A FITNESS APPRAISAL OF TENTH GRADE NORTHERN SASKATCHEWAN STUDENTS

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ABSTRACT

The purpose of this study was to appraise the fitness levels of grade 10 Northern Saskatchewan students, 15 years of age or older. The appraisal was completed using the 1986, Canadian Standardized Test of Fitness (CSTF). The CSTF included both anthropometric and performance measures. Height, weight, skinfolds and body girths composed the anthropometric measures. Grip strength, trunk forward flexion, sit-ups, push-ups, and the Canadian Aerobic Fitness Test (CAFT) composed the performance measures.

The proportional sample, 70 Northern Saskatchewan students, 15 years of age or older, came from a reported population of 100, and were divided by gender into two groups. The sample, all student volunteers recruited from seven schools in the following communities: Buffalo Narrows, La Loche, Pinehouse Lake, Fond Du Lac, Pelican Narrows, Stanley Mission, and Sandy Bay, resided in 'Northern Saskatchewan', herein defined by provincial boundries to the north, west, and east, and the semi-discontinuous permafrost line to the south.

The research area was chosen due to the existence of numerous variables which were thought to affect

fitness levels of the sample. Variables considered included: environment, culture, socioeconomics, health, genetics (heredity), nutrition, and education. It was hypothesized that fitness levels were influenced by these variables to such an extent that the sample had only an 'average' level of fitness. The standards from which comparisons were made originated from the 1986 CSTF norms.

Each fitness component mean was calculated for each group in the sample. Each mean was compared to the male or female Canadian population mean of the 'average' norms listed in the 1986 CSTF. To compare the male and female means to the male and female Canadian population means, a t-test (two-tailed) was used at a probability level of .05.

The findings of this study are tentative; yet, it was found that Northern Saskatchewan students had push-up (upper body endurance) means significantly different ($p<.05$) (higher) than the male and female means of the Canadian 'average' norms. Male and female flexibility means were not significantly different ($p<.05$) than the male and female means of the Canadian 'average' norms. Male and female grip strength means were significantly

different ($p<.05$) (lower) than the means of the Canadian 'average' norms.

The male sit-up (abdominal endurance) mean was not significantly different ($p<.05$) than the mean of the Canadian male 'average' norm. The female sit-up mean was significantly different ($p<.05$) (lower) than the mean of the Canadian female 'average' norm. The male predicted VO2 Max.,(aerobic power) mean result was significantly different ($p<.05$) (lower) than the mean of the Canadian male 'average' norm while the female predicted VO2 Max., mean was not significantly different ($p<.05$) than the Canadian female 'average' norm.

Five of six male anthropometric means including, height, weight, sum of two trunk skinfolds (SOTS), sum of five skinfolds (SOS), and body mass index (BMI) were not significantly different ($p<.05$) from the means of the Canadian male 'average' norms. Only the male weight to height ratio (WHR) mean was significantly different ($p<.05$) (lower) than the mean of the Canadian male 'average' norm.

The female group means for weight, waist to hip ratio (WHR), sum of two trunk skinfolds (SOTS), and body mass index (BMI) were significantly different ($p<.05$)

(higher) than the means of the Canadian female 'average' norm. Only the female height and sum of five skinfolds (SOS) means were not significantly different ($p<.05$) than the means of the Canadian female 'average' norms.

Results were discussed in relation to a number of variables: environment, culture, socioeconomics, health, genetics (heredity), nutrition, and education, which other fitness research had found to be related to fitness levels.

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Chapter 1

Introduction

Northern Saskatchewan is largely undeveloped with less than three percent of the provincial population inhabiting the area[1]. Of the 30,000 people residing in Northern Saskatchewan 80 percent are of Native ancestry[2]. Dieter Semmler, former Department of Northern Saskatchewan employee who is currently a Program Officer with Canada Employment and Immigration in Saskatoon, believes that in 1987 the situation in Northern Saskatchewan remains as it has for years characterized by:

> Social and economic problems (that) have become severe since the traditional Indian lifestyle was disrupted. Low standards of living, alarming rates of disease, alcoholism, crime, family break-down, unemployment and reliance on social assistance have all provided evidence of the inequalities and disparities of the North when compared with the mainstream of Canadian society[3].

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1 R. Turkhein (personal communication, April 27, 1987)

2 R. Turkhein et al. (1987)

3 Government of Canada: Regional Economic Expansion and Government of Saskatchewan: Department of Northern Saskatchewan. (1978). Saskatchewan Northlands.

These stressors have impinged on Northern residents' health and fitness levels. For instance, the poverty in Northern Saskatchewan has caused 50 percent of the Northern Saskatchewan youth to seek hospitalization, compared with only 29 percent for the province[4]. To date, there has been no study that has considered fitness levels of Northern Saskatchewan youth[5,6]. In view of these factors, this researcher became interested in knowing the fitness levels of Northern Saskatchewan youth.

Health education is important to Northerners: the health educators of Northern Saskatchewan have filled many requests for workshops and talks to a variety of groups in several communities. Some of the more common topics have been nutrition, fitness, smoking and weight control[7,8].

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4 Myers, T. (1979). Five years after...Extension Services Branch: Department of Northern Saskatchewan. La Ronge, Sask. p.9.

5 J. Haight (personal communication, May 4, 1987)

6 R. Turkhein et al. (1987)

7 Government of Saskatchewan. (1985a). Saskatchewan health report. Regina, Sask: Department of Health. p.24

8 J. Haight et al. (1987)

The demand for information on fitness indicates that the people of Northern Saskatchewan are interested in learning more about their fitness, and fitness in general. It is important that people of Northern Saskatchewan have information on their physical fitness to satisfy personal curiosity and to equip residents with knowledge that can assist them in their pursuit of personal and family health goals.

In Saskatchewan, students are required to participate in health and physical education courses each year from the time they enter school until the completion of grade nine. Having completed grade nine no other health and physical education classes are required to complete high school. A change in the school program requirements will occur when the Policy Direction For a Core Curriculum (1987) is implemented; one health and physical education course will be required after grade nine. Why is this change necessary? Do educators believe Saskatchewan students are unfit? What are the fitness levels of grade 10 students who have taken health and physical education each previous year?

By measuring fitness levels of grade 10 Northern Saskatchewan students, 15 years of age or older, this researcher provided information that compares their performance to Canadian norms. This comparative

perspective can be useful for the student, the community, educators, and government.

1.1 Purpose of this Study

The purpose of this study was to measure physical fitness levels of a sample of tenth grade Northern Saskatchewan students, 15 years of age or older, using the 1986 version of the Canadian Standardized Test of Fitness(CSTF). This test includes standardized procedures for the measurement of specific fitness components such as, aerobic fitness, muscular strength, flexibility, and muscular endurance. In addition, anthropometric measures were taken to compare the size, shape, and structural variables of the sample to Canadian 'average' norms.

1.2 Statement of the Problem

The major problem of the study was:

Are the mean fitness levels of 'students' significantly different from the means for the 'average' Canadian norms listed in the 1986 CSTF ?

Subproblems

The subproblems of the study were:

Will mean predicted VO2 Max., measures of 'students' be significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?

Will mean grip strength measures of 'students' be significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?

Will mean push-up measures of 'students' be significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?

Will mean trunk forward flexion measures of 'students' be significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?

Will mean sit-up measures of 'students' be significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?

In addition to the performance measures, six anthropometric measures including: BMI(body mass index), SOTS(sum of two skinfolds), SOS(sum of five skinfolds), WHR(waist to hip ratio), height, and weight were taken to discover if the anthropometric values of 'students'

were significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?

1.3 Hypotheses of the Study

This study tested the following research hypotheses relative to fitness levels of 'students':

Hypothesis 1. 'Students' will have predicted VO2 Max., levels different from the means of the 'average' Canadian norms listed in the 1986 CSTF.

Hypothesis 2. 'Students' will have a mean grip strengths different from the means of the 'average' Canadian norms listed in the 1986 CSTF.

Hypothesis 3. 'Students' will have mean push-up scores different from the means of the 'average' Canadian norms listed in the 1986 CSTF.

Hypothesis 4. 'Students' will have mean trunk forward flexion scores different from the means of the 'average' Canadian norms listed in the 1986 CSTF.

Hypothesis 5. 'Students' will have mean sit-up scores different from the means of the 'average' Canadian norms listed in the 1986 CSTF.

Hypothesis 6. 'Students' will have mean anthropometric measures: BMI, SOS, SOTS, WHR, height and weight measures different from the means of the 'average' Canadian norms listed in the 1986 CSTF.

1.4 Definition of Terms

For the purposes of this study the following definitions apply.

Aerobic Fitness (Aerobic Power/Predicted MVO2): Is the "cardio-respiratory efficiency of the individual as expressed by the ability of the body to take in and utilize oxygen" (Government of Canada Fitness & Amateur Sport, 1982, p. 8). The efficiency can be illustrated in millliliters of oxygen per kilogram (body weight) per minute.

Anthropometry: "The study of the human body measurements especially on a comparative basis" (Woolf, 1980, p. 48). In this study anthropometric measures include height, weight, body girths, and skinfold measures.

Body Mass Index - BMI {Wt(Kg.)/Ht(m)2}: A calculated "simple whole number that can indicate low weight for height (under 20) or high relative weight for height (over 30). The BMI, is influenced by body proportions or the relative size of the axial and appendicular skeleton, being higher when the legs are relatively shorter and vice versa" (Garn, Leonard, Rosenberg, 1986, p. 163-164). "BMI does reflect fatness or the estimated fat but it also reflects frame size and it also reflects the amount of lean tissue to a considerable degree" (p. 164).

Canadian Standardized Test of Fitness (CSTF): "A set of procedures used to evaluate specific fitness components" (Government of Canada Fitness & Amateur Sport, 1986, p. 2), and body dimensions.

Muscular Endurance: "The ability of an individual to perform repeated muscular contractions, such as a number of sit-ups within a set time limit" (Piscopo, 1985, p. 446).

Muscular Strength: "The ability of a muscle or muscle group to apply maximal force with a single contraction" (Piscopo, 1985, p. 446).

Physical Activity Readiness Questionnaire (Par-Q): An instrument "designed to identify those individuals for whom certain physical activities might be inappropriate and/or those who should receive medical advice pertaining to the type of activity most suitable for them" (Government of Canada Fitness & Amateur Sport, 1986, p. 5).

Physical Fitness: "The capacity to do work and to recover quickly and completely from doing this work" (Cumming, 1967, p. 868).

Population: "Consists of all units possessing certain characteristics which have been specified by the researcher. It is the complete set of subjects which could possibly be tested" (Rothstein, 1985, p. 77). For example: All grade 10 students, 15 years of age or older, in Northern Saskatchewan.

Pulse Rate or Heart Rate: "Number of pulsations of an artery per minute" (Piscopo, 1985, p. 447).

Sample: "That portion of the population from which measurements are actually obtained. In order to generalize findings to the total population, the sample must be selected in a way that assures its representativeness" (Rothstein, 1985, p. 77), via random, systematic, stratified, cluster or

proportional selection method.

Semi-Discontinuous Permafrost Line: A boundary line that is partially continuous marking the southernmost point at which the ground is permanently frozen at a variable depth below the earth's surface. (J. F. Basinger, personal communication, April 15, 1987)

'Students': In the present study this term refers to male and female grade 10 Northern Saskatchewan students, 15 years of age or older.

Sum of (five) Skinfolds (mm)(SOS): In the present study the SOS number is a product of five measures, namely, triceps, biceps, subscapular, iliac crest, and medial calf skinfolds in millimeters.

Sum of (two) Skinfolds (mm)(SOTS): In the present study SOTS is a product of two measures, namely, the subscapular and iliac crest skinfolds in millimeters.

Waist to Hip Ratio (WHR): The WHR figure in this study is computed by dividing waist girth by hip girth (W/H). "Investigators have suggested that the WHR...provides a valid representation of...fat distribution" (Government of Canada Fitness & Amateur Sport, 1986, p. 14).

1.5 Assumptions of the Study

In the study the following assumptions were made.

1. It was possible to test all students in the sample.
2. Students participated honestly and sincerely.
3. Instructions to students were communicated effectively.
4. From one test site to another all procedures and measures were similar and thus comparable.
5. Students followed preliminary instructions by not eating, smoking or ingesting caffeine two hours prior to testing.
6. Students provided completed consent forms on a volunteer basis. (see Appendix A)
7. The analysis of fitness level scores allowed certain conclusions to be made.

1.6 Delimitations

This study was conducted within the following parameters.

1. The 70 subjects were Northern Saskatchewan grade 10 students, 15 years of age or older attending schools

north of the semi-discontinuous permafrost line. The line is indicated on the map of Northern Saskatchewan. (see Appendix B)

2. All fitness measures were recorded during the last two months of the school year, namely, May and June, 1987.

3. All fitness measures were taken in school classrooms in each of the seven schools.

4. The fitness meausrement process required one visit to each school. In this study however it was necessary to visit one school twice.

5. All measures were taken only in the morning between 9:15 and 12.

6. All students were volunteers who met the preliminary requirements and who were in attendence on the day of testing.

1.7 Limitations

1. Measurements taken may have been subject to human or instrumentational error.i.e., inaccurate hand dynamometer reading or inaccurate weight scale calibration.

