{-1}$ for the untrained males. The authors further established that on the average females work at 70 -75% of the male $\dot{V}O_2$ max, thus trained females may be estimated at $49.98 \text{ ml.kg}^{-1}.\text{min}^{-1}$, while the untrained females may be at $35.4 \text{ ml.kg}^{-1}.\text{min}^{-1}$ levels, when calculated at the 70% level of males.

The pre-programme 12-minute run results revealed that subjects in the present project were on the average non-active youths with mean $\dot{V}O_{2\text{max}}$ of $50.96 \text{ ml.kg}^{-1}.\text{min}^{-1}$ (SD4.4) for males and $39.3 \text{ ml.kg}^{-1}.\text{min}^{-1}$ (SD4.2) for females (Table V). This supported the personal information provided by the subjects (on Appendix C) regarding participation in physical activity.

TABLE V: A summary of the pre- and post-programme results on the cardio-respiratory variables.

COMPONENTS	TOTAL GROUP				MALES				FEMALES			
	PRE		POST		PRE		POST		PRE		POST	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
Pred. $\dot{V}O_2$ max	48.4	7.2	48.5*	8.6	51.0	4.4	53.6	5.6	39.3	4.2	40.4	5.7
Rest HR	65.4	8.8	63.6	7.2	61.8	6.9	61.0	6.4	71.1	8.7	67.8	6.5
Working HR	172.7	15.0	166.3*	14.8	173.8	10.4	164.3	13.9	171.0	20.8	159.3	16.2
Rec HR 1 min	149.9	13.5	142.9*	13.0	148.4	10.9	141.3	14.0	152.3	17.1	145.5	11.3
Rec HR 3 min	120.0	11.4	114.5*	8.2	118.2	10.2	112.6	8.5	122.9	13.0	117.5	7.2
Rec HR 5 min	111.8	10.4	105.5*	8.5	111.9	10.1	103.3	8.3	111.8	11.3	109.0	8.0
Anaerobic power	7.0	.7	7.4*	.8	7.3	.6	7.8	.7	6.4	.6	6.8	.6

* sig. (p < 0.05)

Although the post-programme results were still below the level of trained athletes $\dot{V}O_2$ max, improvements were observed. Statistical analysis revealed significant changes ($p < 0.05$) at the conclusion of the seven weeks participation in the Pantsola jive programme.

The male $\dot{V}O_2$ max value were significantly higher than that recorded for the females, thus confirming the superiority of males in $\dot{V}O_2$ max (see also Figure 4). Although this could be linked with the factor of opportunity for participation, this may not be the only reason, since participation does not only concern involvement in sporting activities but also includes such energy consuming activities as household activities, which were not analysed in this study. Therefore it may be inappropriate to conclude that the lower mean predicted $\dot{V}O_2$ max of females was gender related since there was not enough evidence to this effect.

The Resting Heart Rate

The mean resting heart rate for both males (mean 61.8 beats.min⁻¹ SD 6.9) and females (71.1 beats.min⁻¹ SD 8.7) was lower than the average values of the untrained, which has been reported as high as 90 beats.min⁻¹. They remained above the levels of the highly trained, however, which according to Fox and Mathews (1981), may drop as low as 40 beats.min⁻¹. These resting levels were lower than expected from this group of relatively sedentary

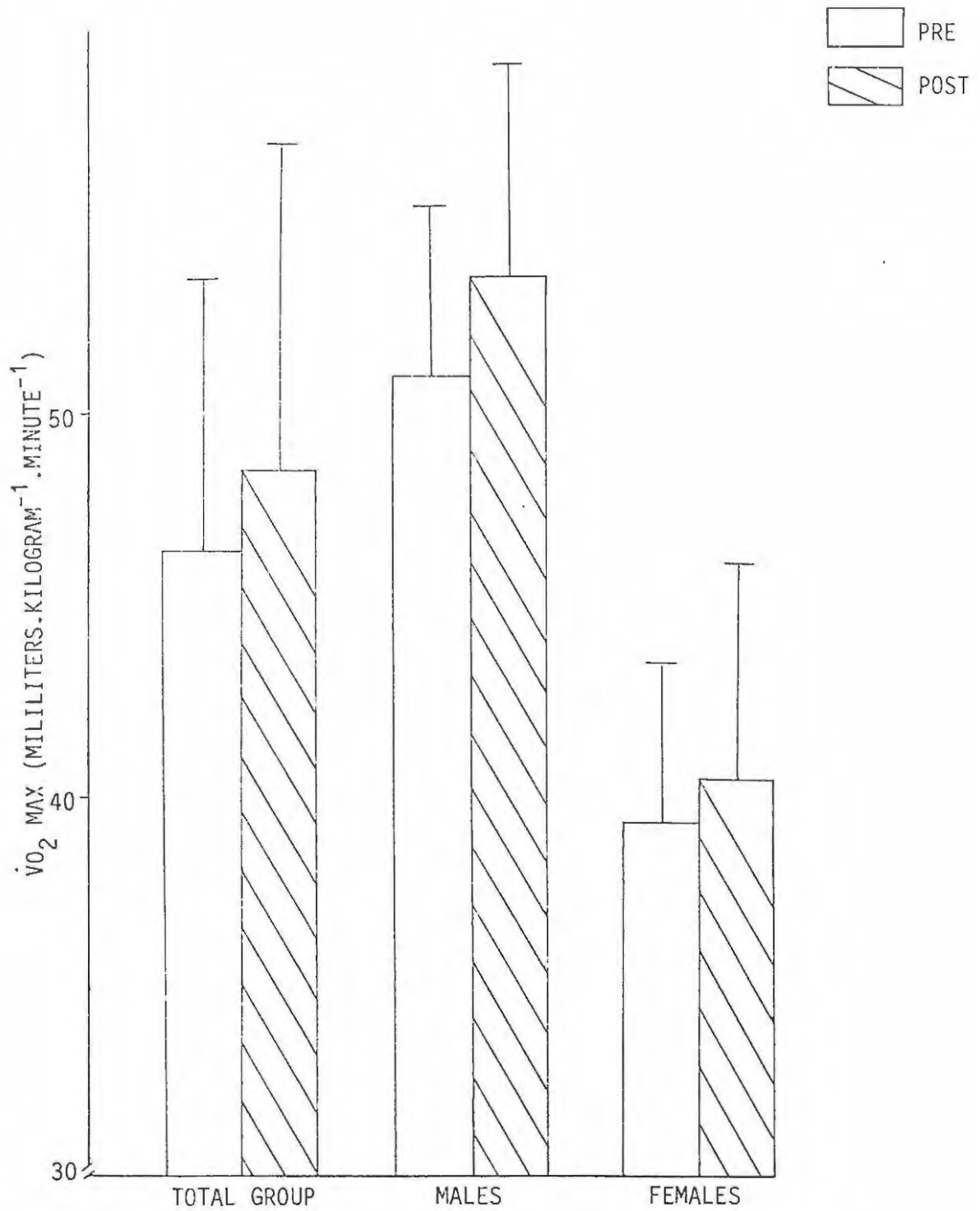


Figure 4 - Mean and standard deviation of the total group, males and females predicted $\dot{V}O_2$ max.

individuals. Åstrand and Rodahl (1977) associate higher resting heart rate with sedentary persons, who need to offset the lower stroke volume of a weaker heart to achieve efficient supply of blood.

A possible reason for this relatively lower resting heart rate could be the age of the subjects. Ausubel et al. (1980) explained that during the final stages of development the heart grows more rapidly, increasing relative cardiac competency, which in turn leads to decreases in the heart rate.

No significant changes ($p < 0.05$) were observed in the mean resting heart rate after participation in the seven week programme in both sexes. Nevertheless the sex differences were significant ($p < 0.05$). This could be accounted for by Tanner's (1978) suggestion of male superiority in heart size, which results in a lower resting heart rate and an efficient oxygen supply.

The Working Heart Rate

In analysing the working heart rate, no significant differences were observed between the mean value for males and that for females, taken during the first 30 seconds of recovery from a 12 minute run. The reason for this similarity may have been the high level of motivation and competitive spirit of males, which would account for their increased work intensity, elevating their mean working heart rate. This would have caused a supplementary

increase in heart rate to occur when the stroke volume has reached its maximum, in order to meet further demands in blood supply (Fox and Mathews, 1981).

The difference in the pre- and post-programme mean working heart rates were significant, and the decrease was apparent in both sexes (Figure 5). It is essential to note that this lower heart rate was evident despite the fact that the subjects covered a greater distance in the post-programme 12-minute run. In other words, more work was done with a lower working heart rate, implying that the cardiac output had been improved as a result of regular participation in the programme, thus yielding a higher task related oxygen consumption and a more efficient working heart.

As already indicated in Chapter 2, improvements in working capacity are directly related to intensity and duration of the activity. The mean working heart rate of the subjects, obtained during participation in the jive programme was initially 115 beats.min⁻¹ in the first week, and increased to 126 beats.min⁻¹ as steps were mastered. This could be indicative of an improvement in intensity at which the subjects worked. It was not surprising that improvements were evident in this relatively sedentary group. Similar achievements were reported by Pollock *et al.* (1984) at intensities as low as 120 beats.min⁻¹, with a low fitness group. This confirms that for gains to be