2. The experimental sample may have represented a biased sample. Those individuals who participated in this study were possibly more health conscious and thus more fit than the "typical" grade 10 Northern Saskatchewan student.

3. Sample size was reduced when: students failed to answer the Par-Q questionnaire or answered yes to any of its questions; failed to return the youth consent form prior to testing; were under 15 years of age.

4. The Aerobic Calculator may have "overestimated the MVO2 for unfit participants" (see Appendix C) (Government of Canada Fitness & Amateur Sport, 1986, p. 15).

5. Communications between the researcher and students may have been impaired by the researcher's inability to communicate, or by language differences, for example, a student may have spoken English as a second language with Chipewyan or Cree as first languages.

6. Students may have been reluctant to participate due to the fact that this researcher was unknown to them or because this was a test.

7. The analysis of student fitness scores using the CSTF provides findings that permitted some tentative conclusions to be drawn. However, no concensus exists on how to form a single summary statistic on individual fitness. (Government of Canada Fitness & Amateur Sport, 1983, p. 21)

1.8 Significance of the Study

This study provided evaluative feedback to grade 10 Northern Saskatchewan students, 15 years of age or older. This feedback was communicated by the researcher directly following testing and after the data analysis. Data analysis results were mailed to teachers who disseminated the information to the students. The feedback provided may have been the information needed to motivate students to become physically fit, maintain present fitness levels or increase fitness levels. In all liklihood "the most important aspect of the CSTF appraisal process [was] the promotion of a physically active, wellness-oriented lifestyle during the interpretation...which follows the test" (Government of Canada Fitness & Amateur Sport, 1986, p.2).

Physical educators and administrators may use findings from this study as support for changes in their physical education programs. The Minister of Education

for the province of Saskatchewan may use these results for support when considering curriculum change or program adjustment for Northern Saskatchewan schools. Various health workers such as public health nurses and nutritionists may use these findings to support their proposals for change in Northern Saskatchewan. Health related research in Northern Saskatchewan contributes to scientific knowledge. Physical fitness appraisals are necessary because of ongoing human development, test and procedure revision and societal change which can influence and change the results of physical fitness appraisals.

The Canadian Standardized Test of Fitness, 1986, third edition, is deemed the foremost contemporary evaluative tool, useful in appraising physical fitness levels of people. (Government of Canada Fitness & Amateur Sport, 1986) Appraisers are required to be Registered Fitness Appraisers (RFA). It was concluded, after communicating with principals and physical education staff at each test site that there were few teachers in Northern Saskatchewan qualified to administer this appraisal and there were no physical education teachers familiar with the 1986 version of the CSTF. As a professional physical educator and RFA, this researcher was able to provide such an appraisal.

Chapter II

Review of Literature

2.1 Introduction

In order to provide background to the study, the literature dealing with physical fitness, physical fitness measures, and related variables such as environment, culture, socioeconomics, nutrition, health, and education were reviewed.

2.2 Physical Fitness

Physical fitness is defined by Cumming (1967) "as the capacity to do work and to recover quickly and completely from doing this work" (p. 868). Other researchers (Biddle, 1986;Burke & Humphreys, 1982; Campbell & Tucker, 1967) believe physical fitness definitions may range from broad concepts to detailed descriptions of numerous fitness components. Saskatchewan Health (1984) suggests that "a person who is physically fit has a healthy body (muscular strength, flexibility, muscular endurance, cardiorespiratory fitness and ideal body fat) and good physical skills (balance, speed, power, agility, and coordination)" (p. 171).

The Saskatchewan Department of Education (1980) states:

> Most fitness authorities agree that there are many specific kinds of physical fitness, including:
>
> 1. skeletal muscle fitness;
> 2. cardiovascular fitness;
> 3. pulmonary fitness;
> 4. flexibility, when body joints are capable of a full range of motion;
> 5. agility, or the ability to change direction quickly;
> 6. power, the ability to exert a sudden powerful force;
> 7. balance.
>
> The most significant kinds of physical fitness are skeletal muscle, pulmonary and cardiovascular. The other four may be considered secondary. (p. 126)

Even though these definitions are similar, complete agreement is lacking concerning which components define physical fitness. The CSTF instrument used in this study includes five components: strength, flexibility, anthropometry, muscular endurance, and predicted aerobic power. The Government of Canada Fitness and Amateur Sport believe these components define physical fitness.

Commonalities found in physcial fitness definitions can be found in physical fitness measuring instruments. The commonalities in each instrument permit partial comparisons only if procedures are analogous. For example, if two fitness studies used different instruments yet sit-up measures were procedurally analogous, then these studies would be partially comparable to one-another.

2.3 Physical Fitness Measures

To determine a person's fitness level using the CSTF, strength, muscular endurance, predicted aerobic power, and flexibility measures are considered. In addition to this a number of anthropometric components are taken to provide body size, shape, and structural information. For each measure, standardized procedures are outlined in the operations manual and norms are supplied which originated from the Government of Canada's 1981 fitness survey. The idea for a CSTF originated from a national conference on fitness in 1972. Recommendation number 9 suggested that: "...Recreation Canada take the initiative and assemble a group of physical activity and health professionals in order to design a field test and...standardize cardiovascular performance fitness tests" (Government of Canada Fitness & Amateur Sport, 1986, p. 3). Field

tests became known as the CSTF and have since been revised twice. The 1986 version is the third edition and is a product of these efforts.

In 1981, a Canada Fitness Survey was conducted to establish norms for use in the CSTF and to provide information on activity levels and lifestyle of Canadians. (Stephens, Craig, & Ferris, 1986, p. 13) Today's CSTF is evidence of the previous work performed by various health and physical activity professionals.

The revisions and standardization of the CSTF allows researchers to compare results. Tests that are not standardized are limited by the fact that results cannot be compared. A vast number of fitness tests are not standardized; thus comparisons from test result to test result are tentative (Shephard, 1986), and open to serious criticism (Cumming, 1967). This reality eliminates the possibility of comparing CSTF results with most other fitness measures. For example, the 1985 Australian Health and Fitness survey of students 7 to 15 years of age included 11 health-related fitness and physical performance tests. (Pyke, 1986) Of the 11 tests only two measures may be compared with results from the CSTF. Another example of results that are partially comparable to CSTF is found in Goslin and

Burden (1986) who measured the fitness levels of South African school children. Of nine tests, four test results are useable as a basis for comparison. A lack of test standardization eliminates the possibility of further comparison.

A number of components used in the CSTF have been developed and/or studied individually by researchers. For example, the step-test(aerobic fitness test) was developed using a cross-section of Saskatoon citizens. (Bailey, Shephard, & Mirwald, 1976) These test results may be compared to step-test results from the CSTF.

Recent examination of the Body Mass Index(BMI), a anthropometric measure(component) included in the 1986 CSTF, has exposed its inherent weaknesses. For instance, Fox and Corbin(1986) state that "the use of height and weight criteria is confusing when dealing with children because of growth spurts and different rates of maturation. Remember, it is fat weight, not the total body weight, that is associated with health risk" (p. 10). Garn, Leonard, and Rosenberg (1986) explain that "the Body Mass Index...is stature-dependent to differing degrees over age range. It is influenced by relative leg length or body proportions....the BMI does not reflect relative fatness or the estimated weight of fat but it also reflects frame size and it

also reflects the amount of lean tissue to a considerable degree" (p. 164). The BMI is "higher when the legs are relatively shorter and vice-versa" (p.164). Rookus, Burema, Van'T Hof, Deurenberg, and Hauvast (1987) add that BMI measures fluctuate day-to-day due to "fluid-balance, changes in intestinal content and glycogen status and alterations in metabolic state" (p. 618). Day-to-day fluctuations "have been found to be 0.42 kg (SD 0.23) in men and 0.28 (SD 0.24) in women" (p.627). McLaren (1987) suggests "there is further reason for doubting the value of something as crude as the BMI when the wealth of evidence is considered concerning the importance to health of the distribution of body fat (android vs gynoid)" (p. 121). Given these views the value of the BMI seems questionable. Does the BMI measure have some value ?

Researchers (Micozzi, Albanes, Jones & Chumlea, 1986;Van Itallie, 1986; Roche, Siervogel, Chumlea, & Webb, 1981) maintain that the BMI measure can be a reliable and useful index of fatness and the Government of Canada Fitness and Amateur Sport (1986) believe the BMI is a credible indicator of proportional weight. (p.15) Roche et al (1981) suggests that "the BMI is the single best indicator of total body fat in girls and

adults" (p. 2831). In light of these views it appears that there is advantage and worth ascribed to BMI measures.

Further anthropometric information comes from body circumference and skinfold measures. These measures have been studied to determine their credibility in identifying the location or distribution of fat in people. Mueller and Malina (1986) found that "circumferences are a more reliable method" (p.437), in determining fat distribution. "However the reliability of skinfolds is still high" (p. 437). Roche (1987) explains that "skinfold thicknesses are predictive of body fatness, but the conceptual limitations associated with using the thicknesses of compressed skin and adipose tissue in combination with uncompressed circumferences, to estimate tissue areas in cross-sections of limbs should be recognized" (p. 209). Roche et al (1981) concluded that for "boys the subscapular skinfold is the best indicator of total body fat" (p. 2831). The 1986 CSTF requires that several skinfold measures, including the subscapular, be taken and a number of circumference measures are necessary to complete the anthropometric assessment of subjects.

Anthropometric and performance results from most published fitness studies are not wholly comparable to

results from the CSTF. There are CSTF results available in Saskatchewan. However, these results concern age groups different from the one considered in this study, thus the results may not be useful. Another fitness instrument produced by the Canadian Government is the Canada Fitness Award Test. These test results are not comparable to the CSTF because different tasks and procedures are used.

Comparing CSTF test results, in whole or in part to other tests can be tenuous due to differences in sampling, response rate, and methodolgy. (Shephard, 1986) To acquire a broader perspective of physical fitness testing limitations it is prudent to be aware that any test score can be greatly affected by: a) the current level of fitness of the individual b) heredity factors c) tester reliability and expertise d) other sources of 'error', such as motivation. (Biddle, 1986, p. 31)

2.4 Related Variables

The fitness levels of individuals are products of many variables: environment, culture, socioeconomics, nutrition and general health. (Goslin & Burden, 1986) Each variable influences fitness. The extent to which these variables contribute to Northern Saskatchewan

resident's fitness is not known: however, in other regions, there is evidence that certain variables affect fitness levels.

Waldie (1968) notes a number of studies (Thompson & Dove,1942;Knuttgen, 1961;Ponthieux,1965;Cratty, 1967), that link fitness performance to cultural, racial and socioeconomic backgrounds. These variables directly influence lifestyle which contributes to fitness.(Health & Welfare Canada, 1984) Anderson, Bolstad, Loying, and Irving (1960) found that among Canadian Arctic Indians, young-men had greater aerobic power than sedentary young-men of Norway. Anderson et al. (1960) believed that the Canadian Arctic Indian's active lifestyle contributed to their fitness levels. Conversely, a Saskatoon study (Bailey, Shephard, Mirwald, & McBride, 1973), found that average Canadian lifestyles were detrimental to Canadian's fitness levels which were below Scandinavian and American Heart Association norms. (Astrand, 1985, p. 7)

Eighty percent of the population in Northern Saskatchewan is of Native ancestry. (R. Turkhein, personal communication, April 26, 1987) More specifically, 80 percent of Northern Saskatchewan residents are Metis, Cree, Dene, and 20 percent are

Non-Native. The lifestyle in Northern Saskatchewan is different from the south due in part to culture and the environment. (Department of Northern Saskatchewan, 1981) This reality may positively or negatively influence fitness measures. The Canadian Fitness Survey indicates that more-active youth have higher fitness scores, have better health practices, are non-smokers, and rate themselves as being in good health. (Government of Canada Fitness & Amateur Sport, 1983, p. 33)

The traditional lifestyle of people of Native ancestry in Northern Saskatchewan is described by a Native elder resident, as a time when:

> The people used to make their living by hunting, fishing and trapping. In the winter, family groups would travel up north by dog team. The women and men always worked together even trapping and hunting. The women would hunt and trap and would also make clothes by hand from moose hide....For food, the people would hunt, fish and trap, and would eat rabbits and ducks....In the fall, the people would catch about two thousand fish for food and another two thousand fish for the dogs, and then they would have enough to last right through winter, even till the end of May....In the older days, the people did not get into trouble like

> today because the men and the children did not drink every day....Nowdays, the people just live on groceries from the store because they do not go hunting or trapping like before. (Lemaigre, 1978, p. 10-11)

From this information, it is possible to picture the active lifestyle, which men, women, and children had when they were living traditionally. Can it be assumed that traditional nutrition was good, with hunting, fishing, and trapping supplying a variety of foods ?

Rhea Joseph, a Saskatchewan regional nutritionist within the medical services branch of health and welfare Canada concluded in her 1985 Assessment of Food Costs in Northern Saskatchewan that "milk and many vegetables were not a traditional part of the northern Indians diet" (p. 14). The finding in combination with demographic features of the present day Indian population which includes: " a high percentage of young people (0-14 years); large families and households; high mobility rates; and an estimated on-reserve unemployment rate of 75%,...describe a population highly likely to be at risk for undernutrition" (p.2).

Non-Native people settling in Northern Saskatchewan during the 18th and 19th century were mostly trappers,

fishermen, missionaries, Hudson Bay employees, government employees or independent retailers (Wuorinen, 1981;Lemaigre, 1978). Settlers developed lifestyles that were a combination of Native and adapted ways from previous experiences at former locations, this researcher believes.

Northern Saskatchewan traditional lifestyles have been modified during past centuries. Change has occurred, due for the most part to the deluge of foreign culture. The opening of the Hudson's Bay Post at York Factory in 1682 (Lemaigre, 1978), was the beginning of the erosion process which slowly became more complete as time passed. Conflict amongst the Slave, Cree, and Chipewyan (Caribou eaters), grew, due to the competition to trap for the Hudson's Bay Post. (Lemaigre, 1978, p. 2-3) The European culture was first introduced through the fur trade, and then through the first schools in Northern Saskatchewan which were Anglican (1840-Cumberland House), and Roman Catholic (1860-Ile a la Crosse), and taught mostly religious curriculum while ignoring the Native peoples' culture. (Cornett, 1980) The saturation of Northern Saskatchewan with foreign culture has made traditional living an arduous task.

Changes, due to the mixing of Native culture with

immigrant cultures in North America are sometimes visible in many diverse areas. For instance, "today, many of the traditional North American foods are less plentiful" (Health & Welfare Canada, 1985, p. 9). Health and Welfare Canada (1985) propose the generalization that:

> With the growth of large urban centers and rural settlements, nomadic lifestyles have been abandoned. People must travel further to hunt and fish. In some areas, the water has been contaminated with pollutants, such as mercury, forcing people to look for alternatives to the traditional fish diet. Food habits have also changed in response to changing work habits, [unemployment], the availability of refrigeration and freezer storage and the growth of modern air transportation. Further, a decrease in the traditional sources of food and the increased availability of store foods have also changed food habits. While modern technology has created many time-saving benefits, [gas and oil heat, ski-doos, the automobile, etc], it has also introduced soft drinks, candy bars and high energy, low nutrient snack foods. For some, the resulting change has led to careless food habits and a number of

nutritional...problems. (p. 9)

Assuming that the generalization may be applicable to Northern Saskatchewan, possibly, traditional lifestyles were indeed more active, and supported by nutritious diets, they produced a high level of fitness. However, with the recent modifications to the traditional lifestyle, including a less nutritious diet, it may be that fitness levels have been affected.

The Department of National Health and Welfare (1973) found a high incidence of obesity among Indian and Inuit women due to an energy imbalance created by a lack of exercise and excess intake of high energy food that had low nutrient values (p. 2) These results may be due to the disruption of the traditionally active lifestyle combined with an increase in store bought goods such as, snack and processed foods which yield high energy yet are low in nutrient value. There is a possibility that "the old ways" persist in that, males were not found to be obese; traditionally "boys weren't allowed to eat large amounts: they had to stay thin so they would be fast runners [and were] fed a certain type of fish to give the boys a long wind" (Health & Welfare Canada, 1986, p. 16)

The relationship between fitness and nutrition, and their impact on overall personal health and appearance

has been studied. (Saskatchewan Health, 1984) Shephard (1980) found that a diet deficient in first class protein can restrict working capacity, an indicator of aerobic fitness. Past research (Richardson 1977; Waaler 1983) has noted that malnutrition can lead to reduced growth and Astrand (1985) suggested some of our modern diseases may at least partly be consequences of chronic malnutrition. These factors can influence fitness levels. A survey of Saskatchewan youth found that 50 percent of the young people believed they received no information on nutrition. (Weston, 1980) Ignoring good nutritional practices or being uninformed may have been responsible for the observation found in a report to the Minister of Northern Saskatchewan on education that emphasized, that frequently, some students came to school with severe health problems that overwhelmed any possible chance of school success. (Department of Northern Saskatchewan, 1981)

The linkages between poverty and poor living conditions are clear. Poverty affects health via several mechanisms resulting in increased incidence of infectious diseases and cardiovascular diseases. (Waaler, 1983) Northern youth may be examples of the effect that poverty and poor living conditions have on people. The previously noted observation, in the report

to the Minister of Northern Saskatchewan on education concerning student health problems in the classroom supports this view.

In 1979 the Saskatchewan government, recognizing the high cost of food in the far north and the threat of malnutrition to the people in the area, implemented a food transportation subsidy program. (B. Goffin, personal communication, August 14, 1987) The program partially covered the cost of shipping food into Northern Saskatchewan's far north, i.e., Athabaskan and Wollaston Lake regions. In early 1985, the food transportation subsidy program was cancelled. (Government of Saskatchewan, 1985b)

Cancelling the program, in effect increased the cost of food in retail outlets as 'far' Northerners now buy food at an inflated price due to shipping costs. This is a serious problem in view of the high unemployment rates in the north and may increase the probability of malnutrition. "In March 1985, food costing in four Northern communities showed that people living on a fixed income do not have the power to purchase a nutritionally adequate diet" (Health and Welfare Canada, 1985, p. 16), and that increasing food and transportation costs virtually ensures that

malnutrition will continue in Northern Saskatchewan.

In the lower portion of Northern Saskatchewan, for example road accessible areas such as La Loche, Stanley Mission, and Sandy Bay, food costs are 1.5 to 2.0 times as high as Saskatoon's. (D. Gailey, personal communication, May 23, 1987) This fact coupled with unemployment rates between 70 and 90 percent in Northern Saskatchewan (Klien, 1986), and unrealistically low income supplements (Health & Welfare, Canada, 1985), may create nutritional problems in the area.

Health and Welfare Canada (1985) have stated:

> As a preventive health measure, a nutritionally adequate diet is very important. The need for a healthful diet is especially important for northern residents where stressful living conditions (both environmental and socio-economic) increase nutrient requirements. Over a period of time, an inadequate diet can potentially cause nutrition related diseases (eg. rickets in children) or exacerbate pre-existing diseases (eg. tuberculosis). In addition, an affordable high carbohydrate diet could increase the incidence of obesity, a malnourished state which is associated with a number of health problems (eg. heart disease, diabetes). (p. 16)

Northern Saskatchewan's problems can be linked to high unemployment directly and indirectly:

> In particular, lack of employment and purpose in life as well as breakdown in the familiar social and cultural fabric of a community are often principal causes of alcohol abuse. These and other underlying problems such as overcrowding, lack of education and a lacking sense of community purpose must be addressed....Studies have shown that crowding may be a causal factor in many social problems: communication of disease...[or] poor performance at school. (Underwood McLellan, 1981, p. 88-89)

Poor student performance in school, can lead to grade failure. Eventually a failing student may drop out of school. This sequence of events has been observed more often by northern educators than by their southern counterparts. (Department of Northern Saskatchewan, 1981) Reasons for this include a lack of positive role models and high unemployment which affects individual physical and mental well-being. In turn these stressors may influence fitness level scores.

Alcohol and drug abuse has lead to serious health

problems in Northern Saskatchewan. The rates per 1000 for hospital admissions, physician, and psychiatric services is almost double that of the provincial rate. (Saskatchewan Alcohol & Drug Abuse Commission, 1987, p. 5-6) Indeed, health factors can impact on fitness levels of individuals, directly, and indirectly.

Problems in the home and community may produce instances of malnutrition and this condition can restrict working capacity (Shephard 1980), which can impinge on certain fitness level scores, such as aerobic capacity. Even if nutrition appears to be satisfactory fitness scores can be variable. For instance, Anderson (1971) described male Western Canadian Treaty Indians' diet as "well balanced" (p. iv), yet they had less grip strength, an indicator of overall body strength, than average Canadians of the same age and weight. (p. 151) Fitness measures may be one method to reveal nutritional practices that are good and poor for Northern Saskatchewan youth. For instance, finding high aerobic power values and healthy anthropometric characteristics suggests that diet has contributed to and not burdened the subject's aerobic capacity.

Ecologically, Northern Saskatchewan is a rugged area of Precambrian Shield, sparsely populated, covered by lakes, rivers and extensive sub-Arctic forest.

(Government of Saskatchewan, 1980, p. 6) The climate is a limiting factor since weather affects or controls most outdoor recreational activities; winters are long and cold and summers are short, usually from late June to early September. (Beak Consultants, 1978) Living in such an environment requires proper clothing, supplies, residence, and facilities.

The environment contributes to peoples' demands for better living conditions. However, few government initiatives were taken to improve conditions during the 1940's, 50's, and 60's. In 1972 the Department of Northern Saskatchewan (DNS) was formed with a mandate aimed to enhance the quality of life and narrow the disparities between northern and southern sectors of Saskatchewan. (Government of Canada, et al. 1978) The DNS built roads, airports, municipal facilities, recreational facilities, and improved or constructed sewer and water services. (p. 16-17)

Cornett (1980) an experienced Northern Saskatchewan teacher, suggested that:

> The basic philosophy of the DNS was to involve northern people in the decision-making process; greater emphasis was also placed on the local school committees....It was obvious that the

> control of education was now in the hands of northern people and their priority was to develop an educational system suited to the need of Northerners. (p. 75)

In the midst of progress DNS was dismantled in 1982, one decade after its creation. Responsibilities were shifted to mainline government departments and this disrupted the delivery of governmental services. (Staff, 1982) This event has inspired criticism from Northerners, politicians and concerned citizens. Keith Goulet, NDP member from Cumberland Saskatchewan, has suggested that the provincial government has "fallen down" in its duty to the north and Native people. (Staff, 1986) These events may reduce the amount of development and maintaince needed and this could eventually affect the fitness levels of the people as conditions deteriorate. Mainline government departments must now deal with an area that is ecologically and culturally different from Southern Saskatchewan.

In 1972, when the DNS was created, there were two schools offering grade 12 in Northern Saskatchewan and 90 percent of those who enrolled dropped out before grade 12. (Department of Northern Saskatchewan, 1981, p. 2) There were many reasons for high dropout rates.

As well as the high unemployment and lack of positive role models previously mentioned, students faced a new culture, a new set of values, and books, and courses that reflected an almost foreign society. (Myers, 1979, p. 15) Northern teachers had less training and experience. Teacher turn-over rates were about 60 percent, and the north lacked facilities. (p. 15) The lack of schooling and facilities may have contributed negatively to residents' fitness levels. This remains an inference as "there have been no fitness level appraisals conducted in Northern Saskatchewan to date" (J. Haight, personal communication, May 4, 1987): However, there has been evidence that suggests that lack of health education can lead to high rates of malnutrition. (Myers, 1979, p. 9)

Outside of the home it has been up to "teachers to stimulate good health attitudes and practices; this has been very important since the foundation of adult health lifestyles [has always been] laid in childhood" (Health & Welfare Canada, 1984, p. i). The school system and Northern Saskatchewan students have represented dissimilar cultures in the past; yet they shared the same roof. There may have been discord and there will possibly always be antagonism until one view can be shared in the best interest of Northerners.

A report to the Minister of Northern Saskatchewan on Education for the 80's noted that Northern Saskatchewan simply has its own unique condition; population composition, and distribution; social and economic developments; and government and administrative organization. (Department of Northern Saskatchewan, 1981, p. 2) The report explained that education in the north simply cannot replicate the system possessed by school systems in the south because northern conditions demand that an educational system be compatible, and to this end uniquely designed. (p. 29)

By the early 1980's eight schools offered grade 12, and drop out rates improved such that 30 percent of the students completed grade 10. (Department of Northern Saskatchewan, 1981, p. 9) There was new sense of hope in the north: education was viewed as a vehicle that could transport Northerners to a better future. Today with more positive role models, more people have recognized the value of education. (D. Semmler, personal communication, April 26, 1987) Northern Saskatchewan school administrators have stated that there are recreational facilities at all schools offering grade 10 in Northern Saskatchewan. (G. Andrews & C. Samoleski, personal communications, April 02, 1987) These

facilities are an indication of the progress made in Northern Saskatchewan. This progress has contributed to residents' fitness levels due to their greater access to knowledge and recreational facilities which has permitted year-round activity.

A number of efforts, which may potentially affect fitness levels of northern youth, have come to the attention of this researcher. The Saskatchewan Trust Initiatives Program(T.I.P.), 1987, "established to provide financial assistance to communities, regions and zones for initiating opportunities to participate in sport, cultural and recreational activities" (p. 2), aims to "enhance the quality of lifestyle for residents" (p. 2). The program has funded many projects and programs. The following examples are recent accomplishments of the Saskatchewan (T.I.P.): "1. Buffalo Narrows has received a new gymnasium which was added to the arena. 2. Fond du lac received funding for a project called, 'Classroom to Caribou'. The program included hunting, skinning, tanning hides, preparation of meat, and traditional lifestyle teaching. 3. Sandy Bay received funding for a facility feasibility study for the development of a recreation hall complex" (p. 2-3). These projects can positively influence fitness levels of local people.