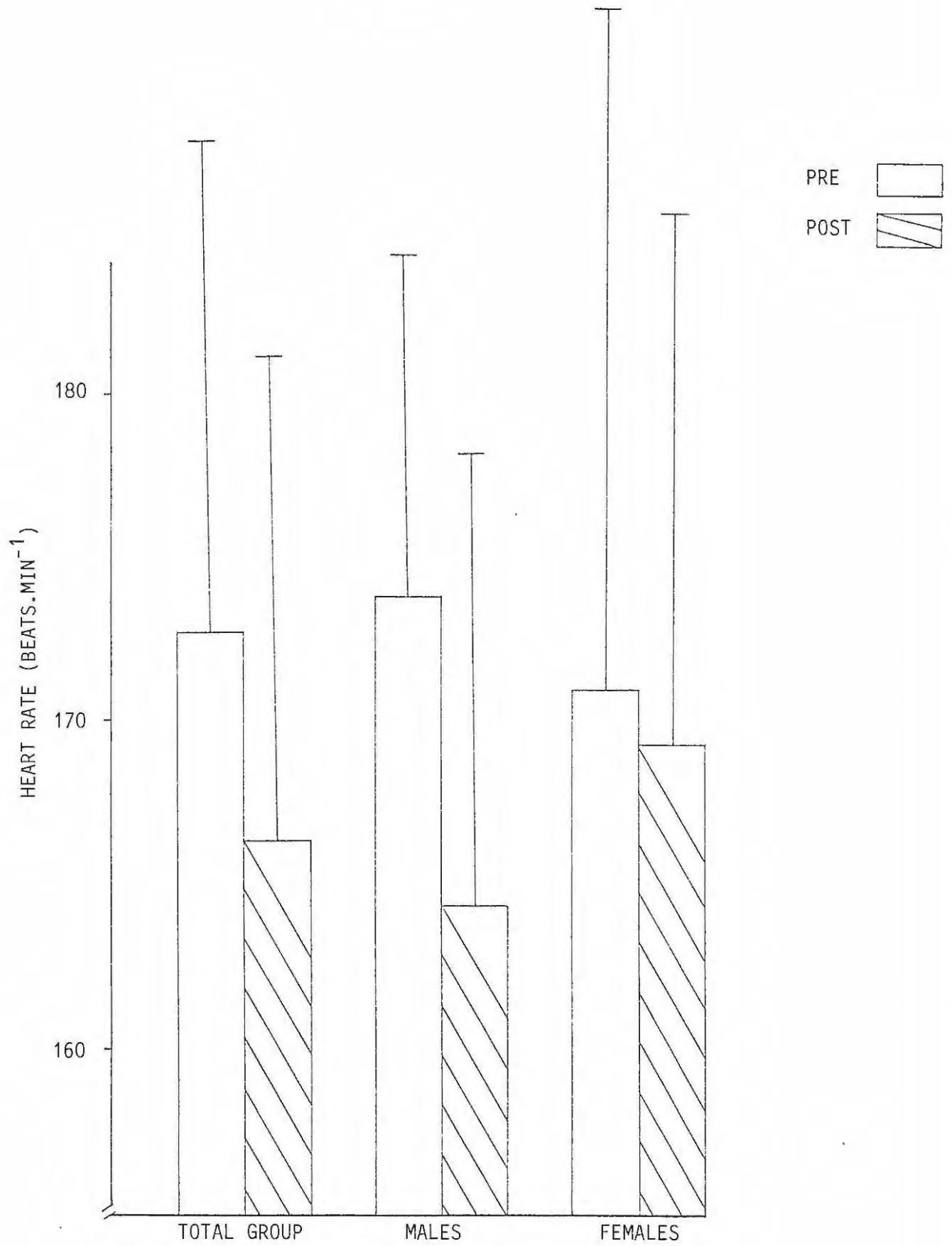


Figure 5 - Working heart rates.

apparent, the minimum threshold intensity in energy expenditure must be exceeded, which could well have been the situation in this study, because of the initially low working capacity which allowed more room for improvement, as stated by Igbanugo and Gutin (1978). The length of the term in this study also corresponds with that of Hooper and Noland (1984) who reported improvements in the distance covered by their subjects in 12 minutes running after participation in an 8-week aerobic dance programme. On the other hand, subjects in the present study were not extremely obese (Figure 3) and were thus expected to respond to moderate programmes as suggested by Pollock *et al.* (1984).

The Recovery Heart Rate

The difference between male and female initial recovery heart rate (analysed at the 1st, 3rd and 5th minute recovery periods) was not significant. This similarity was not expected since the working capacity of the two groups was significantly different. Berger (1982) indicated that individuals with higher working capacities have a faster recovery. The improvements in the cardio-vascular condition may further be confirmed by the significant alteration of the recovery heart rate. The group as a whole demonstrated a significant improvement in recovery heart rate. The decrease in recovery time during the 1st, 3rd and 5th minutes of recovery are included in Figure 6.

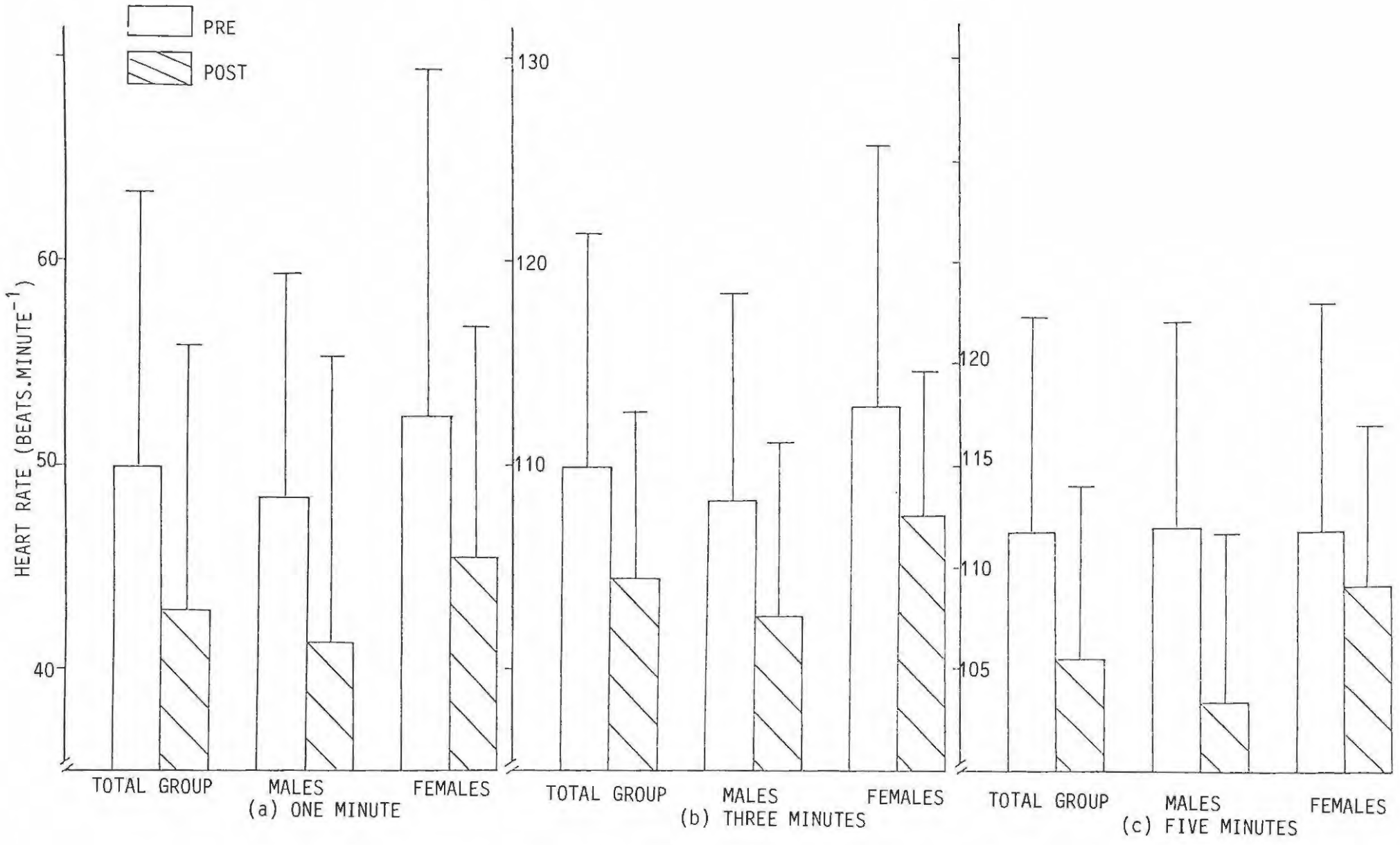


Figure 6 - Recovery heart rates for 1, 3, and 5 minutes

Anaerobic Power

The anaerobic capacity as measured by the Margaria-Kalamen step-test was significantly greater ($p < 0.05$) in the male subjects (Figure 7), which would appear to indicate that there was greater storage of readily usable ATP-PC system in males than in females.

The difference between the initial mean power results and the results after the seven week participation was also significant. The results (Figure 7) indicate that there was a significant increase in both males and females. It would therefore appear that the programme elevated the anaerobic capacity of participants. This is not surprising as the jive involves whole body movement which demands a great involvement of the lower limbs, and may promote strength development in this part of the body, thus elevating the energy storing capacity in the working muscles. This suggests that the activity stimulated the supply of phosphagens and anaerobic glycolysis since according to Fox and Mathews (1981) improvements are exercise specific.

Motor Components

The pre-programme scores and those obtained after the seven weeks of participation differed significantly with both males and females showing a marked improvement in motor performance (Table VI). The male capacity remained higher than that of females (Figure 8).

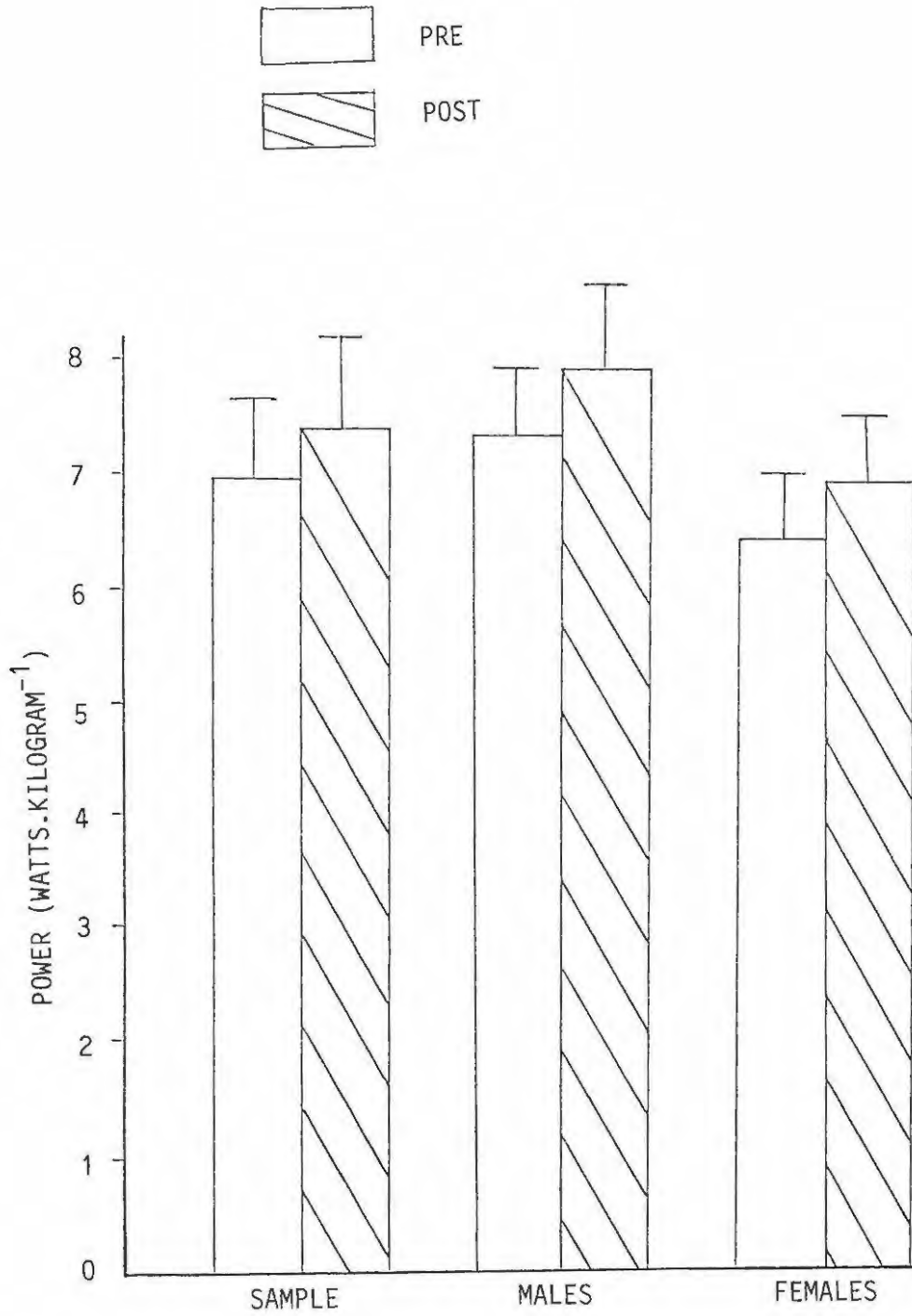


Figure 7 - Power output results.

TABLE VI: Pre- and post-programme motor components results

COMPONENTS	TOTAL GROUP				MALES				FEMALES			
	PRE		POST		PRE		POST		PRE		POST	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
Balance	1.1	.9	1.8*	.8	1.4	1.0	2.1	.9	.6	.7	1.5	.5
Flexibility	1.9	.7	2.4*	.8	1.9	.7	2.3	.9	1.9	.8	2.5	.7
Agility	1.2	.8	1.6*	1.1	1.4	.8	2.1	1.0	.8	.5	.8	.7
Strength	2.2	.9	2.6*	.6	2.7	.8	2.8	.5	1.5	.5	2.2	.6
Power	2.0	1.1	2.2	1.0	2.7	.6	2.6	.7	1.0	.7	1.5	1.0
Endurance	1.5	1.1	1.8*	1.0	2.0	.9	2.2	.9	.6	.7	1.3	.8
% Passes	54.7	21.5	63.6*	19.65	67.0	16.8	78.1	19.0	35.2	11.0	54.2	8.9

* sig. (p < 0.05)

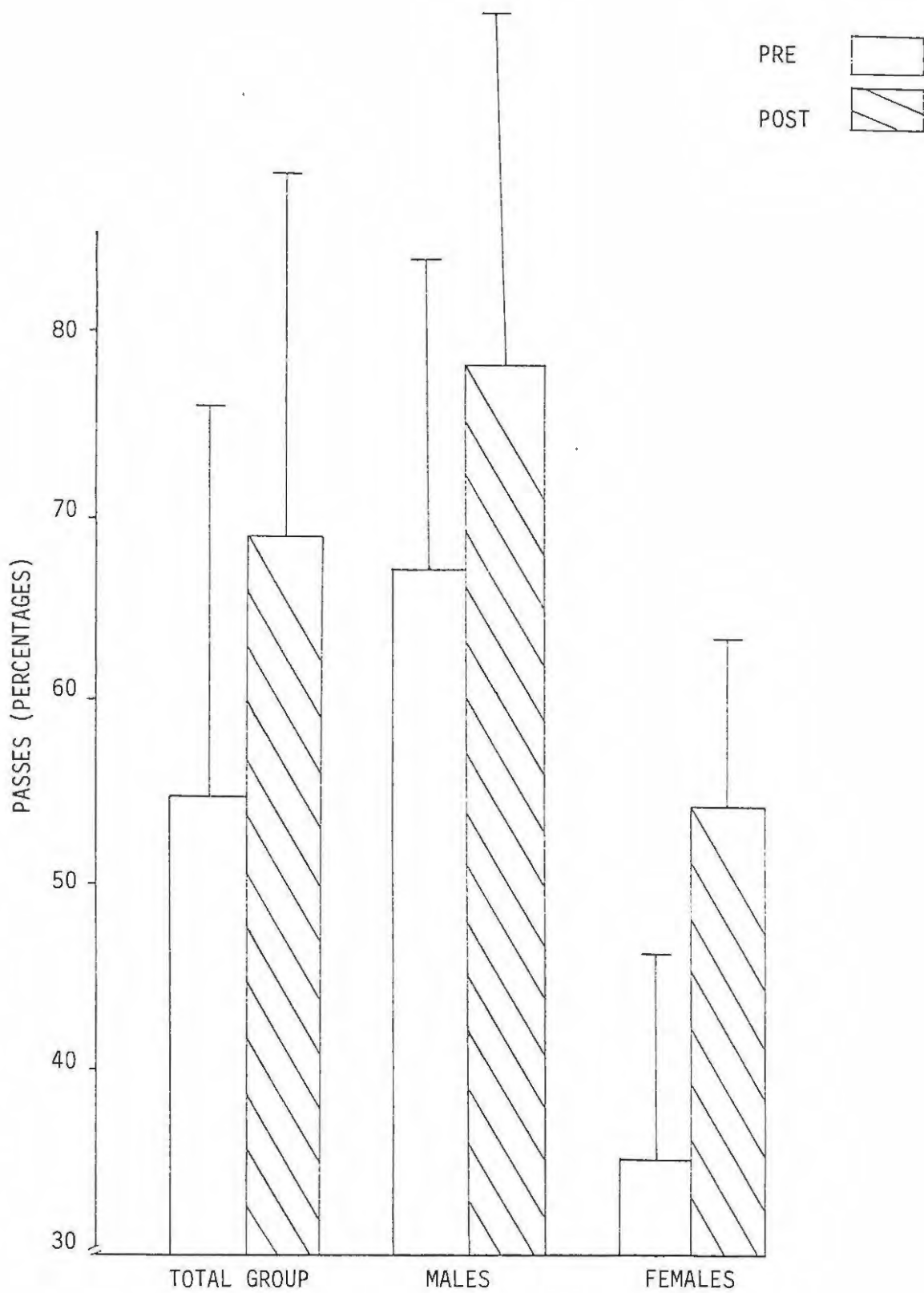


Figure 8 - Motor components percentage passes.

Although overall motor ability was scored as a total percentage, the various components were treated individually.

Statistical analysis revealed a significant difference between males and females in the component of balance, as measured with the Curetons' Illinois 18-item test. Scores (Table VI) revealed that males were superior in the balance ability (mean 1.4 SD 0.96) to female (mean 0.6 SD 0.7). It should be remembered that the components of balance cannot be analysed in isolation since the process depends on the recruitment of specific muscle groups. Therefore sex linked differences will be discussed jointly with other variables. Nonetheless, in its complexity, balance was improved by the Pantsola jive programme.

It is interesting to note that no significant difference was observed in flexibility between males and females. The female superiority of joint looseness advocated by de Vries (1980) which is said to occur at all ages and is reported to be an innate ability, was not apparent in this study. Perhaps a bigger sample group would help to draw reasonable conclusions regarding this controversial issue. It is important to note, however, that the males in this project were more active initially, and the females more obese. Hence there was greater opportunity for males to develop flexibility, and there was evidence of more obstruction to joint movement by fat pads in females.

Significant differences were obtained between the pre- and post-treatment results in flexibility in both males and females. Positive responses of this component to exercise were expected, because of the great movement range within the joints, and the relationship between the mastery of movements, and loosening of the joints. Unfortunately the test battery did not involve a test of ankle flexibility and it was most evident that this joint underwent excessive twisting movements in the jive.

The stretching exercises included in the warm-ups prior to the main exercise programme were executed to loosen up joints in preparation for the demands of the jive. The continuous stretching of the muscles which lasted about 9 minutes, three times a week for 7 weeks, may be regarded as an additional session on its own. This may render some bias in analysing the benefits derived from the main programme under study. Nevertheless, it does not rule out the fact that there were benefits obtained from participation in the seven week programme.

As was discussed in Chapter 2, agility involves gross motor tasks which include other complex motor tasks such as speed and co-ordination. Superiority of males in the muscular components may well be responsible for the significant difference found between the male and female subjects (Table VI). A significant difference ($p < 0.05$) was also found between the pre- and post-programme results, as measured by the Illinois 18-Item fitness test. It would appear that the speed of movement and the fine

co-ordination required in the execution of the jive movements, were in all probability responsible for the improvement noted in the agility component.

Statistically significant differences between the means of males and females were observed on the tests for muscular strength. This could be related to the muscular hypertrophy experienced in the males, which is caused by endrogen secretion towards the end of the developmental stage, resulting in the bulkiness of muscular tissue, as stated by Pollock et al. (1984), and Oppliger et al. (1986), the latter emphasising the importance of muscle bulkiness in strength abilities.

This difference may also be accounted for by body type differences between the males and females (Figure 3). Endomorphs possess more fat and less muscle tissue and if the size of the muscle is important in determining the strength then by implication the more endomorphic females of the study group will not be as strong as the males. This superiority of muscular strength could also be the reason for the superiority of males in the balance and agility components as the execution of these activities relies greatly on the recruitment of the particular muscle groups.