Another fitness related organization is the Northern Recreation Coordinating Committe(NRCC). The NRCC identifies, addresses, and represents the concerns of Northerners while providing parks and recreation services within Northern Saskatchewan. (Department of Culture & Recreation, 1987, p. 1) One of the NRCC's duties is to coordinate sport, cultural, and recreational activities held on a northwide basis. (p.1)

Table 1 displays information concerning facilities and programs existing in the seven schools considered in this study.

Table 1

School Locale, Facilities Rating, Age,

Employment of P.E. Teacher

Locale	Age of School	Rating	P.E. Teacher
Buffalo Narrows(a)	10 years	Good	yes
La Loche(b)	8 years	Good (No Gym)	yes
Pinehouse(c) Lake	7 years	Good	yes
Stanley(d)** Mission	9 years	Good	no
Pelican(e)** Narrows	20+years	Poor	yes
Sandy(f) Bay	2 years	Good	yes
Fond(g)** du lac	20+years	Poor	no

Note. ** = Band Controlled School. a = (Wuorinen, 1981)

b = (Cornett, 1980) c = (Underwood McLellan, 1981)

d = (Personal Communication, T. Green, May 27, 1987)

e = (Personal communication, I. Swan, May 28, 1987)

f = (Hilderman, Feir, Witty, & Associates, 1982)

g = (Personal communication B. Hook & J. E. MacDonald, June 3, 1987)

Table 1, was constructed using this researcher's subjective rating and information from various people

during conversations at each location.

Within the next two years, new multi-million dollar schools will be constructed at Pelican Narrows and Fond du lac. (I. Swan, & J. McDonald, personal communications, May 28, & June 3, 1987) School principals explained at the seven schools in this study that physical education is offered a minimum of three days per week throughout the school year and that the student body did have extra-curricular activities even though inter-school competition was not always available due to cost and time factors brought about by inter-school distances. Physical education appears to be provided on a minimal basis in contrast to southern schools that offer better facilities, physical education programs and frequent intra and inter-school competition.

Most Northern residents were aware of the north-south school differences and at the seven locations in this study, residents communicated many of their concerns. One concern was for their future. Moves to revive cultural heritage was observed in several schools visited in this study. Decisions to preserve their culture stem from various realizations. For example, the community of Sandy Bay included in their Municipal Planning Study the following thoughts:

> There was a general feeling that the traditional life-skills were being eroded.
> Culture was emphasized in the education program and local recreation program.
> Cultural values were viewed as an important component of regional land use policies.
> (Hilderman, Feir, Witty, & Associates, 1982, p. 20)

Even though Northerners desired facilities similar to those found in the south they remained cautious in an effort to safeguard their culture. Evidence for the contention was found in the Lac La Ronge Band Educational Authority, which controls the Stanley Mission school, among others, and has outlined its objectives, some of which are directly related to this research:

> 1. The Education Program will instill pride in the Indian Child....a) the school program will include topics that promote pride in the Indian child: Sports....2. Cree Cultural Programming a) the school program will include traditional skills and activities such as: snowshoeing....Indian games, preparing Indian food, fishing, trapping, the use of canoes....d) the school will include outdoor education-survival, camping, shelters e) the school program will include Indian Health:...-alcohol and

> drug abuse. (Lac La Ronge Indian Band Educational Branch, 1986, p. 39)

Not all communities or reserves have put into print culturally related goals and policies. During this study there were a number of projects in progress at various test sites which concerned the future development of Northern Saskatchewan communities. It is suggested that these future developments will probably influence fitness levels, thus it will be necessary to reappraise fitness levels of Northern Saskatchewan residents in future years.

2.5 Summary

This chapter noted that the lack of agreement on a definition of physical fitness led to the development of tests to measure physical fitness that were dissimilar and non-standardized. The development of the CSTF permitted researchers to compare results to Canadian norms, and to each other with greater reliability due to the standardization of tasks and procedures.

The CSTF recognized five components which define physical fitness: strength, flexibility, muscular endurance, and aerobic power measures. Anthropometric measures were included in the CSTF to provide fitness

related information concerning body shape, size, and structure. It may be suggested as Goslin and Burden (1986) did that certain fitness results are influenced by nutrition and/or a culturally related lifestyle. It may be proposed that aerobic fitness results are influenced by nutrition (Shephard, 1980), or lifestyle. (Anderson, Bolstad, Loying, & Irving 1960;Bailey, Shephard, Mirwald, & McBride, 1973;Waldie, 1968) Fitness measures may reveal some idiosyncrasy such as inferior levels of strength as found by Anderson (1971) in a sample of western Canadian treaty Indian males.

A measure of fitness is necessary to contribute to scientific knowledge, to show the effect of patterns of culture on physical fitness, to medically separate the fit from the unfit (Cumming, 1967), and to assist in increasing peoples' awareness of fitness and health related to aspects of lifestyle. (Pyke, 1986) Possibly the best reason to measure fitness using the CSTF is to motivate students to enhance their participation in physical activity by comparing their results to Canadian norms. (Government of Canada Fitness & Amateur Sport, 1986, p. 2)

Northern Saskatchewan's environment, population compostion, and culture contributes to residents' fitness levels. The Native cultures have changed in

response to the arrival of migrants, governmental agencies such as the DNS, and educational instituitions. Some of the changes are thought to have contributed to fitness levels, as in the case of new facilities, and programs; some changes are thought to have reduced fitness levels, as in the case of urban development, urban living, and associated changes in diet.

There are many variables influencing fitness levels of Northerners: education, health, nutrition, genetics, and socioeconomics factors. Northerners are presently striving to preserve their culture. The school is usually the first location for cultural programs to be initiated.

Northerners are concerned about their future and their changing culture. Preservation seems to be a popular word of community leaders and educators. Given the current situation in Northern Saskatchewan residents can benefit from fitness level appraisals today and in the future.

Chapter III

Procedures

3.1 Measuring Instrument

The 1986 CSTF, employed to appraise the fitness levels of Grade 10 Northern Saskatchewan students who were 15 years of age or older, contains a battery of physiological measures and pre-test screening devices. The CSTF includes these anthropometry measures: standing height, body weight, chest, waist(abdomen), hip (gluteal), and thigh body girths; plus tricep, bicep, subscapular, iliac crest, and medial calf skinfolds. The CSTF includes five performance measures: the Canadian Aerobic Fitness Test (CAFT or step-test), grip strength, push-ups, sit-ups, and trunk forward flexion measures.

Pre-test screening involved the use of the Par-Q (Physical Activity Readiness Questionnaire), Consent Form, and blood pressure check. All results were recorded on the observation sheet (data sheet). The Par-Q and blood pressure check assisted the appraiser in identifying people who could not or should not participate in fitness testing in whole or in part. The CSTF permitted the evaluation of specific fitness and anthropometric components in a standardized manner which

were then compared to Canadian 'average' norms.

(Government of Canada Fitness & Amateur Sport, 1986)

3.1.1 Measurement Apparatus

To complete the CSTF appraisal the following equipment was used:

1. Tycos - Sphygmomanometer (Blood Pressure Cuff).

2. Sunbeam Digital Weigh Scale.

3. Slimguide(R) Skinfold Calipers (Creative Health Products - Plymouth, MI).

4. Anthropometric Linen Tape - Almedic measure 200 cm./78".

5. Luctor 7 Jewels Stopwatch.

6. Canadian Home Fitness Test - Stepping Cadences Cassette Tape - Government of Canada, 1976(CSTF).

7. Hand Grip Dynanometer (Kg.) Lafayette Instrument Company, Layfayette, IN.

   Note: Dynanometer was calibrated before field testing using a known (10 kg.) weight which was secured to the grip handle via a steel band. The dynanometer was secured in a bench-vice as the reading was made - no adjustments were necessary.

8. #5050 Nursescope Color Coded Deluxe Model - Hartz Standard Stethoscope.

9. Ergometer Steps - Constructed by this researcher. (see Appendix D).

10. Flexometer - Constructed by this researcher. (see Appendix D)

11. Metric Steel Tape (Lufkin, 9 metre).

12. Cassette Recorder.

13. Chairs, Table, Gym Mats.

3.2 Sample Selection

To appraise the fitness levels of grade 10 Northern Saskatchewan students, 15 years of age or older, it was necessary to travel to a number of schools in the defined area. Seven schools were identified as institutions which accommodated grade 10 students. Of these seven, four were within the Northern Lights School Division (NLSD) No. 113 and three were locally controlled by Indian bands in the Prince Albert District of Indian and Northern Affairs Canada (INAC).

Grade 10 students were selected because they represented the minimum age group that the CSTF was designed to measure. It was assumed that there would be few grade nines who were 15 years of age or older and there were few grade 11 or 12 students in the defined region. It was learned that there were 100 grade 10 students in the research area and from this population a sample of 70 volunteered to participate.

3.3 Sample

Ethnicity was not recorded. However, since Northern Saskatchewan is 20 percent Non-Native and 80 percent are of Native Ancestry, it was believed the sample was mostly of Native ancestry. The sample consisted of 70 grade 10 students who attended schools located north of the semi-discontinuous permafrost line. Sample size was determined by the following factors:

1. absentee students the day of testing,
2. number of volunteers,
3. failure to return consent form or answering 'yes' to an item on the Par-Q. (see Appendix F)

The number in parentheses identifies the number of grade 10 students tested at each locale: Buffalo Narrows(07), La Loche(14), Pinehouse Lake(14), Pelican Narrows(08), Stanley Mission(12), Sandy Bay(08), and Fond Du Lac (07). Data describing sample characteristics are displayed in Table 2. The sample consisted of 70 students, of whom 41 were male (59%) and 29 were female (41%). Ages ranged from 15 to 19 years. The sample represents 70 percent of the grade 10 Northern Saskatchewan population.

Table 2

Sample Size By Location and Sex (n=70)

Locale	Males	Females	Total	School Control
Pelican Narrows	4	4	8	Prince Albert District Chiefs(PADC)
Pinehouse Lake	10	4	14	Northern Lights School District(NLSD)
La Loche	8	6	14	NLSD
Buffalo Narrows	2	5	7	NLSD
Stanley Mission	11	1	12	PADC
Sandy Bay	3	5	8	NLSD
Fond Du Lac	3	4	7	PADC
Totals	41	29	70	

3.4 Gaining Entry and Preparation for Testing

Permission to conduct this study was received by this researcher by letter from the NLSD and INAC, Prince Albert District. Within the NLSD, permission was received from school principals and individual teachers.

Within INAC, permission was received from each Band's education director, the school prinicipal and teachers. Reply cards (see Appendix E), sent with permission letters, were returned by Band education directors, principals, and teachers.

Each teacher was contacted by this researcher by phone prior to arrival. It was explained that preliminary requirements to be followed by students, consisted of no eating, smoking or ingestion of caffine two hours prior to testing. Each teacher was asked to communicate this information to the students. Student consent forms were mailed to each teacher, to be returned to teachers prior to testing. The request of proper dress (gym attire), the only preliminary instruction which was not mandatory, was followed by most students.

The Par-Q was completed by students prior to being tested. None of the volunteers were eliminated based on the Par-Q answers. Consent forms were checked at this time. Each student had completed the consent form and where necessary, as some students were under 19, had obtained parent signatures. When these formalities were completed, physical testing was conducted in a classroom, each morning from 9:15 to 12. Even though gymnasiums

were available at each school, it was believed by this researcher, the school principals, and teachers, that a vacant classroom would offer fewer distractions.

3.5 Data Collection

Data collection was completed during an 18 day period from May 19th until June 5th, 1987. The time period was similar to the one in which norms for the 1986 CSTF were developed. The 1986 CSTF norms came from data compiled through the Canada Fitness Survey during May and June of 1981. The commonality was reason to believe results may be more applicable to established 1986 CSTF norms.

3.6 Testing Procedures

1. At approximately 9:15 a.m. the researcher selected the first two students to be tested. Each person's resting heart rate (see Appendix G1) and blood pressure (see Appendix G2) were measured and recorded. Note: The first step was not followed at the first test site. Instead the entire class of grade 10s, in this case seven students, was present as peers were measured. It was concluded, following this experience that having the entire class present while testing was not effective. Consequently, at the remaining six sites, steps one to eight where followed.

2. Anthropometric measurements of height and weight were recorded (see Appendix G3). Student body girths (see Appendix G4), were measured, including the chest, waist, hip, and thigh (see Appendix G5). The researcher's wife completed measurements of chest, waist, hip, and thigh for female students. Note: This researcher completed these measurements at one location as no female was available to measure female subjects.

3. Skinfold measurements (see Appendix G6), were taken from the triceps,biceps (see Appendix G7), subscapular, iliac crest and medial calf, (see Appendix G8). These measures were documented individually and then summed. The researcher's wife measured subscapular and iliac crest skinfolds of female students. Note: This researcher did complete these measurements at one location as no female was available to measure female subjects.

4. The step test (see Appendix G9), was completed by each subject. Post exercise blood pressure and heart rate was noted. Grip strength measures (see Appendix G10) were logged.

5. The number of push-ups (see Appendix G11), a subject could do correctly was recorded. There was no time limit for this exercise.