Similar improvements may therefore have been observed if the programme had lasted longer. A longer training period may have shown the more ectomorphic -mesomorphic males levelling off

(Karpovich and Sinning, 1971) and the females continuing to lose fat and build muscle until these changes reached an equilibrium related to inherent capacity and training demands.

As stated by Heyward et al. (1986) and Oppliger et al. (1986) strength gains are associated with an achievement of a level of exercise that will stimulate stressful conditions and thus improve the level of fitness. It is clear that the physical condition of the subjects in the present study was relatively low, suggesting that the required threshold for strength gains must have been achieved.

The sex differences in power were also statistically significant ($p < 0.05$). Since power relies greatly on muscle strength, and the males in the study showed superiority in strength, the results were not surprising. Similar results were obtained in the anaerobic power test previously discussed.

However, there were no significant alterations in power (as assessed in the Illinois 18-Item) after the seven weeks programme which was somewhat unexpected since muscular strength in the 18-Item, and power, in the Margaria-Kalamen anaerobic test, did improve significantly. The one problem in this regard may have arisen from the method used in the test. As power is related to strength and time and since the factor of time is in fact not considered in the Illinois 18-item test (Appendix D). This

could mask the validity of the test itself. The test itself shows some resemblance to muscular endurance. Complex motor skills rely on diverse factors such as power and agility, muscular strength, endurance and flexibility making it difficult to determine the right measure of each individual component. Power tested by a Margaria-Kalamen step-test, as already mentioned, showed significant improvements. Another important factor might be that the anaerobic power test (Margaria-Kalamen) uses the lower limbs which were more involved in the jive, while the Illinois test concentrated more on the upper limbs, which were not particularly involved in the jive routine.

As for strength, muscular endurance showed some sex differences statistically, with males once more showing superior abilities (Table VI). It has been stated that muscular endurance is directly linked with the cardio-respiratory system because of the persistent contraction of muscle fibres over a period of time. This can only be sustained provided there is a sufficient supply of energy. The males in this study have already been assessed as being superior in energy demanding activities such as the 12-minute run. Therefore the difference may be the result of the difference in the oxygen carrying capacity as stated by Tanner (1978), as well as the greater ability of males to neutralize the metabolic by-products.

There were significant differences ($p < 0.05$) in the muscular endurance component at the end of the jive sessions in both sex

groups, which may be related to the gains in strength together with the cardio-respiratory improvement. In other words participation in the Pantsola jive induced muscular endurance training which improved the pathway of the stored energy and the ability of muscles to tolerate accumulative lactic acid in the process of contraction.

There was a significant difference ($p < 0.05$) when the pre-programme percentage passes obtained in the Illinois 18-Item motor fitness test were compared with the post-programme percentages. Figure 8 shows that males started at higher levels than females and that females achieved relatively higher gains by the end of the programme. This further confirms the relationship of fitness benefits to the initial level of fitness. The trend of these differences is presented in Figure 9.

Psycho-Social Results

Body and Self-Concept

Figure 10 illustrates the pre- and post-programme results of (a) the mean body concept and (b) the mean self-concept of the total group of the males and females. The illustrated difference between males and females in the body concept is of no significance. The similarity could be the result of the fact that the research was conducted in an area with few sporting



Figure 9 - Motor components responses of the total group, males and females.

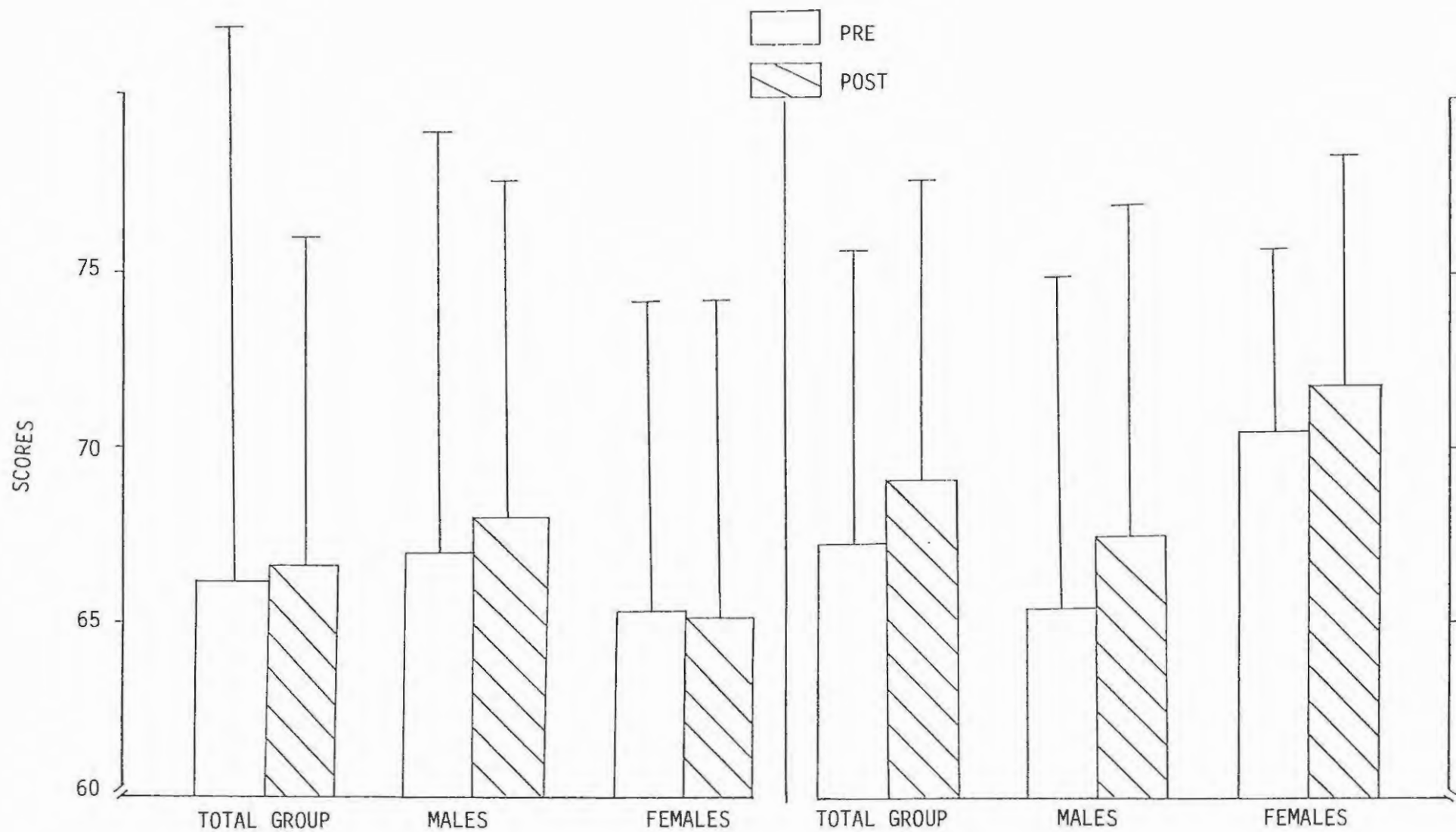


Figure 10 - The body and the self-concept results.

facilities and minimal opportunities for participation at the school. Thus only a few subjects participated in regular physical activities. Despite the superior level of males in the physiological parameters which would be expected to elevate their body regard, subjects reported the same, subjectively perceived level of body image. The subjects may have assessed their self evaluation by using their peers as objective standards of reference more than a personal basis of evaluation.

Statistical analysis further revealed no significant difference ($p < 0,05$) between the pre- and post-jive programme results. At this stage it may be necessary to point out that all objective measurements of the physiological parameters, performance ability and morphological tests were executed after the pre-programme tests on the body concept. Hence, while the responses were spontaneous, they were acquired before a rapport with the subjects had been developed and the responses were based on how the subjects valued their own bodies without actually objectively knowing much about them, or having much idea of what the objectives of the questionnaire were.

The post-programme test, on the other hand, was performed after all other parameters were tested, thus adding objective knowledge to the existing point of reference of peer comparison. Perhaps the pre-programme testing should have been performed

after the biophysical and the physiological pre-programme testing, to eliminate the factor of ignorance about the body. It is therefore difficult to conclude whether participation in the Pantsola jive had impact on the body image or not. The test was administered before subjects knew about their results in other tests and based solely on an image of their general daily routine performance.

Similar results were obtained in the self-concept responses. No statistically significant difference ($p < 0.05$) was observed between the males and females in the study group. The reason for this is not clear but may have been because of the stated relationship between the body and the self-concept. When Johnson (1962) indicated the important role that the body concept plays in a child's self-concept he never mentioned the age at which a self-image starts to be affected by other factors. The drafting of the questionnaire was influenced by and directed toward the body and its functions. That is, responses to the self-concept could have been influenced by the atmosphere created by the presence of, and intermingling with, body concept statements. Nevertheless, it is not clear whether separate questionnaires on the body and the self-concept would make a difference.

Self-concept responses on the pre- and post-Pantsola jive programme were not significantly different ($p < 0.05$), indicating that no apparent improvements in the self-concept

resulted from participation in the jive programme. The small gains indicated in Figure 10, while greater than the gains in body concept, were also not statistically significant.

Although it is not known why the attitudinal responses were apparently unaffected by the programme even though there were physiological benefits, some possible reasons will be discussed. There is a probability that the self-concept responses were influenced by the body concept discussed above, and the environmental influences might have been fairly strong, for as Tajfel and Frazer (1978) indicated, the prevalence of situational influences may not be observed by the researcher but may effect the respondents. In other words, when the self description is supposed to be objective, the self is influenced by subjective affective feelings and the sociological environmental setting. In the pre-programme testing situation in this study, the subjects clearly perceived the researchers as superior and were keen to impress them. The responses could thus have been biased in their attempt to give the "correct" responses. Tyson (1987) referred to this situation as "individuation", a condition of being in a temporary and unreal situation which may result in less self awareness. Responses could have been regulated by the way subjects wanted to be perceived by the researchers, especially at their age, which Sonstroem (1978) reported to be more ready to deny physical inability than to confirm it. There is a likelihood that a denial of physical

inability and a desire to please the researcher could have been the reason why the pre-programme responses were so similar to the post-programme results, which were given after the realisation of the objective physical and physiological tests. It is the author's strong conviction that this was the case and that the post-programme results were indeed a true reflection of the subject's perceptions of body and self-concept.

A further possibility is that because of the initial high level of the responses there was little room for improvement, which supports the suggestion put forward by Tucker (1983).

Another possibility that may have affected the results is that of language. Since the language used in the questionnaire was a second language to the subjects, statements, although altered, may still not have been well comprehended.

The last possibility which must be considered is that the programme may not have had any impact on either the body or the self-concepts at all, which would then tally with the findings by Vincent and Dorsey (1968) and Puretz (1982) who found no relationship between the body concept and participation in physical activity. This lack of any relationship, according to Vincent and Dorsey (1968), could result from the lack of the validity of the scale used in the test.

In analysing the relationship between the body and the self-concept (Figure 11) the data indicated that the self-concept was higher than the body concept in both males and females, in both the pre- and post-programme results.

As already indicated, the self-concept may have been influenced by factors other than just the body image and its capabilities. If subjects in the study group had reached a psychological maturity which would expose them to other environmental factors, then their self-concept may have been influenced by other aspects such as their intellectual achievements, position in society, or even their life-styles. Under these conditions therefore a difference would be expected between the body and the self-concepts.

In contrast to the self-concept, the body concept is not a general entity, but a specifically directed form of perception which is determined, (Vincent and Dorsey, 1968) by satisfaction or dissatisfaction with one's body or body parts and their capabilities. Although these self-evaluations are subjective, previous value judgement regarding the body will be brought into account and this will serve as a point of reference. It is possible that a degree of objectivity may be promoted by specificity of reference.

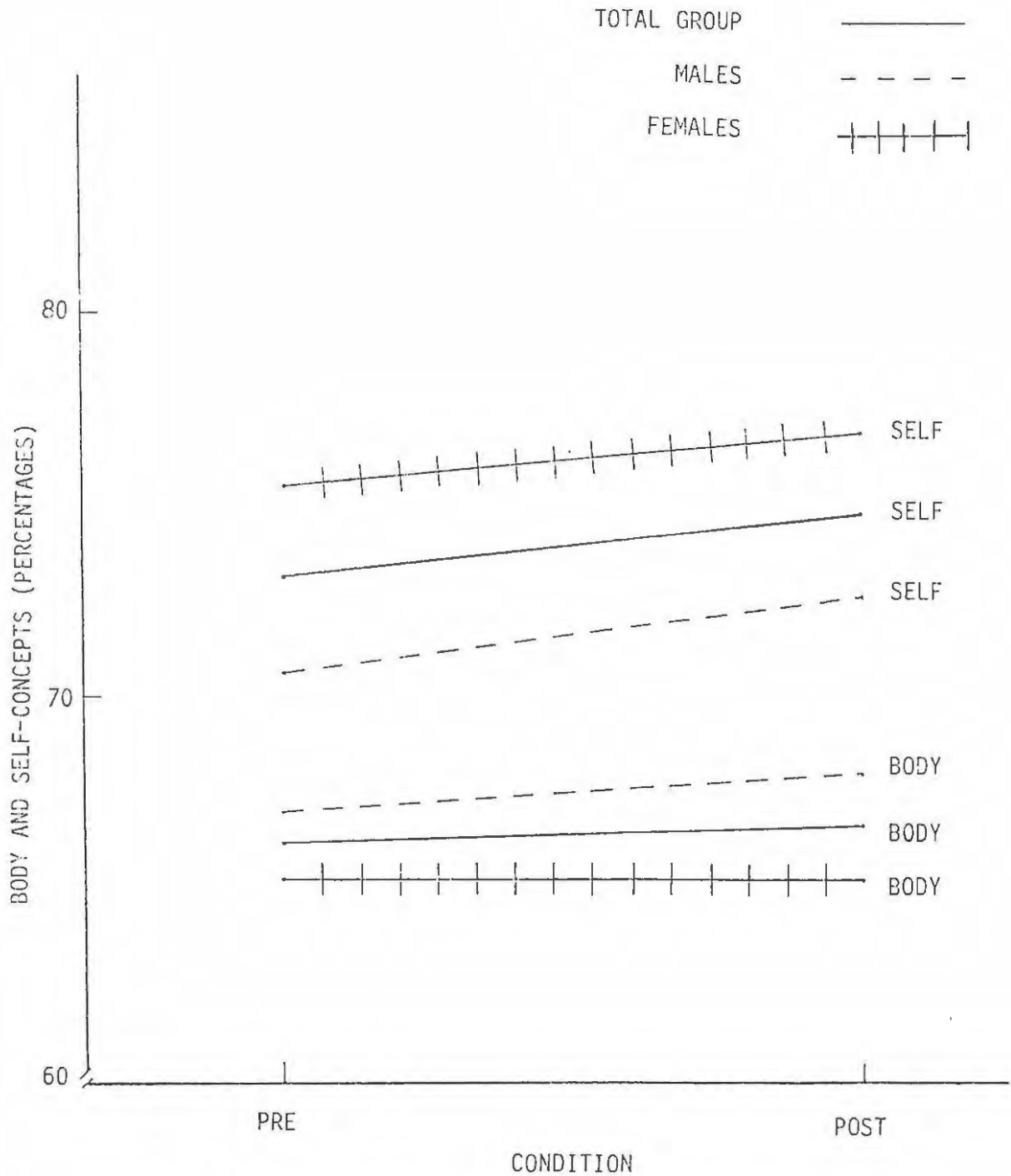


Figure 11 - The trend of responses to the body and self-concepts questionnaire.

It could otherwise be argued that the subjects were not satisfied with their bodies but possessed high concepts about the self, which could have been elevated by other factors as already discussed.

Attitudes

Figure 12 and Table VII illustrate the subject's attitudinal responses grouped into Kenyon's six subdimensions. Responses in the pre- and post-programme testing followed the same pattern although a few minor differences occurred. Although testing conditions in the pre-programme test were such that the anonymous tester may have created an unnatural environment, which in turn may have affected the respondents, the similarity in pattern of the pre- and post-programme results reduced the possibility. It also minimised the possibility of lack of knowledge or understanding of objectives of at least the questionnaire itself. Therefore, it could be concluded that the general concept was understood by the subjects.

There were reasonable differences and similarities between responses of the study group subjects (Figure 12) and those responses displayed by Black Rhodes University students (Table I and Figure 1). Both groups ranked Health and Fitness the highest, while the study group ranked ascetic experience second.

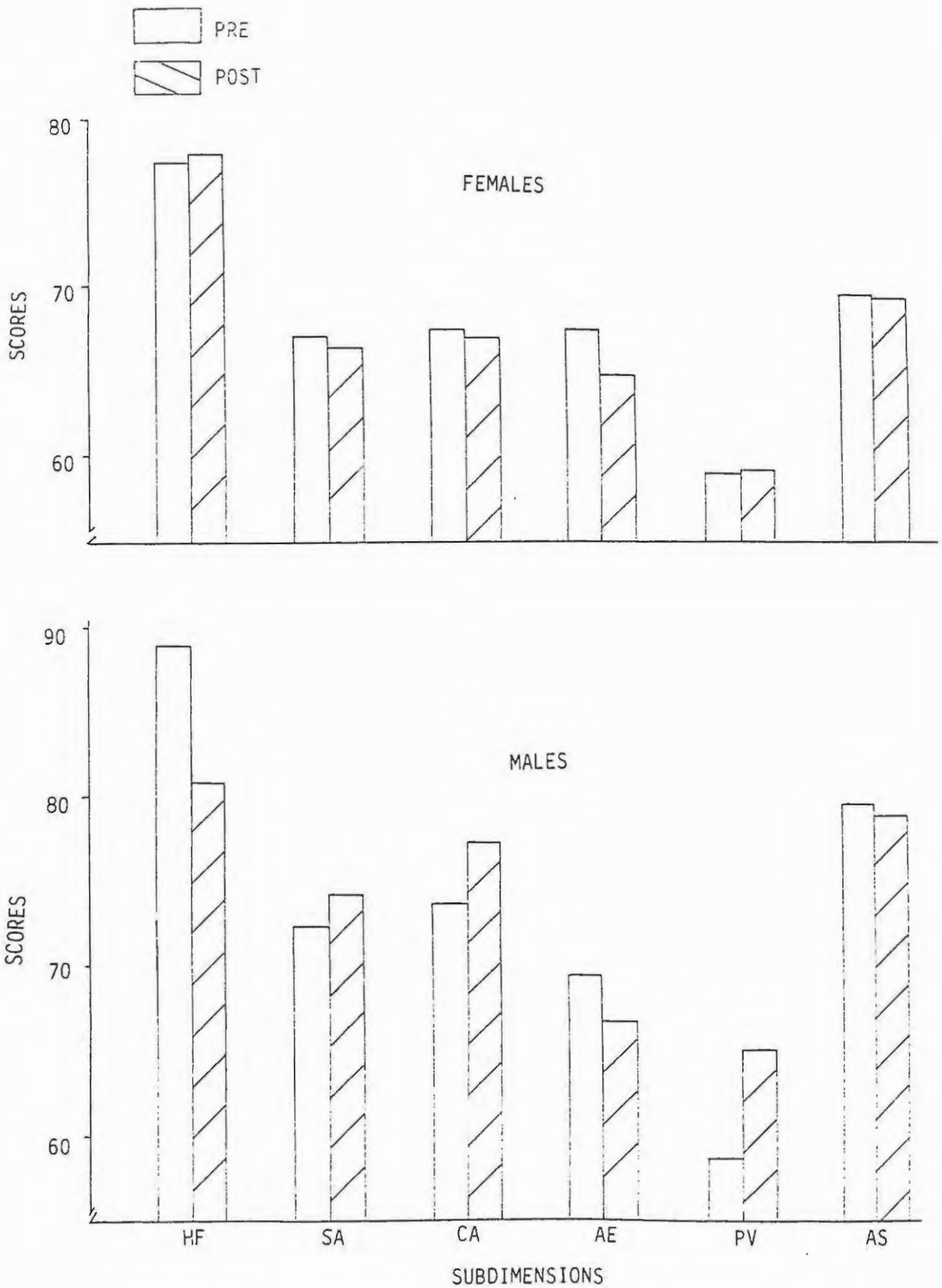


Figure 12 - Attitudinal responses grouped in Kenyon's subdimensions in the pre- and post-programme tests.