6. Subjects completed forward trunk flexions (see Appendix G12), and performances were recorded.

7. Subjects completed as many sit-ups (see Appendix G13), as possible in sixty seconds. For this exercise one subject stabilized the other subject's feet. The researcher counted sit-ups and recorded the number completed in sixty seconds. Subjects switched positions. The exerciser became the exercisee or leg holder for the exerciser. All Par-Q information and test data was recorded on the CSTF data sheet. (see Appendix H)

8. Following the exercises, interpretive feedback was given regarding: resting heart rate, blood pressure, height, weight, body girths, skinfold measures, step-test performance, post-exercise heart rate, blood pressure, grip strength, push-ups, trunk flexion and sit-ups. For example, female students completing 42 sit-ups in one minute were told that their performance was excellent according to CSTF, and that they had excellent abdominal muscular strength and endurance. Student questions were answered. An Assessment Report Booklet (see Appendix I) was given to each person and each was thanked for his or her participation. Further feedback was promised and was mailed to teachers at the completion of the data analysis (see Appendix J).

Teachers were informed that feedback would be sent sometime before the end of the school year and that students were to transcribe their results listed on the feedback sheet into their assessment report booklet.

3.7 Data Organization

Testing data for the sample was separated by sex into two groups. The mean from each measure, for each group, was compared to means listed in the 1986 CSTF. For the purpose of this study, it was concluded, that median scores listed in the 1986 CSTF were, in most cases, the rounded means from data obtained through the 1981 Canada Fitness Survey. For example, flexibility and sit-up measures for males aged 15-19 from the 1981 fitness survey were as follows: 29.8, 38.6. Comparing these data to median scores for males aged 15-19 listed in the 1986 CSTF, of 30 (flexibility), 39 (sit-ups), the similarity was noted. As a result of these observed congruencies, and similar congruencies between median scores in the 1986 CSTF and data from the 1981 Canada Fitness Survey; it was decided for this study that median scores in the 1986 CSTF would be accepted as the means for the Canadian 'average' norms.

3.8 Null Hypotheses

The following null hypotheses were tested in the present study:

Hypothesis 1. There will be no statistically significant difference found between the mean predicted VO2 Max., measures of 'students' and the means of the 'average' Canadian norms listed in the 1986 CSTF.

Hypothesis 2. There will be no statistically significant difference found between mean grip strength measures of 'students' and the means of the 'average' Canadian norms listed in the 1986 CSTF.

Hypothesis 3. There will be no statistically significant difference found between the mean push-up measures of 'students' and the means of the 'average' Canadian norms listed in the 1986 CSTF.

Hypothesis 4. There will be no statistically significant difference found between the mean forward trunk flexion measures of 'students' and the means of the 'average' Canadian norms listed in the 1986 CSTF.

Hypothesis 5. There will be no statistically significant difference found between mean sit-up measures of 'students' and the means of the 'average' Canadian norms listed in the 1986 CSTF.

Hypothesis 6. There will be no statistically significant difference found between the mean anthropometric measures of 'students' and the means of the 'average' Canadian norms listed in the 1986 CSTF.

3.9 Statistical Analysis

To compare the means of the Canadian population and Northern Saskatchewan students, a t-test (two-tailed) was used. The two-tailed t-test produces a number which can indicate direction, either (+) above, or (-) below, the point of comparison. The t-test number also indicates whether or not a researcher can reject or accept a null hypothesis after referring to a "table of values for t-test significance" (Rothstein, 1985, p. 287). The t-test computation allows the difference between two independent group means to be illustrated. The difference is judged significant or not significant by comparing the t-test number to an appropriate t-value; a number from a t-ratio table.

Testing for "differences between means requires taking into account standard deviation and how large the groups were" (Widdop, 1978, p. 68). The comparison of means involves a number of steps. To illustrate these steps the forward trunk flexion (flexibility) mean of the male sample is compared to the Canadian male mean for

the 'average' norm using the t-test (two-tailed).

Step 1. Means were calculated to be:

Male sample $\bar{X}$ = 30.0 cm.

Canadian male $\bar{X}$ = 30.66 = 31.0 cm.

Step 2. Find Standard Deviation (SD):

Male sample SD = 8.27

Canadian male SD = 9.4*

* Note: It was necessary to compute the SD for the Canadian (male and female) norms due to the fact that "the Government of Canada Fitness and Amateur Sport did not compute the SD for the 15-19 year old age group" (B. Ferris, personal communication, June 10, 1987).

The SD computation was actually an estimation using a formula involving percentile figures. The formula provides SD estimations which are credible. (R. Brant, personal communication, September 30, 1987)

Formula: 95th Percentile - 5th Percentiles/ 3.3
(Constant based on normal distribution)

Computation: 44 - 13 = 31 31/3.3 = 9.4 SD
Flexibility

Step 3 Find Standard Error of the Means (SEM).

Formula: SD/square root of N (size of sample).

Computation: Canadian Male 9.4/848 = 9.4/29.12 = .323

Male Sample 8.27/41 = 8.27/6.4 = 1.3

Step 4 Find the Standard Error of the Difference between the Means (SEDM's).

A. Square (.323) SEM Canadian male and (1.3) SEM of the male sample. Add these results to realize 1.774, then find the square root of 1.774 which equals 1.33, therefore 1.33 is the SEDM's.

Step 5 Divide the difference between the means by the SEDM's. Canadian male mean (30), minus male sample mean (31) = -1, -1 is then divided by 1.33 = -.752. The negative sign indicates direction, sample mean was less than the Canadian male mean.

Step 6 Compare t-test result to t-table value. t-test result was -(0.752) and t-table value was 2.021, therefore, since the t-test result was less than the t-table value it can be stated that the difference between the groups means was not significant ($p < .05$). The two-tailed t-test is appropriate for this study. (M. G. Bickis, personal communication June 10, 1987 & R. A. Yackulic, August 31, 1987)

The level of significance in this study was ($p<.05$). For each hypothesis and anthropometric component mean the aforementioned steps were followed to

compare each groups (male/female) mean to Canadian (male/female) 'average' norms.

To reject a hypothesis or anthropometric measure for males, t-scores were required to be equal to or greater than 2.021. For females t-scores of 2.045 or greater were required. If t-score computations were less than stated values, the null hypothesis or anthropometric component mean result was accepted and research hypothesis was accepted. Direction was indicated by (-) or (+) sign aside t-scores.

3.10 Summary

In chapter three the 1986 CSTF was described. The apparatus neccessary to use the CSTF was listed and the procedures for sample selection were explained. Each of seven test sites: Fond Du Lac, La Loche, Buffalo Narrows, Pinehouse Lake, Stanley Mission, Sandy Bay, and Pelican Narrows, were noted and the size of the sample (n = 70), and number of students in each group (male, n = 41 & female, n = 29), as well as age range of 15 to 19, was given.

The steps taken for gaining entry into school districts and schools were explained. The preparation for testing and the data collection time period was

given. It was noted that during field research all testing procedures used were those found in appendices G1 to G13, which were originally developed by the Government of Canada Fitness and Amateur Sport. The organization of data into two groups based on sex was explained, and it was noted that group means would be compared to the Canadian male and female 'average' mean norms. Six null hypotheses were stated and the data analysis using two-tailed t-tests was explained.

Chapter IV

Results of Data Analysis

Chapter IV describes the outcome of the statistical analysis of data in relation to the six hypotheses.

Two-tailed t-tests were applied to each male and female group mean within the sample for each of the six hypotheses to test for significant ($p<.05$) differences between the mean scores of Northern Saskatchewan male and female students and the Canadian male and female means for the 'average' norms. Null hypotheses were accepted when means were not significantly different ($p<.05$) and rejected when means were found to differ significantly ($p<.05$).

4.1 Hypothesis 1

There will be no statistically significant difference found between mean VO2 Max. scores of 'students' and the means of the 'average' Canadian norms listed in the 1986 CSTF.

To test for significant differences between the male and female means, concerning predicted VO2 Max., and the Canadian population male and female 'average' means, two-tailed t-tests were used. Males mean score was 53.5 ml., this was 2.5 ml., lower than the Canadian

'average' mean. Females mean score was 39.0 ml., 1.0 ml., greater than the Canadian 'average' mean. The decision to reject the null hypothesis for males was due to a negative t-score of -(2.14) which was greater than the t-table value 2.021. The female t-test result was 1.55 which was less than the t-table value 2.045, thus the null hypothesis was accepted for the female group.

On the basis of the findings in this analysis the male 'students' mean was found to be significantly different ($p<.05$) from the Canadian male 'average' mean, yet the female 'students' mean was not significantly different ($p<.05$) from the Canadian female 'average' mean. The null hypothesis was negatively rejected for males and positively accepted for females. The research hypothesis was accepted for males and rejected for females. These findings illustrated the fact that males had significantly ($p<.05$) less aerobic power than 'average' Canadian males the same age, whereas females had aerobic power results that indicated they were not significantly different ($p<.05$) from 'average' Canadian females the same age. Table three illustrates the results. The difference between the means is shown as a percentage.

Table 3

Sample and Canadian Population VO2 Max. Means, t-test Results and Null Hypothesis Decision

	Males (n=41)		Females (n=29)	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.
VO2 Max.	53.5	5.15	39.0	3.4
Canadian Population	56.0	6.6	38.0	4.0
Difference	-2.5		1.0	
% Difference	-4.5%		2.6%	
t-score Result(.05)	-(2.14)		1.55	
Null Hypothesis Decision	Reject		Accept	

4.2 Hypothesis 2 There will be no statistically significant difference found between mean grip strengths of 'students' and the means of the 'average' norms found in the 1986 CSTF.

Grip strength measures for male and female students were lower than the Canadian 'average' norms for each sex. The male mean was 81.0 kg., which was 16.0 kg., less than the Canadian male 'average' mean. The female grip strength mean score of 51.0 kg., was 9.0 kg., less

than the Canadian female 'average' mean. The differences were found to be significant ($p<.05$) after completing two-tailed t-tests for males and females. The decision to reject the null hypothesis for each group (gender) was due to negative t-values of -(5.6) for males, which was greater than 2.021, the t-table value for males, and -(5.48) for females, which was greater than the 2.045 t-table value for females.

On the basis of findings in this analysis the null hypothesis was negatively rejected for 'students' (male/female) and the research hypothesis, predicting that differences would be found between 'students' means and the Canadian (male/female) 'average' means, was accepted. Clearly, the strength measure results indicated that both males and females in this sample had significantly ($p<.05$) less than 'average' grip strength when compared to the norms for the Canadian (male/female) population. Table four presents male and female means, the percent difference between the means, two-tailed t-test results, and null hypothesis decision.

Table 4

Sample and Canadian Population Grip Strength Means, t-test Results and Null Hypothesis Decision

Measure	Males (n=41) $\bar{X}$	S.D.	Females (n=29) $\bar{X}$	S.D.
Grip Strength	81	17.5	51	9.0
Canadian Population	97	17.6	60.0	10.0
Difference	-16.0		- 9.0	
% Difference	-16.5%		-15%	
t-score Result(.05)	-(5.6)		-(5.48)	
Null Hypothesis Decision	Reject		Reject	

4.3 Hypothesis 3 There will be no statistically significant difference found between mean push-up measures of 'students' and the means of the 'average' norms found in the 1986 CSTF.

Two-tailed t-tests were used to test for significant differences ($p<.05$) between male and female push-up means, and the Canadian male and female 'average' means. The male mean for push-ups was 35.0

compared to the Canadian male population mean of 24.0. The means differed by 11.0. The two-tailed t-test produced a positive t-score of 4.08 which was greater than the t-value of 2.021.

Females received a mean push-up score of 24.0, which was four greater than the Canadian female population mean of 20.0. The two-tailed t-test calculation resulted in a positive t-score of 2.72 which was greater than the t-value of 2.045.

On the basis of findings in this analysis the null hypothesis was positively rejected for 'students' (male/female). The research hypothesis, predicting that differences would be found between 'students' (male/female) means and the Canadian (male/female) 'average' means, was accepted. Male and female mean results were significantly ($p<.05$) higher (more repititions) than Canadian (male/female) 'average' norm means. Table five presents male and female means, the percent difference between the means, two-tailed t-test results, and null hypothesis decision.

Table 5

Sample and Canadian Population Push-Up Means, t-test Results and Null Hypothesis Decision

Measure	Males (n=41) $\bar{X}$	S.D.	Females (n=29) $\bar{X}$	S.D.
Push-Ups	35	17	24	7.6
Canadian Population	24	13	20	13
Difference	11		4	
% Difference	31.4%		16.7%	
t-score Result(.05)	4.08		2.72	
Null Hypothesis Decision	Reject		Reject	

4.4 Hypothesis 4 There will be no statistically significant difference found between mean forward trunk flexion measures of 'students' and the means of the 'average' norms found in the 1986 CSTF.

To test for significant differences ($p<.05$) between the male and female sample means, concerning trunk forward flexion, and the Canadian male and female population 'average' means, two-tailed t-tests were used. The male mean for trunk flexion was 31.0 cm.,

compared to the Canadian male population mean of 30.0 cm. The means differed by 01.0 cm. The two tailed t-test produced a positive t-score of 0.752 which was less than the t-value of 2.021.