An age factor and life style could be the reasons for this, for the study group was still in a competitive age group and also in a school environment where participation usually takes the form of some kind of competition with other schools. The study group ranked catharsis third, aesthetic experience fifth and vertigo last. The same reason for the low pursuit of vertigo by the university students may be applied to the responses of the study group, since both groups belong to the riot troubled generation.

Table VII: A summary of the pre- and post-programme attitude responses towards physical activity.

Components	Males				Females			
	Pre		Post		Pre		Post	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
Health and Fitness	88.7	8.70	80.7	11.3	77.3	12.6	77.7	12.1
Social Aspects	72.1	10.9	74.1	10.3	67.0	16.7	66.3	10.4
Catharsis	73.4	13.4	77.2	9.30	67.3	10.2	66.9	13.1
Aesthetic Experience	69.2	11.1	66.6	10.1	67.3	11.8	64.7	10.3
Pursuit of Vertigo	58.6	15.0	64.95	13.7	59.0	11.2	59.1	9.11
Ascetic Experience	79.5	9.99	78.8	7.95	69.5	9.0	69.4	12.8

The absence of any significant change in attitude may have resulted from the initially high response which showed a fairly high positive attitude toward participation in physical activity, indicating a continuing positive attitude. This type of behaviour was advocated by Tajfel and Frazer (1978) when they stated that the weighted sum of the originally held attitude and the attitude after an introduction of a new experience may be small if the discrepancy between the two situations is small. This is interesting to note as the subjects in the present study were in an environment not conducive to physical activity. This was not altogether surprising since attitudes are not only developed from practical experience, but may also be reinforced by education.

The minor differences noted may simply have been an adjustment and/or correction of what was previously perceived as the subject's response to what was finally regarded as their response after participation in the programme. Whatever the case may be, these differences were of no significance statistically ($p < 0.05$).

The latter results may be considered similar to those of the body and self-concepts which were also rated initially high with little or no difference at the completion of the programme. According to Coldicott (1979), the self-concept has a great impact on attitudes. He concluded that initially less active subjects with negative attitudes towards physical activity,

demonstrated improved attitudes with increased physical activity. In other words the body and self-esteem, if raised by a stimulus, such as an involvement in an activity programme may determine the direction of strength of attitudes towards that stimulus.

Although sex differences in attitude were expected, no significant differences were apparent in this study.

As previously discussed in Chapter 2, changes in attitude towards physical activity may be a lengthy process. Since observable physical gains, such as body composition alterations, often only result from a longer term programme (Ruskin and Oren, 1979) it may be concluded that the seven-week period of the present project was not long enough to produce significant improvement in body composition and thus not long enough to bring about attitudinal differences.

CHAPTER 5**SUMMARY, CONCLUSIONS AND RECOMMENDATIONS****Aims of the Study**

The study sought to examine the effects of a South African youth jive on specific biophysical, physiological and psycho-social parameters, using a selected group of Black youths. A further aim was to determine the nature, if any, of sex differences attributable to participation in the programme.

The research hypothesis was, therefore, that there would be no differences between results obtained prior to and following a seven-week jive programme. The variables under consideration were: anthropometric, cardio-respiratory and attitudinal parameters. It was further hypothesised that there would be no difference between the male and female subjects in response to the programme.

Methods

The group studied comprised 31 Black South Africans of both sexes (mean age 19.29 yrs) from a local secondary school. Initially, 41 pupils were tested, of whom 10 (mean age 22.5 yrs SD .6) dropped out, leaving 31 subjects (19 males and 12 females). All

subjects participated in the pre-programme data collection, the jive programme lasting for seven weeks, and a post-programme retest.

Data collection in both the pre- and post-programme tests involved measurements of stature (cm), body mass (Kg), five skinfolds (mm), femoral epicondylar and humeral condylar diameters (cm), arm and calf girths (cm), predicted $\dot{V}O_{2max}$ ($ml.Kg^{-1}.min^{-1}$), physical fitness (Cureton's 18-item Illinois Motor Fitness Test), the body and self-concepts and individual attitudes towards physical activity. In the latter three tests, percentages to responses were used for statistical analysis. Scales for the body and the self-concepts and of attitude tests were constructed to suit the particular conditions of the study.

A carefully controlled Pantsola jive programme followed the initial data collection. All 31 subjects participated in the seven week programme which lasted for 45 minutes three times a week. Each session comprised a warm-up period, the jive activity and a cool-down period, and although the intensity of the jive was not directly measured, working heart rates were monitored on the last days of the first, fourth and last weeks of participation.

The pre- and the post-data were then statistically compared using a two factor analysis of variance with repeated measurements on one factor. The level of significance was set at 0.05.

Results

1. There were no significant changes in average body composition at the end of the seven-week programme. This was reflected by the lack of significant differences ($p < 0.05$) between the pre- and post-programme mean values for both the mass and the percentage body fat. As a result no changes were observed in the somatotype of the male and female groups.
2. When considering sex differences, females recorded larger body mass and higher percentage body fat, but were shorter in stature. Females also exhibited a predominantly endomorphic body type while males were more ectomorphic.
3. Males exhibited higher predicted $\dot{V}O_2$ max mean values than females, and while no sex differences were observed in the working and recovery heart rates, mean resting values were significantly ($p < 0.05$) lower in males than in females.
4. There were significant ($p < 0.05$) improvements in the mean predicted $\dot{V}O_2$ max values in the post-programme data for both males and females. Improvements were observed in the working and recovery heart rates, but not in the resting heart rate. These results indicate an overall improvement of the cardio-respiratory system.

5. The anaerobic capacity of both sexes improved significantly by the end of the programme ($p < 0.05$). As with $\dot{V}O_2$ max, the males were superior to the females.
6. There were significant improvements in five of the six motor components, namely: balance, flexibility, agility, strength and endurance. No significant improvements were observed in power. With regard to differences between males and females, significant differences ($p < 0.05$) existed in all components except flexibility, with the males recording the better scores.
7. In respect of body and self-concepts the study revealed no significant changes when the pre- and post-data were compared. Neither were there any significant differences between male and female mean responses.
8. The study further found no improvements nor any apparent sex differences in mean attitudinal responses.

Conclusions

There was no overall improvement in body composition resulting from participation in the Pantsola jive programme. There are two possible reasons for this:

1. Since the dietary factor was not controlled, it was possible that the increased involvement in regular physical exercise resulted in greater caloric intake.
2. The programme may not have been of sufficient duration. Although positive results in fat reduction have been demonstrated in similar aerobic dance programmes, intensity at the beginning of the programme in this study was reduced because of the teaching process. In other aerobic dances the intensity is generally constant from beginning to end. Other physiological factors such as conversion of fat to muscle tissue take time and, as explained by Birrer and Levine (1987) and Pollock et al. (1984), may only become evident after 3-6 months depending on the intensity and duration of participation.

Differences in body composition between males and females at this final stage of development, as in the subjects under study, were discussed by Tanner (1978), Becque et al. (1986) and Bailey et al. (1987). They reported that during this stage of life, females generally become more endomorphic while males become more ectomorphic. Therefore the difference in somatotype was as expected.

Despite no observable differences in the resting heart rate, the overall cardio-respiratory system improved as in other documented studies on aerobic dances. It is not clear why

there were no alterations in resting heart rate, but it may be concluded that a high intensity with longer duration could have brought about some changes.

No psycho-social changes were observed in this study. The fact that the body concept remained unchanged may have had a bearing on self-concept which in turn may have influenced the subjects' attitudes. The reason for the lack of change in body concept is not clear. However, while there was no change in actual body make-up, there were significant improvements in the performance of the body as measured by the 18 items. This may also have been caused by situational factors such as the initial anonymity of researchers, or even the later discovery of the real objective of the test, namely the actual body function as opposed to the imagination of what one's body was capable of. Such factors may also have lead to the similarities in male and female responses.

Hypothesis 1. With respect to the anthropometric measures made, the null hypotheses was tentatively accepted since no differences attributable to the Pantsola jive programme could be shown.

With respect to the physiological parameter the null hypothesis was rejected ($p < 0.05$) since significant differences attributable to the programme were shown.

With respect to the physcho-social parameters measured, the null hypothesis was tentatively accepted since no significant programme effects were noted.

Hypothesis 2. With respect to male-female differences the null hypothesis was rejected for tests of biophysical characteristics and physiological responses since significant sex-related differences were demonstrated. In the case of the psycho-social parameters measured, however, the null hypothesis was tentatively accepted; no significant differences have been found attributable to sex.

Recommendations

Participation in Pantsola jive, as appears to be the case with other aerobic activities and dances, does improve the cardio-respiratory system. One can therefore conclude that the jive qualifies as an aerobic activity.

It is the author's contention that a longer duration of the actual programme may have had important implications concerning changes in body composition. If the programme could have been extended by at least two weeks it may well have reduced the problems brought about by the teaching process in the first two weeks, which unavoidably involved less actual physical activity.

The problem of encouragement and motivation in Cooper's 12-minute run needs to be investigated in relation to the differences in

exertion between males and females. The females in this study seemed less competitive and even though extrinsically motivated, did not perform as well as the males. This was also observed from the similarity in working and recovery heart rates between the two groups where the resting levels were not the same.

Administration of psycho-social tests designed for culturally different target groups clearly requires further careful study. A body concept scale may be reinforced by its administration after the more objective anthropometric, physiological and physical performance tests for meaningful pre- and post-attitudinal comparisons since the observation of gains may be an important issue. A further implication is that the ignorance about a body concept and self-concept would be reduced if a more familiar test atmosphere was provided.

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APPENDIX A

RHODES UNIVERSITYDEPARTMENT OF HUMAN MOVEMENT STUDIES AND PHYSICAL EDUCATIONInformed Consent Information Sheet

Research Project: THE EFFECT OF A SOUTH AFRICAN BLACK YOUTH JIVE ON THE ANTHROPOMETRIC, PHYSIOLOGICAL AND PSYCHOLOGICAL PARAMETERS.

GENERAL INFORMATION

This research project was undertaken to investigate benefits that could arise from participating in a Black Youth Jive (Pantsola Jive). Focus will be directed to alterations in the anthropometric parameters, any significant changes in the cardiorespiratory responses, changes in the physical fitness as a whole and the impact that the jive may have on the psycho-social sphere of the participant.

Attention will be directed to the youths of both sexes, of ages ranging from 15 to 18 years. The differences in gains between the two sexes will also be investigated.

Participation is voluntary and pupils with health problems will be exempted. Subjects may withdraw any time prior to or during the designated period of research.

PROCEDURE

Subjects will be required to avail themselves to the following testing sessions and exercise programmes:

1. Pre-exercise programme data collection

A light tee-shirt and shorts will be appropriate for this programme. The data collection will be divided into four sessions.

Session 1: Duration will be approximately 2 hours.

Personal particulars: Subjects will be required to complete a questionnaire pertaining to personal particulars.

Attitude questionnaires: Two questionnaires are provided to this effect:

- The body- and self-concept scale, where one is expected to express what one feels about oneself.
- The scale of attitude towards physical activity. Subjects are expected to express their personal attitudes towards physical activity as a whole.

Maximum Anaerobic Power: Subjects will run up a flight of stairs as fast as possible. Each subject will run three times and the best time will be noted.

Session 2: Duration will be approximately 30 minutes for 4 subjects.

Anthropometric measurements: Measures of mass and stature will be taken.

Skinfolds: Five skinfold measurements will be performed on each subject. The skinfolds are: the biceps, triceps, subscapular, the suprailiac and the calf.

Widths: The humerus and the femur for both the left and right sides will be measured.

Girths: The biceps and the calf circumferences for both left and right will be measured.

These data are required in order to calculate the somato-type of each subject.

Session 3: Duration will be approximately 45 minutes for 10 subjects.

Fitness Test: Subjects are expected to participate in an 18-item programme for testing fitness. The programme was planned to test the following aspects:

Flexibility

Balance

Agility

Strength

Power and

Endurance.

Session 4: Duration will be approximately 30 minutes for 2 subjects.

Endurance capacity:

Resting heart rate for each subject will be recorded.

A predicted maximum oxygen consumption will be obtained from running each subject for 12 minutes and measuring the distance taken in that duration.

Working heart rate will be recorded as soon as the subject stops running.

Recovery heart rate will be recorded after every 30 seconds in the first five minutes of recovery.

2. Participation in a six-weeks exercise programme

After the pre-exercise data collection, subjects are expected to participate in a programme lasting 40 minutes, three times a week for six weeks. The programme includes warm-up exercises, stretch exercises and the aerobic jive.

3. Post-exercise programme data collection

All four sessions of the pre-exercise programme data collection will be repeated.

RISKS

Inherent risks in this research project are minimal.

Nonetheless, discomfort may be experienced as a result of the sudden onset of exercise to a nonconditioned individual, especially at the beginning of the programme.

The following may be experienced: Fatigue - to avoid this, subjects will be advised to work at their own pace.

PRECAUTIONS

The following precautions will be taken to avoid hazards:

- The tester shall under all circumstances be made aware of any medication (and/or any such medical treatment as may be prescribed by medical personnel) taken by any subject during the course of participation in the project.
- No drug, unless prescribed by medical personnel and declared safe, in which case the tester should be notified in time, should be taken prior to or during the designated hours of either the data collection and/or participation in the six-weeks programme.
- Pupils exempted, for medical or religious reasons from participating in physical activities, will be exempted from this research project.
- The tester will, at any time it is deemed fit, discontinue participation of a pupil as a result of such conditions as could expose the pupil to social, psychological and/or health hazards.

BENEFITS

Full participation may result in the following benefits:

- Improvement in general physical fitness.
- Possible physiological benefits; the cardiorespiratory function improvements.
- Improvement of general well-being associated with such aspects as tensions and depression, coupled with possible benefits in the social sphere, improving aspects such as socialisation, and a fulfilment of the urge to be physically active.
- Results at the conclusion of the project will provide information pertaining to pre- and post-programme testing of the following parameters:
 - heart rate
 - body fat
 - general fitness
 - the endurance capacity and
 - the attitude one has towards oneself and to physical activity as a whole.

APPENDIX B

RHODES UNIVERSITYDEPARTMENT OF HUMAN MOVEMENT STUDIES AND PHYSICAL EDUCATIONCONSENT FORM

I, _____, having been fully informed of the nature of the research entitled:

THE EFFECT OF A SOUTH AFRICAN BLACK YOUTH JIVE ON THE ANTHROPOMETRIC, PHYSIOLOGICAL AND PSYCHOLOGICAL PARAMETERS

do hereby give my consent as head-master/-mistress, on behalf of pupils in my school, to act as subjects in the above-named research.

I am fully aware of the procedures involved as well as the potential risks and benefits attendant to their participation as explained to me verbally and in writing. In agreeing to their participation in this research, I waive any legal recourse against the researchers or Rhodes University, from any and all claims resulting from personal injuries sustained by any of my pupils. The waiver shall be binding upon the school and government properties and upon individual pupil's representatives. I realise that it is necessary for my pupils to promptly report to the researcher any signs or symptoms indicating any abnormality or distress.

I am aware that I may withdraw my consent and may withdraw any of my pupils from participating in the research at any time. I am aware that my pupils' anonymities will be protected at all times, and agree that the information collected may be used and published for statistical or scientific purposes.

I have read the information sheet accompanying this form and understood it. Any questions which may have occurred to me have been answered to my satisfaction.

PERSON INVOLVED	PRINT NAME	SIGNATURE	DATE
SUBJECT (OR LEGAL REPRESENTATIVE)			
ADMINISTRATOR OF INFORMED CONSENT			
WITNESS			
PROJECT SUPERVISOR			

APPENDIX C

RHODES UNIVERSITY

DEPARTMENT OF HUMAN MOVEMENT STUDIES AND PHYSICAL EDUCATION

PRE AND POST-PROGRAMME DATA COLLECTION SHEET

1. Name 2. Subject Code
 3. Date of Birth 4. Sex
 5. Participation in Sporting Activities

Activity	No of times per week				Approximate time (hours)
	3+	2	1	0	
Netball					_____
Soccer					_____
Volleyball					_____
Tennis					_____
Others _____					_____
_____					_____
_____					_____

Anthropometric Measures:

	Pre-Programme				Post-Programme			
Stature (cm)	_____				_____			
Body Mass (kg)	_____				_____			
Skin-folds (mm)	1	2	3	\bar{X}	1	2	3	\bar{X}
Biceps								
Triceps								
Subscapular								
Subrailiac								
Calf								
	Right		Left		Right		Left	
Humeral Bi-epicondylar (cm)	_____		_____		_____		_____	
Femoral Bi-epicobdylar (cm)	_____		_____		_____		_____	
Flexed arm circumference (cm)	_____		_____		_____		_____	
Maximum calf circumference (cm)	_____		_____		_____		_____	

APPENDIX D

RHODES UNIVERSITY
DEPARTMENT OF HUMAN MOVEMENT STUDIES AND PHYSICAL EDUCATION

5. Physical Measurements

The Cureton "Illinois" 18-Item fitness Test.

Instructions: Subject either passes or fails in all instances.

Pass is indicated by means of \checkmark and fail by means of \times .

Components	Items	Pre-Programme	Post-Programme								
	<u>Balance</u>										
1.	Diver's Stance	_____	_____								
2.	Squat Stance	_____	_____								
3.	Dizziness Recovery	_____	_____								
	<u>Flexibility</u>	Total pass _____									
4.	Floor Touch	_____	_____								
5.	Trunk Flexion Forward	_____	_____								
6.	Trunk Extension-Backward	_____	_____								
	<u>Agility</u>	Total pass _____									
7.	Kneeling Jump	_____	_____								
8.	Jack Spring	_____	_____								
9.	Agility 6-Count Exercise	_____	_____								
	<u>Strength</u>	Total pass _____									
10.	Man Lift	_____	_____								
11.	Stick Body	_____	_____								
12.	Extended Press-ups	_____	_____								
	<u>Power</u>	Total pass _____									
13.	Standing Long Jump	_____	_____								
14.	Floor Push-ups	_____	_____								
15.	Straddle Chinning	_____	_____								
	<u>Endurance</u>	Total pass _____									
16.	V-Sit	_____	_____								
17.	Breath Holding	_____	_____								
18.	Endurance Hops	_____	_____								
		Total pass _____									
		PASS FAIL	PASS FAIL								
TOTAL		<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>					<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>				
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APPENDIX F

DEPARTMENT OF HUMAN MOVEMENT STUDIES AND PHYSICAL EDUCATION

RHODES UNIVERSITY, GRAHAMSTOWN 1988

BODY- AND SELF-CONCEPT SCALEPre-programme Post-programme

INSTRUCTIONS: The following sixteen statements assess how you feel about yourself. Circle the correct number to indicate whether you STRONGLY AGREE 1, AGREE 2, DISAGREE 3 or STRONGLY DISAGREE 4. There are no right or wrong answers. Please indicate what you personally feel. Please respond to ALL statements.

	RESPONSES			
	Strongly Agree	Agree	Disagree	Strongly Disagree
1. I take a positive attitude towards myself.	1	2	3	4
2. At times I think I am no good at all.	1	2	3	4
3. I am a natural athlete.	1	2	3	4
4. My friends seem to be more physically active than I am.	1	2	3	4
5. My body is stronger and more muscular compared to other boys/girls my age.	1	2	3	4
6. I feel I do not have much to be proud of.	1	2	3	4
7. I can get into a good physical condition faster than most people my age.	1	2	3	4
8. I lack confidence in performing physical activities.	1	2	3	4
9. I feel that I am a person of worth.	1	2	3	4
10. I am not very good at most physical skills.	1	2	3	4
11. I can run faster than most of my friends.	1	2	3	4
12. Overall, I am inclined to feel that I am a failure.	1	2	3	4

	Strongly agree	Agree	Disagree	Strongly disagree
13. I feel that I have a number of good qualities.	1	2	3	4
14. Poor timing handicaps me in certain physical activities.	1	2	3	4
15. On the whole, I am satisfied with myself.	1	2	3	4
16. I often doubt my physical ability.	1	2	3	4

APPENDIX G

PRE PROGRAMME

SELF CONCEPT				BODY CONCEPT			
NO.	POLARITY	SUBJECT SCORE	FINAL SCORE	NO.	POLARITY	SUBJECT SCORE	FINAL SCORE
1	+			3	+		
2	-			4	-		
6	-			5	+		
8	-			7	+		
9	+			10	-		
12	-			11	+		
13	+			14	-		
15	+			16	-		
		SCORE	%			SCORE	%
TOTAL							

APPENDIX H

Lilian Britten House
Rhodes University

ATTITUDE TEST

I am a Master of Arts student in the Department of Human Movement Studies.