Females received a mean trunk flexion score of 36.0 cm., which was 01.0 cm., greater than the Canadian female population mean of 35.0 cm. The two-tailed t-test calculation resulted in a positive t-score of 0.580 which was less than the t-value of 2.045.

On the basis of findings in this analysis the null hypothesis was accepted for 'students' (male/female) and the research hypothesis, predicting that differences would be found between 'students' (male/female) means and the Canadian (male/female) 'average' means, was rejected for males and females. Results indicated that there was no significant difference ($p<.05$) between the male and female sample results and the Canadian population (male/female) flexibility norms at the 'average' level. Table six presents male and female means, the percent difference between the means, two-tailed t-test results, and null hypothesis decision.

Table 6

Sample and Canadian Population Trunk Flexion Means, t-test Results and Null Hypothesis Decision

Measure	Males (n=41) $\bar{X}$	S.D.	Females (n=29) $\bar{X}$	S.D.
Flexibility	31	8.3	36	6.6
Canadian Population	30	9.4	35	9.0
Difference	1		1	
% Difference	3.2 %		2.8 %	
t-score Result(.05)	0.752		0.580	
Null Hypothesis Decision	Accept		Accept	

4.5 Hypothesis 5 There will be no statistically significant difference found between mean sit-up measures of 'students' and the means of the 'average' norms found in the 1986 CSTF.

To test for significant differences ($p<.05$) between male and female sit-up means and the Canadian male and female population 'average' means, two-tailed t-tests were used. The male mean for sit-ups was 38.0, compared to the Canadian (male) population mean of 39.0, the

difference realized was 01.0. The two- tailed t-test produced a negative t-score of -(0.61) which was less than the t-value of 2.021.

The females mean sit-up score of 21, was 12 less than the Canadian population (female) mean for the 'average' norm. The two-tailed t-test calculation resulted in a negative t-score of -(7.89) which was greater than the t-value of 2.045.

On the basis of findings in this analysis the null hypothesis was negatively accepted for males and negatively rejected for females. The research hypothesis, predicting that differences would be found between 'students' (male/female) means and the Canadian (male/female) 'average' means, was rejected for males and accepted for females. Results indicated that the male mean was not significantly different ($p<.05$) from the Canadian male 'average' norm, yet the female sample mean was significantly different ($p<.05$) (lower) than the Canadian female 'average' norm. Table seven presents male and female means, the percent difference between the means, two-tailed t-test results, and null hypothesis decision.

Table 7

Sample and Canadian Population Sit-Up Means, t-test Results and Null Hypothesis Decision

Measure	Males (n=41) $\bar{X}$	S.D.	Females (n=29) $\bar{X}$	S.D.
Sit-Ups	38	9	21	8
Canadian Population	39	9	33	9.7(10)
Difference	-1		-12	
% Difference	-2.6 %		-36.4 %	
t-score Result(.05)	-(0.61)		-(7.89)	
Null Hypothesis Decision	Accept		Reject	

In addition to the five performance measures this study examined the following anthropometric components including: BMI, SOTS, SOS, WHR, height, and weight.

4.6 Hypothesis 6 There will be no statistically significant difference found between the mean anthropometric measures of 'students' and the means for the 'average' norms listed in the 1986 CSTF.

To test for significant differences between the male and female means, concerning height, weight, BMI,

WHR, SOS, and SOTS, and the Canadian male and female population 'average' means, two-tailed t-tests were used.

The male mean for height was 173.85 cm., compared to 174.00 cm., for the Canadian (male) population. The height difference was 0.15 cm. The two tailed t-test produced a negative t-score of -(1.2) which was less than the t-value of 2.021. The null hypothesis was accepted as the male mean did not differ significantly ($p<.05$) from the Canadian male 'average' mean.

The male mean for weight was 67.3 kg., compared to 66.0 kg., for the Canadian male population. The difference in weight was 1.3 kg. The two tailed t-test produced a positive t-score of 0.845 which was less than the t-value of 2.021. The null hypothesis was accepted as the male mean did not differ significantly ($p<.05$) from the Canadian male 'average' mean.

The male mean for body mass index (BMI) was 22.2 compared to 22.0 for the Canadian (male) population. The difference was 0.2. The two tailed t-test produced a positive t-score of 0.578 which was less than the t-value of 2.021. The null hypothesis was accepted as the male BMI mean did not differ significantly ($p<.05$) from the Canadian male 'average' mean.

The male mean for waist to hip ratio (WHR) was 0.81 compared to 0.83 for the Canadian population. The WHR means differed by 0.02. The two tailed t-test produced a negative t-score of -(28.6) which was greater than the t-value of 2.021. The null hypothesis was accepted as the male WHR mean was significantly different ($p<.05$) from the Canadian male 'average' mean.

The male mean for sum of two trunk skinfolds (SOTS) was 18.9 mm., compared to a 17 mm., mean for the Canadian (male) population. The SOTS means differed by 1.9 mm. The two tailed t-test produced a positive t-score of 1.80 which was less than the t-value of 2.021. The null hypothesis was accepted as the male mean did not differ significantly ($p<.05$) from the Canadian male 'average' mean.

The male mean for sum of five skinfolds (SOS) was 37.2 mm., compared to a 38.8 mm., mean for the Canadian(male) population. The SOS means differed by 0.8 mm. The two tailed t-test produced a negative t-score of -(0.37) which was less than the t-value of 2.021. The null hypothesis was accepted as the male SOS mean did not differ significantly ($p<.05$) from the Canadian male 'average' mean.

The female mean for height was 162.0 cm., compared to 164.0 cm., for the Canadian (female) population. The height means differed by 02.0 cm. The two tailed t-test produced a negative t-score of -(1.8) which was less than the t-value of 2.045. The null hypothesis was accepted as the females did not differ significantly ($p<.05$) from the Canadian female 'average' mean,

The female mean for weight was 62.0 kg., compared to 56.0 kg., for the Canadian (female) population. The weight means differed by 6.0 kg. The two-tailed t-test produced a positive t-score of 3.24 which was greater than the t-value of 2.045. The null hypothesis was rejected as the female weight mean differed significantly ($p<.05$) from the Canadian female 'average' mean.

The female mean for body mass index (BMI) was 24.0 compared to 21.0 for the Canadian (female) population. The BMI means differed by 3.0. The two-tailed t-test produced a positive t-score of 3.81 which was greater than the t-value of 2.045. The null hypothesis was rejected as the female BMI mean differed significantly ($p<.05$) from the Canadian female 'average' mean.

The female mean for waist to hip ratio (WHR) was 0.83 compared to 0.75 for the Canadian (female)

population. The WHR means differed by 0.08. The two-tailed t-test produced a positive t-score of 7.10 which was greater than the t-value of 2.045. The null hypothesis was rejected as the female WHR mean differed significantly ($p<.05$) from the Canadian female 'average' mean.

The female mean for sum of two trunk skinfolds (SOTS) was 29.0 mm., compared to 23.0 mm., for the Canadian (female) population. The SOTS means differed by 6.2 mm. The two tailed t-test produced a positive t-score of 2.79 which was greater than the t-value of 2.045. The null hypothesis was rejected as the female SOTS mean differed significantly ($p<.05$) from the Canadian female 'average' mean.

The female mean for sum of five skinfolds (SOS) was 64.0 mm., compared to 61 mm., for the Canadian (female) population. The SOS means differed by 3.0 mm. The two-tailed t-test produced a positive t-score of 0.748 which was less than the t-value of 2.045. The null hypothesis was accepted as the female SOS mean did not differ significantly ($p<.05$) from the Canadian female 'average' mean.

On the basis of findings in this analysis of six body components the null (anthropometric) hypothesis was

accepted for males and rejected for females, hence the research hypothesis, predicting that differences would be found between 'students' (male/female) means and the (male/female) 'average' means, was rejected for males and accepted for females.

Table eight presents male means, standard deviations, the percent difference between the means, two-tailed t-test results, and the null hypothesis decisions.

Table 8

Mean Anthropometric Results For Males, t-test Results and Decisions Per Measure

Measure	Male (n=41) $\bar{X}$	Canadian Population $\bar{X}$	Percentage Difference (+)(-)	t-score Result p.05 (+/-)	Decision
Height	173.8	174.0	-0.09%	-.124	Accept
SD*	7.5	9.1			
Weight	67.3	66.0	1.93%	0.845	Accept
SD	9.6	10.3			
BMI	22.2	22.0	0.90%	0.578	Accept
SD	2.1	3.0			
WHR	0.81	0.83	-2.4%	-28.6	Reject
SD	.04	0.058			
SOS	37.2	38.0	-2.1%	-0.37	Accept
SD	13.4	17.3			
SOTS	18.9	17.0	10.%	1.80	Accept
SD	6.64	9.4			

Note: * = SD = Standard Deviation

Table 9 presents female means, standard deviation, the percent difference between the means, two-tailed t-test results, and the null hypothesis decisions.

Table 9

Mean Anthropometric Results For Females,

t-test Results and Decisions Per Measure

Measure	Female (n=29) $\bar{X}$	Canadian 'average' $\bar{X}$	Percentage Difference (+)(-)	t-score Result p<.05 (+/-)	Decision
Height	162	164	-1.2%	-1.8	Accept
SD	6.0	8.8			
Weight	62.0	56.0	9.7%	3.24	Reject
SD	10.0	9.10			
BMI	24.0	21.0	12.5%	3.81	Reject
SD	4.2	3.3			
WHR	0.83	0.750	9.6%	7.10	Reject
SD	0.06	0.064			
SOS	64.0	61.0	5.1%	0.748	Accept
SD	22.0	24.2			
SOTS	29.0	23.0	21.0%	2.79	Reject
SD	12.5	11.0			

Table 10 presents male and female performance means, two-tailed t-test values, the percent difference between the means, two-tailed t-test results, and the null hypothesis decisions.

Table 10

Summary of Mean Male and Female Performance Results, t-test Results and Decisions Per Measure

Measure	Sample $\bar{X}$	Canadian Population $\bar{X}$	Percentage Difference (+) (-)	t-value Result p.<.05	Decis-ion
Males: (N=41)					
VO2 Max.	53.5	56.0	-(4.5)	-(2.14)	Reject
SD	5.15	6.6			
Grip Stren.	81.0	97.0	-(16.2)	-(5.6)	Reject
SD	17.5	17.6			
Push-Ups	35.0	24.0	31.4	4.08	Reject
SD	17.0	13.0			
Trunk Flex.	31.0	30.0	3.20	0.752	Accept
SD	8.3	9.4			
Sit-Ups	38.0	39.0	-(2.6)	-(0.61)	Accept
SD	9.0	9.0			
Females: (N=29)					
VO2 Max.	39.0	38.0	2.6	1.55	Accept
SD	3.4	4.0			
Grip Stren.	51.0	60.0	-(15.0)	-(5.48)	Reject
SD	9.0	10.0			
Push-Ups	24.0	20.0	16.7	2.72	Reject
SD	7.6	13.0			
Trunk Flex.	36.0	35.0	02.8	0.580	Accept
SD	6.6	9.0			
Sit-Ups	21.0	33.0	-(36.4)	-(7.89)	Reject
SD	8.0	9.7			

4.7 Summary

Chapter four presented results of the data analysis for each of six null hypotheses. It was found that male means were significantly different ($p<.05$) from the Canadian male 'average' means on three performance measures, including: push-up (greater), grip strength (lower), and VO2 Max. (aerobic power) (lower), thus these null hypotheses were rejected. Male means for flexibility and sit-ups were not significantly different ($p<.05$) from the Canadian male 'average' means, hence flexibility and sit-up null hypotheses were accepted.

The male anthropometric WHR mean result was found to be significantly different ($p<.05$) (lower) than the Canadian male 'average' norm, thus the WHR measure was rejected. However, height, weight, SOTS, SOS, and BMI, means were not significantly different ($p<.05$) from the Canadian male 'average' means, hence these were accepted, as was the anthropometric null hypothesis for males.

Four female performance means: push-ups (higher), grip strength (lower), sit-ups (lower), and VO2 Max., (aerobic power) (higher) were significantly different ($p<.05$) from the Canadian female 'average' means, thus these null hypotheses were rejected. Only the female

flexibility mean was not significantly different ($p<.05$) than the Canadian female 'average' mean, thus the null hypothesis was accepted.

Female height and SOS means were not significantly different ($p<.05$) from the Canadian female 'average' means. However, female WHR, SOTS, BMI, and weight means were found to be significantly different ($p<.05$) (higher) than the Canadian female 'average' norm. As a result of these findings the anthropometric null hypothesis for females was rejected.

Chapter V

Discussion

5.1 Introduction

The following discussion interprets, draws inferences, and emphasizes consequences of the results. Comments on the shortcomings of this study are included.