I would like you to please state all your reasons for participation in sporting and/or physical activities.

Please realise that your statements will neither be wrong nor right; it is the ideas and personal reasons that I wish to assess. Your answers will help me in the drafting of a questionnaire that better suits an attitude test battery for South African Blacks, with less Western influence.

It is important to express your own opinion and to avoid external influences.

For example, simply walking for pleasure or jiving to music are all physical activities. What do you enjoy?

The following personal information will be helpful too:

PLACE OF ORIGIN (e.g. Eastern Cape):.....

My reasons for participating in sport or physical activity(ies) are:

1.
2.
3.
4.
5.

- 6.
- 7.
- 8.
- 9.
- 10.

The activities I enjoy are:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

DEPARTMENT OF HUMAN MOVEMENT STUDIES AND PHYSICAL EDUCATION

RHODES UNIVERSITY, GRAHAMSTOWN 1988

ATTITUDE SCALE TOWARDS PHYSICAL ACTIVITYPre-programme Post-programme

INSTRUCTIONS: The following twenty-four statements assess your attitude towards Physical Activity as a whole. Circle the correct number to indicate whether you STRONGLY AGREE 1, AGREE 2, DISAGREE 3 or STRONGLY DISAGREE 4. There are no right or wrong answers. Please indicate what you personally feel. Please respond to ALL statements.

	RESPONSES			
	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Vigorous daily exercise is absolutely necessary to maintain one's general health.	1	2	3	4
2. Physical activities that are primarily for social purposes like disco and jive are a waste of time.	1	2	3	4
3. I prefer those sporting activities that require very hard training.	1	2	3	4
4. Playing dangerous sport may be fun for others, not for me.	1	2	3	4
5. Activities including stylish beautiful movements such as dance and jive are desirable.	1	2	3	4
6. I enjoy sport mostly because it gives me the opportunity to meet new people.	1	2	3	4
7. After a day at school, I prefer to take it easy rather than participate in a vigorous sporting activity.	1	2	3	4
8. Physical activity is important for the development of the body and not for social interactions.	1	2	3	4
9. Sports are not fun to engage in if they demand excessive time and energy.	1	2	3	4

	RESPONSES			
	Strongly agree	Agree	Disagree	Strongly disagree
10. I would rather play chess than engage in the dangers of contact sports.	1	2	3	4
11. When tensions are high, I prefer to lie down and rest rather than be physically active.	1	2	3	4
12. One needs to exercise regularly to keep fit and healthy.	1	2	3	4
13. I hate hard physical work.	1	2	3	4
14. I do not really care what I look like when I am involved in physical activity.	1	2	3	4
15. Exercise relieves me of emotional strain.	1	2	3	4
16. I like the rough and tumble of contact sports.	1	2	3	4
17. I do not enjoy trying to be graceful in my movements when performing physical activities.	1	2	3	4
18. I prefer team sport to individual sport because of the experience of playing with different people.	1	2	3	4
19. Getting into good physical shape takes too much effort to be really worth it.	1	2	3	4
20. I enjoy the discipline of long strenuous physical training.	1	2	3	4
21. Participating in sport provides me with a welcome escape from the pressure of daily demands.	1	2	3	4
22. Physical activities requiring one to take a chance and be exposed to risk are the best.	1	2	3	4
23. Physical training programmes should include activities where graceful movements such as dance movements are experienced.	1	2	3	4
24. Being strong and fit is not very important in my life.	1	2	3	4

APPENDIX J

PRE-PROGRAMME

SCORING +VE = 5-SCORE
-VE = SCORE

HEALTH AND FITNESS

SOCIAL EXPERIENCE

NO	POLE	SUBJECT SCORE	FINAL SCORE	%	NO	POLE	SUBJECT SCORE	FINAL SCORE	%
1	+				2	-			
12	+				6	+			
19	-				8	-			
24	-				18	+			
TOTAL					TOTAL				

CATHARSIS

AESTHETIC EXPERIENCE

NO	POLE	SUBJECT SCORE	FINAL SCORE	%	NO	POLE	SUBJECT SCORE	FINAL SCORE	%
7	-				5	+			
11	-				14	-			
15	+				17	-			
21	+				23	+			
TOTAL					TOTAL				

PURSUIT OF VERTIGO

ASCETIC EXPERIENCE

PURSUIT OF VERTIGO					ASCETIC EXPERIENCE				
NO	POLE	SUBJECT SCORE	FINAL SCORE	%	NO	POLE	SUBJECT SCORE	FINAL SCORE	%
4	-				3	+			
10	-				9	-			
16	+				13	-			
22	+				20	+			
TOTAL					TOTAL				

POST PROGRAMME

HEALTH AND FITNESS

NO	POLE	SUBJECT SCORE	FINAL SCORE	%
1	+			
12	+			
19	-			
24	-			

TOTAL

SOCIAL EXPERIENCE

NO	POLE	SUBJECT SCORE	FINAL SCORE	%
2	-			
6	+			
8	-			
18	+			

TOTAL

CATHARSIS

NO	POLE	SUBJECT SCORE	FINAL SCORE	%
7	-			
11	-			
15	+			
21	+			

TOTAL

AESTHETIC EXPERIENCE

NO	POLE	SUBJECT SCORE	FINAL SCORE	%
5	+			
14	-			
17	-			
23	+			

TOTAL

PURSUIT OF VERTIGO

ASCETIC EXPERIENCE

PURSUIT OF VERTIGO					ASCETIC EXPERIENCE				
NO	POLE	SUBJECT SCORE	FINAL SCORE	%	NO	POLE	SUBJECT SCORE	FINAL SCORE	%
4	-				3	+			
10	-				9	-			
16	+				13	-			
22	+				20	+			
TOTAL					TOTAL				

APPENDIX KThe Jive Programme Routine

This routine was divided into 4 levels, namely, the warm-up, the stretch exercises, the main activity and the cooldown procedure.

Routine Number 1: Warm up.

Music : "Onketsang"

Time : 6 minutes

Purpose : To increase circulation rate, and to stretch the muscle so as to warm up the body ready for the demands of the main programme.

Activity : This programme was purposefully choreographed to music with a steady beat to avoid a sudden demand on the body. A deliberate attempt was made to include exercises which were derived from the actual Pantsola jive.

Routine Number 2: Calisthenics

Music : None

Time : 5 minutes

Purpose : Stretching exercises were included to further loosen up muscles and joints in preparation for the main activity.

Activity : The following stretch exercises are examples of those used, otherwise adaptations and additions were occasionally made to avoid redundancy of the activity, and/or the onset of boredom.

1. Lunge to side with left leg bent at knee and stretching the right leg, push body down 4 times, and do the same lunge to the right side. Repeat twice.

2. In a relaxed standing position, swing both arms simultaneously to the front 8 times and then to the back 8 times.

3. Standing with feet astride, with hands on hips, do full hip rotation, first to the left and then to the right, alternating sides after every full rotation, 8 times to each side.

Alternative:

Get partner of same height and hold each other with both hands (facing one another) and arms fully stretched. Make a full rotation turn to one side and then back to the other. Repeat 3 times more to each side.

4. In a slight astride stance and hands on hips do heel raises; use of the wall for support was permitted until self-supporting was prevalent.

5. Relax and general shaking of legs.

6. Squating with palms on the floor and feet together try to stand with palms remaining on the floor, locking legs at the knees.

Alternative 1:

Start with hands well in front of the body and after pushing up with legs walk with hands towards the feet.

Alternative 2:

Standing with feet together, reach for the floor without bending knees, hold for 5 seconds then come up to standing position. Repeat 7 times more.

7. Kneeling on the floor and hands supporting at the back, push hip up, hold for 3 seconds then relax. Repeat 7 times more.

Routine Number 3: Pantsola jive

Music : "Can't turn around"

Time : 15 - 20 minutes

Purpose : This was the main activity under investigation; the main aim being to test if improved physical conditioning resulted from participation, and whether new attitudes were formed towards participation in physical activity in general.

Activity : The activity was derived from movements of Pantsola groups obtained with special permission from the

SABC, Pretoria. The tempo of the jive was slow at the beginning and then built up as participants became familiar with the jive movements. This was the result of the teaching, as movements were broken down, and not necessarily a deliberate overload procedure. Since the first week was mainly basic movement patterns and perfection of the steps, with several non-active intervals in between, a seventh week was added to the previously planned six weeks programme in an attempt to increase the intensity over a longer period. Otherwise the same routine was followed every day to the same music. Movements were choreographed from a particular video tape, and gradually more complicated steps, derived from the very basic ones, were added to the routine.

Steps were first demonstrated and then performed by all subjects simultaneously, initially to the instructor's call, and once movements were mastered they would then be fitted to the music. (Each daily routine involved execution of the learnt steps to the music and an addition of a new step until the whole programme was mastered. This learning process extended into the third week.

On the last participating day of every week, at the end of the programme, subjects watched the video

programmes obtained from the SABC to instil motivation, as well as to renew the visual image of the activity and thus improve the execution of the five steps.

Routine Number 4: Cooldown

Music : None

Time : 4 minutes

Purpose : To allow circulation to return gradually to resting levels.

Activity : 1. Walk around for 15 steps.
2. Breath in, raising arms above head and then out doing floor sweeps. Repeat 7 times more.
3. Lying on back, tuck in knees to chest, locking with hands, then roll slowly to left side, then to the right, 4 times to each side.
4. Still lying on back, stretch out as much and as tall as possible, then tuck in knees making the body form a small bundle. Repeat 3 times more.
5. Still lying on back relax completely, then breath in and hold it and then out. Repeat 3 times more.
6. Completely relax for 10 seconds.