5.1.1. Predicted VO2 Max.,(Aerobic Power)

In this study an aerobic power rating was found for each student using the predicted VO2 Max., method. This method involves the completion of submaximal exercise (step-test). The male mean was significantly different ($p<.05$) (lower) than the Canadian male 'average' mean. The female mean was not significantly different ($p<.05$) from the Canadian female 'average' mean. The results were tentative because the Canadian Aerobic Fitness Test, CAFT (step-test), originally devised as a motivational tool which could provide a gross estimate of fitness, was and still is under investigation by an Ad-Hoc Canadian Aerobic Fitness Test (CAFT) Advisory Committee. The investigation will improve and extend the application of the CAFT. (Government of Canada Fitness & Amateur Sport, 1986, p. 15)

By comparing the CAFT with other methods of measuring aerobic power it was discovered that there was a high correlation with the maximal treadmill test. (Jette, 1979, p. 214) The treadmill test has been recognized and used in the laboratory to provide a valid and reliable method of assessing VO2 Max. Researchers studying the CAFT concluded, among other points, that the accuracy and validity of the CAFT is dependent upon the subject keeping up the prescribed stepping cadence and also on the accuracy of the pulse counting. (Bailey, Shephard, & Mirwald, 1976, p. 77) In this study each subject was tested individually and the above factors were observed to ensure accuracy and standardization throughout the study.

The CAFT results in this study revealed that males may not have been receiving the necessary amount of activity to maintain or attain an 'average' cardiovascular fitness level. The result could have been influenced by their lifestyle (activity level). Males completed the third stepping session on average, as did the Canadian population. This indicated circulatory efficiency. (Burke & Humphreys, 1982)

Aerobic power results have been found to be higher for those living traditionally active, labour intensive lifestyles, and less for people living sedentary urban

lifestyles (Anderson, 1960). Given the mean aerobic power value for males in this study possibly males are more sedentary compared to the 'average' Canadian male (15-19), or it may be that males smoked heavily given the fact that "smoking tends to have a deleterious effect on physical performance" (Koch, 1974, p. 41).

Aerobic power is powerfully influenced by heredity with over ninety percent of aerobic power being inherited. (Burke & Humphreys, 1982, p. 44) Given this information it is possible that the sample's aerobic power results are a reflection of their heredity since the sample (male & female) was largely of Native ancestry. In this study the female group did not have a significantly different ($p<.05$) VO2 Max., mean result whereas males had a significantly different ($p<.05$) (lower) than 'average' VO2 Max. mean result.

The aerobic power finding of males seemed to oppose traditional Indian emphasis on males being fast runners (Health & Welfare Canada, 1986, p. 15), because most runners, have higher than 'average' aerobic power values. Possibly traditional Indian lifestyles in Northern Saskatchewan have changed, as the literature has suggested.

Females were found to have an aerobic power result that was not significantly different ($p<.05$) from the 'average' mean of the Canadian (female) population. From this finding it is possible to infer that Northern Saskatchewan females had a lifestyle that was adequate for the promotion of 'average' cardiovascular fitness.

On average, females completed two stepping sessions indicating females reached 70 percent of their possible maximum. This level is considered a recommended level of fitness. (Government of Canada Fitness & Amateur Sport 1983, p. 48) The achievement is good considering the higher than 'average' mean weight values found for females. Wells (1985) explains that since "body fat is essentially dead weight-it contributes to the load carried, (i.e., body weight), but it does not contribute to the absolute VO2 max (i.e., it doesen't do any work)" (p. 25). For both sexes aerobic power is supposed to be at its peak during the teen years. (Koch, 1974, p. 47) Could the age factor (15-19) be partly responsible for the findings ?

A Saskatoon study (Bailey, Shephard, & Mirwald, 1976) of cardio-respiratory fitness was conducted to discover whether or not the 'step-test' could identify aerobic power of those tested. In fact, the study was developing the CAFT. It was found, among other points,

that people had aerobic power measures related to their level of habitual activity. Using the 1986 CSTF norms, males from the 1976 study, aged 15 to 19, would have been 'below average' and females 'average'. The present study found aerobic power scores similar to the 1976 study in that females scored higher than males. It was suggested in the 1976 study that "undoubtedly genetic factors...contribute to the intial range of cardio-respiratory status" (Bailey, et al, 1976, p. 74).

5.1.2. Grip Strength

Strength refers to the force of a single contraction, or peak performance (Government of Canada Fitness & Amateur Sport, 1983, p. 25), and was measured in this study using a hand grip dynanometer. The null hypothesis was rejected and the research hypothesis was accepted as both male and female means were significantly ($p<.05$) lower than the Canadian population 'average' means. The weaker grip strength result of the sample was similar to that of Anderson's (1971) study which found western male Treaty Indians had lower grip strength than average Canadians of the same age and weight, even though they consumed a well balanced diet. (p. 151)

Diet may have been the reason for males 'below average' weight and females had 'above average' weight yet the weight factor seems to have contributed little to grip strengths. This situation is contrary to previous findings that noted body weight correlates highly with grip strength. (Montpetit, 1967) One suggestion for these strength results is that modern technological society contributes to a reverse of muscle build-up as muscles that are not used are known to decrease in size. (Burke & Humphreys, 1982, p. 46) However, Shephard (1969) has noted that there was no relationship between activity level and grip strength, thus it may be that sample activity levels were not resposible for the less than average strength results. Furthermore, Anderson (1971) found no difference between employed and unemployed Indian males' grip strength (p. 148).

The less than average grip strength of the sample (males/females) could be attributed to some genetic trait. Researchers (Goslin & Burden, 1986;Watkins, 1986) have found that grip strength can be linked to ethnicity. Another factor that may have influenced grip strength results related to measuring apparatus defect. However, since the dynanometer was calibrated the factor was ignored. The extent of the difference between the Northern student's grip strength scores and the mean of

the 'average' Canadian norm was consistant with Anderson's (1971) study.

Strength norms in the 1986 CSTF had been increased substantially from the 1977 standards. The 1977 standards came from the Canadian Public Health Association project and would have placed the present study sample (males/females) in the minimum ('average') range. It has been suggested that the reason for the change in norm standards, especially among females was due to sampling procedures. (B. Ferris, personal communication, June 23, 1987) Could it be that the sample used to establish 1986 CSTF norms were unusually strong compared to the 1977 project's norms ? If the suggestion were true than the 1986 CSTF, needs to establish new strength norms. If the suggestion is not true then it is possible that the sample (male/female) in this study had a lack of strength. The weakness could interfere with attempts to be active at work or during leisure. (Government of Canada Fitness & Amateur Sport, 1983, p. 25)

5.1.3. Push-Ups

Deemed an indicator of local muscular endurance (LME), push-up measures identify a person who can or cannot complete repeated upper body muscular

contractions without becoming tired. Both male and female push-up means were significantly different ($p<.05$) higher than the (male or female) means for the Canadian population 'average' norms.

Usually aerobic power is closely related to endurance. (Wells, 1985) Male aerobic power was significantly ($p<.05$) lower than 'average' yet their upper body endurance was significantly ($p<.05$) higher. The male sit-up performance (LME abdomen) was 'average' in contrast to their 'above average' push-up (LME upper body) score. In light of this it was suggested that males were accustomed to upper body activity of low intensity over a period of time, whereas lower body (abdominal) activity was limited, hence lower body exercise was not accomplished to the extent that upper body exercise was.

The female push-up mean was significantly ($p<.05$) higher than the 'average' mean for the Canadian (female) population. Females had lower than 'average' sit-up results and a higher than 'average' push-up result. Females had superior endurance in their upper body muscles and inferior abdominal endurance. Females had 'average' aerobic power yet they had a mean push-up result which was significantly ($p<.05$) higher than

'average' indicating superior upper body endurance.

5.1.4. Forward Trunk Flexion

Flexibility in the trunk region concerns a number of movements about a sequence of joints. The trunk flexibility of the sample (male/female) was affected by the "degree of stretch and position of attachment of the connective tissue such as ligaments and tendons, and the shape and size of the muscles and, the shape, size, and arrangement of bones" (Burke & Humphreys, 1982, p. 48). The sample (male/female) had mean flexibility measures that were not significantly different ($p<.05$) from the Canadian (male/female) 'average' means.

While conducting this measure, students questioned their abililty to flex at the waist given their body shape. In reply to this concern it was necessary to communicate the fact, that generally speaking static flexibility can be measured indirectly by the sit-and-reach test with no significant interference from anthropometric measurements. This implies that even though the task may not be appropriate and the sample may have variable anthropometric measures, flexibility scores are credible.

The Government of Canada, Fitness and Amateur Sport (1983) emphasized that "flexibility appears to decline

as adolescence approaches, and then turns upward again. For females, the peak comes during the period 15-19, while males do best in their twenties" (p. 24). In this study the 15-19 year old sample (males/females) had mean scores which were not significantly different ($p<.05$) from thier respective Canadian 'average' means.

At this point it appeared that flexibility performance could be related more to genetics than to any other variable. Flexibility fitness results can be related to ethnic origin as Shephard (1986) discovered by examining and comparing fitness results of other countries to Canadian norms. However, a South African study following the CSTF sit-and-reach procedures discovered that flexibility measures were not effected by ethnicity (genetics), socioeconomics (class), or diet (inferred from class). (Goslin & Burden, 1986, p. 134) In view of this it is questionable whether or not flexibility measures were due to genetics in the present study. Instead, type and level of activity could be the single most important variable effecting flexibility. DeVries (1986) has suggested that "flexibility can be improved through exercise" (p. 467). Certainly, the flexibility results of this study could be improved.

5.1.5. Sit-Ups

The male sit-up mean was equal to Canadian 'average' mean whereas the female mean was significantly ($p<.05$) lower than 'average' in the present study. The sit-up task was examining, due to the sixty second directive, the anerobic system. Bailey et al. (1986) suggests "children are at a functional disadvantage when performing strenuous activities lasting 20-60 sec" (p. 160). Whether or not the sample was made up of mature adults or children is not clear.

The sit-up and push-up scores of the sample were indirectly related in that both concerned local muscle endurance (LME). Each measures procedure differed in that sit-ups were completed in 60 seconds whereas pushups had no time limit. The superior push-up mean result and 'average' sit-up mean for males in this study compared to the Canadian (male) 'average' mean brought about the observation that males had 'average' and 'above average' endurance as a group in the trunk and upper body areas respectively.

Generally females had significantly less than 'average' endurance in the abdomen. Moreover, females had excess adiposity in the trunk region. This was concluded by looking at the significantly higher than

'average' mean weight and significantly (larger) than 'average' girth measures of the trunk area. The significantly lower than 'average' sit-up mean and various anthropometry (girth and skinfold results) of the female group suggests that females lacked abdominal endurance, strength, and tone.

5.1.6. Anthropometry

For five of six anthropometric measures males did not differ significantly ($p<.05$) from the Canadian (male) 'average' means. These anthropometric measures included sum of five skinfolds (SOS), sum of two trunk skinfolds (SOTS), height, weight, and body mass index (BMI). Only the waist to hip ratio (WHR) was significantly different ($p<.05$) (lower) than the Canadian (male) 'average' mean.

The 1986 CSTF excluded percent body fat estimates as well as other traditional body weight and compostion evaluations due to "considerable degrees of error" (Government of Canada Fitness & Amateur Sport, 1986, p. 14), associated with certain estimates. Risk zones used in the 1986 CSTF were developed by considering trends in vital statistics. Certain body shape, size, and structural traits of a person can be shown to be unhealthy using the health risk zones. Males in this

study had WHR mean results that were less than the 'average' amount of subcutaneous fat in the trunk region. This may be good because excess fat in the trunk region "has been shown to be associated with increased morbidity" (p. 14).

Anthropometric scores for females were significantly different ($p<.05$) (higher) than the Canadian (female) 'average' mean values for weight, BMI, WHR, and SOTS. Females had greater amounts of adipose tissue in the trunk region and a BMI result located in the 'poor' region of the 1986 CSTF. 'Poor' status is in an estimated health risk zone according to trends in morbidity and mortality. (Government of Canada Fitness & Amateur Sport, 1986, p. 30) Findings suggest that females in the present study have consumed more food energy (calories) than expended, thus positive (high) anthropometric values were realized when compared to Canadian female 'average' norms.

Females, were in the health risk zone for both BMI and WHR. The fact that female mean weight values were significantly different ($p<.05$) (higher) than 'average' and their height was 'average' provides evidence for the 'poor' BMI result. The SOS should confirm the BMI, and the SOS should indicate very directly the extent of subcutaneous fat in the trunk region. In the present

study ths SOS measure did not provide support for the BMI, yet the SOTS and WHR, above 'average' results did provide support for the conclusion that females had greater subcutaneous fat in the trunk region.

In total, "one must not overlook the importance of a visual appraisal of the individual, which can be a useful adjunct to the assessment of body weight, adiposity and fat distribution as outlined in this procedure" (Government of Canada Fitness & Amateur Sport, 1986, p. 15). Consequently, it was the opinion of this researcher that males had 'average' to 'excellent' physiques, while most females appeared to have excess body mass for their height with a concentration of adiposity in the trunk area.

5.2 Summary

Chapter five discussed the findings and suggested possible reasons for the findings. Fitness research limitations were mentioned.

Although the findings did not produce one summary statistic from which to judge, results indicated that overall male and female flexibility mean scores were not significantly different ($p<.05$) from the Canadian (male/female) 'average' means. Male and female grip

strength measures were significantly different ($p<.05$) (lower) than the Canadian (male/female) 'average' means. Male and female push-up mean scores were significantly different ($p<.05$) (higher) than the Canadian (male/female) 'average' means.

Males had lower than 'average' VO2 Max., (aerobic power) mean results. Male anthropometric component measures including: weight, height, SOTS, SOS, WHR, and BMI, were not significantly different ($p<.05$) from the Canadian (male) 'average' means. Only the WHR mean was significantly different ($p<.05$) (lower) than the 'average' Canadian (male) mean.

The female VO2 Max., (aerobic power) mean was not significantly different ($p<.05$) from the Canadian 'average' female mean. Sit-up results were significantly different ($p<.05$) (lower) than the 'average' for females.

The female anthropometric means were different from findings for males in that: SOTS, WHR, BMI, and weight values were significantly different ($p<.05$) (higher) than 'average' Canadian (female) norm values. Only height and SOS means were not significantly different ($p<.05$) from the Canadian (female) 'average' norm. These anthropometric findings describe a sample with an

excess of weight (adiposity) in proportion to height.

In sum, this study concerned itself solely with the CSTF perception of fitness. The 1986 CSTF attributes no superior or inferior status to one measure or another. Each measure is equally important, thus no one summary statistic could be generated to summarize. Each measure was addressed individually.

Chapter VI

Summary, Conclusions, and Recommendations

6.1 Summary

Chapter six includes a review of the study: its purpose, a summary of the significance of the study, the procedures, the subjects involved, the research design, and the major results.

The purpose of this study was to measure physical fitness levels of tenth grade Northern Saskatchewan students, 15 years of age or older, using the 1986 version of the CSTF. It was believed that an appraisal of fitness levels would provide useful evaluative feedback for students. The findings could motivate students to maintain or improve present fitness levels. Fitness feedback was generated via comparisons to Canadian norms.

The fitness appraisal involved the measurement of performance and anthropometric components related to fitness. The appraisal allowed judgements, inferences, and suggestions to be made concerning student results. Students were divided by sex into two groups. Their ages ranged from 15 to 19 years old. Out of a reported

population of 100 Northern Saskatchewan grade ten students, 70 were tested. Of the 70, 29 were female (41%) and 41 were male (59%). The CSTF performance component measures included: predicted VO2 Max., push-ups, sit-ups, trunk forward flexion, and grip strength. Anthropometric measures included, height, weight, skinfolds and body girths. Since there had never been an appraisal of Northern Saskatchewan residents' fitness it was hoped that this research would be a foundation on which other fitness or fitness related studies could build.

6.2 Conclusions

In the present study the major problem was:

Are the mean fitness levels of 'students' significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?

Because this study concerned itself solely with the 1986 CSTF perception of fitness, the major problem could not be answered using one summary statistic or short answer. The reason for this is that the 1986 CSTF attributes no superior or inferior status to one measure or an other. Each measure is equally important, thus no one summary statistic or statement can be generated to summarize findings in this study. Each measure was

addressed individually in an effort to, in part, answer the major problem. Conclusions are clearer if each measure is considered in relation to another.

Fitness levels of 'students' were not strictly 'average' nor were they significantly different, at all times, from the Canadian male and female 'average' norms. Fitness measures were variable.

In the present study the following conclusions were made regarding the six subproblems.

1. With regard to the subproblem of this study which asked - "Will mean grip strength measures of 'students' be significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?" - it was concluded that grip strength means of the male and female groups were significantly different ($p<.05$) (lower) than the mean for the Canadian (male/female) 'average' norms listed in the 1986 CSTF. The finding supported the research hypothesis.

   A. The male grip strength mean was 16.0 Kg., lower than the Canadian male 'average' mean.

   B. The female grip strength mean was 9.0 Kg., lower than the Canadian female 'average' mean.

2. With regard to the subproblem of this study which asked - "Will mean push-up measures of 'students' be significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?" - it was concluded that push-up means of the male and female groups were significantly different ($p<.05$) (higher) from the mean for the Canadian (male/female) 'average' norms listed in the 1986 CSTF. The finding supported the research hypothesis.

A. The male push-ups (upper body endurance) mean was 11.0 higher than the Canadian male 'average' mean.

B. The female push-up (upper body endurance) mean was 4.0 higher than the Canadian female 'average' mean.

3. With regard to the subproblem of this study which asked - "Will mean trunk forward flexion measures of 'students' be significantly different from the mean for the 'average' Canadian norms listed in the 1986 CSTF ?" - it was concluded that flexibility means of the male and female groups were not significantly different ($p<.05$) from the means of the Canadian (male/female) 'average' norms listed in the 1986 CSTF. The finding did not support the research hypothesis.

A. The male flexibility mean was 1.0 cm.,greater than the Canadian male 'average' mean.

B. The female flexibility mean was 1.0 cm.,greater than the Canadian female 'average' mean.

4. With regard to the subproblem of this study which asked - "Will mean predicted VO2 Max., measures of 'students' be significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?" - it was concluded that:

A. Males were significantly different ($p<.05$) (lower) from the Canadian male 'average' norm listed in the 1986 CSTF. The finding supported the research hypothesis.

The male predicted VO2 Max.,(aerobic power) mean was 2.5 ml. lower than the Canadian male 'average' mean.

B. Females were not significantly different ($p<.05$) from the mean for the Canadian female 'average' norm listed in the 1986 CSTF. The finding did not support the research hypothesis.

The female predicted VO2 Max.,(aerobic power) mean, was 1.0 ml., higher than Canadian female 'average' mean.

5. With regard to the subproblem of this study which asked - "Will mean sit-up measures of 'students' be significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?" - it was concluded that:

A. The male mean was not significantly different ($p<.05$) from the mean for the Canadian male 'average' norm listed in the 1986 CSTF. The finding did not support the research hypothesis.

The male sit-up (abdominal endurance/strength) mean was 1.0 lower than the Canadian male 'average' mean.

B. The female mean was significantly different ($p<.05$) (lower) from than the mean for the Canadian female 'average' norm listed in the 1986 CSTF. The finding supported the research hypothesis.

The female sit-up (abdominal endurance/strength) mean was 12 lower the Canadian female 'average' mean.

In addition to the five performance measures, anthropometric measures were taken to find out if:

6. BMI (body mass index), SOTS (sum of two

skinfolds), SOS (sum of five skinfolds), WHR (waist to hip ratio), height, and weight measures of "'students' were significantly different from the means of the 'average' Canadian norms listed in the 1986 CSTF ?". Anthropometric results led to the following conclusions.

A. For males, height, weight, SOTS, SOS, and BMI means were not significantly different ($p<.05$) than the means of the Canadian male 'average' norms listed in the 1986 CSTF. These findings did not support the anthropometric research hypothesis.

1. Male height mean difference (-.015 cm.)
2. Male weight mean difference(1.3 kg.)
3. Male SOTS (sum of two trunk skinfolds) mean difference, (1.9 mm.).
4. Male SOS (sum of five skinfolds) mean difference, (-0.8 mm.).
5. Male BMI (ratio of body weight divided by height in meters squared) mean difference, (0.2).

Only the WHR measure was significantly different ($p<.05$) (lower) than the Canadian male 'average' norm listed in the 1986 CSTF. This finding supported the anthropometric research hypothesis.

6. Male WHR mean difference, (-0.02 cm.).

B. For females weight, WHR, SOTS, BMI, means were significantly different ($p<.05$) (higher) than the means of the Canadian 'average' norms listed in the 1986 CSTF. These findings supported the anthropometric research hypothesis.

1. Female weight mean difference, (6.0 kg.).
2. Female WHR mean difference, (0.08 cm.).
3. Female SOTS mean difference, (6.0 mm.).
4. Female BMI mean difference (3.0 Kg/Ht (m)2)

Only the SOS and height means were not significantly different ($p<.05$) than the means of the Canadian female 'average' norms listed in the 1986 CSTF. This finding did not support the anthropometric research hypothesis.

5. Female height mean difference, (-2.0 cm.).
6. Female SOS mean difference, (3.3 mm.)

In view of this summary a number of major points can be emphasized. Male and female push-up means were significantly different ($p<.05$) (higher) than Canadian 'average' means. This finding indicated upper body endurance. Male and female flexibility means were not significantly different ($p<.05$) than the Canadian 'average' means. Male and female grip strength means,

an indicator of overall body strength, were significantly different ($p<.05$) (lower) than the Canadian 'average' means.

Anthropometrically, five of six mean male results were not significantly different ($p<.05$) than the Canadian 'average' means. Only the weight to height ratio (WHR) of males was significantly different ($p<.05$) (lower) than the 'average' Canadian male norm. Female anthropometric measures were significantly different ($p<.05$) (higher) than the Canadian 'average' means for weight, sum of two trunk skinfolds (SOTS), body mass index (BMI), and waist to hip ratio (WHR). Only the female height and sum of five skinfolds (SOS) means were significantly different ($p<.05$) than the Canadian female 'average' means.

6.3 Recommendations

Based on findings of this study the following recommendations were made.

Recommendation 1: Further attention should be given to fitness; fitness education; fitness measures, research, and promotion, through existing educational systems in place in Saskatchewan and through governmental agencies.

Recommendation 2: Future research would have increased effectiveness if fitness appraisals were accompanied by other types of self-report instruments, such as attitude scales, semantic differentials, and lifestyle questionnaires. This study found that there was not enough fitness related literature concerning the north to permit complete discussions.

Recommendation 3: Given the findings of this study it may be prudent for schools to implement required physical education courses through grade twelve in Northern Saskatchewan. Presently most Northern schools follow provincial guidelines excluding mandatory physical education courses past grade nine.

Recommendation 4: Future research should involve a larger sample, more age groups, and be conducted by a research team with advanced laboratory measuring equipment in an effort to achieve more conclusive and precise results.

Recommendation 5: The CSTF should be updated and improved to overcome the limitations concerning the CAFT(step-test) and anthropometric procedures(fat distribution measures). It is hoped that future Ad Hoc CSTF Advisory Committee suggestions will offer further guidance and rationale to enable researchers to

rise above tentativeness.

Recommendation 6: Longitudinal research could shed additional light by comparing the affects of traditional lifestyles versus urban lifestyles on fitness levels.

Recommendation 7: Lower grip strength scores for Northern students as found in the present study, suggests that future studies could further examine this fitness component and physical education programs should be refocused to concentrate on strength training.

Recommendation 8: The finding of higher than average push-up mean scores in the present study could be studied to determine reasons for these results.

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Personal Communications

Page

1. R. Turkhein, Secretary of the Northern Development Council, April 27, 1987.

2. J. Haight, Health Educator for Northern Saskatchewan, May 4, 1987.

10. J.F. Basinger, Associate Professor of Geological Sciences - University of Saskatchewan - April 10, 1987.

24. R. Turkhein - April 26, 1987.

31. B. Goffin, Northern Affairs Secretariat, August 14, 1987.

32. D. Gailey, Town Administrator, community of La Loche, Sask., May 23, 1987.

37. J. Haight - May 4, 1987.

38. D. Semmler, Program Officer Canada Employment and Immigration - Saskatoon, April 26, 1987.

38. G. Andrews, Director of Education for the Northern Lights School District No. 113., Prince Albert, Sask., April 2, 1987.

Personal Communications

Page

38. C. Samoleski, District Superintendent of Education, Indian and Northern Affairs Canada - Prince Albert District, April 2, 1987.

41. T. Green, Principal, Keethanow School - Stanley Mission, Sask., May 27, 1987.

41. I. Swan, Principal, Pelican Narrows School, Pelican Narrows - Sask., May 28, 1987.

J. MacDonald, Band Administrator, Fond Du Lac, Sask., June 3, 1987.

B. Hook, Principal, Fond Du Lac - Dene School,Fond Du Lac, Sask., June 3, 1987

42. I. Swan - May 28, 1987.
J. MacDonald - June 3, 1987.
B. Hook - June 3, 1987.

59. B. Ferris, Coordinator Canada Fitness Survey - Ottawa, Ont., June 10, 1987.

Personal Communications

Page

59. R. Brant, Assistant Professor of Community Health - University of Toronto, September 30, 1987.

60. M. G. Bickis, Assistant Professor of Mathematics - University of Saskatchewan, June 10, 1987, and R. A. Yackulic, Assistant Professor of Education - University of Saskatchewan, August 31, 1987.

90. B. Ferris, Coordinator Canada Fitness Survey - Ottawa, Ont., June 23, 1987.

APPENDICES

APPENDIX A

INFORMED CONSENT FORM

A STUDY OF PHYSICAL FITNESS AMONG GRADE 10 STUDENTS, 15 YEARS OF AGE OR OLDER IN NORTHERN SASKATCHEWAN

Informed Consent Form

I understand that the reason for the study is to measure physical fitness levels of grade 10 students. I understand that the methods will be fully explained and that I am a volunteer who may decide not to participate. I understand that the results will be used for research and school purposes.

After reading the above, I volunteer to take part in the physical fitness testing held at my school.

Signed by student's parent _____

Signed by the student _____

Date _____

Please return this to the school. Thank-You

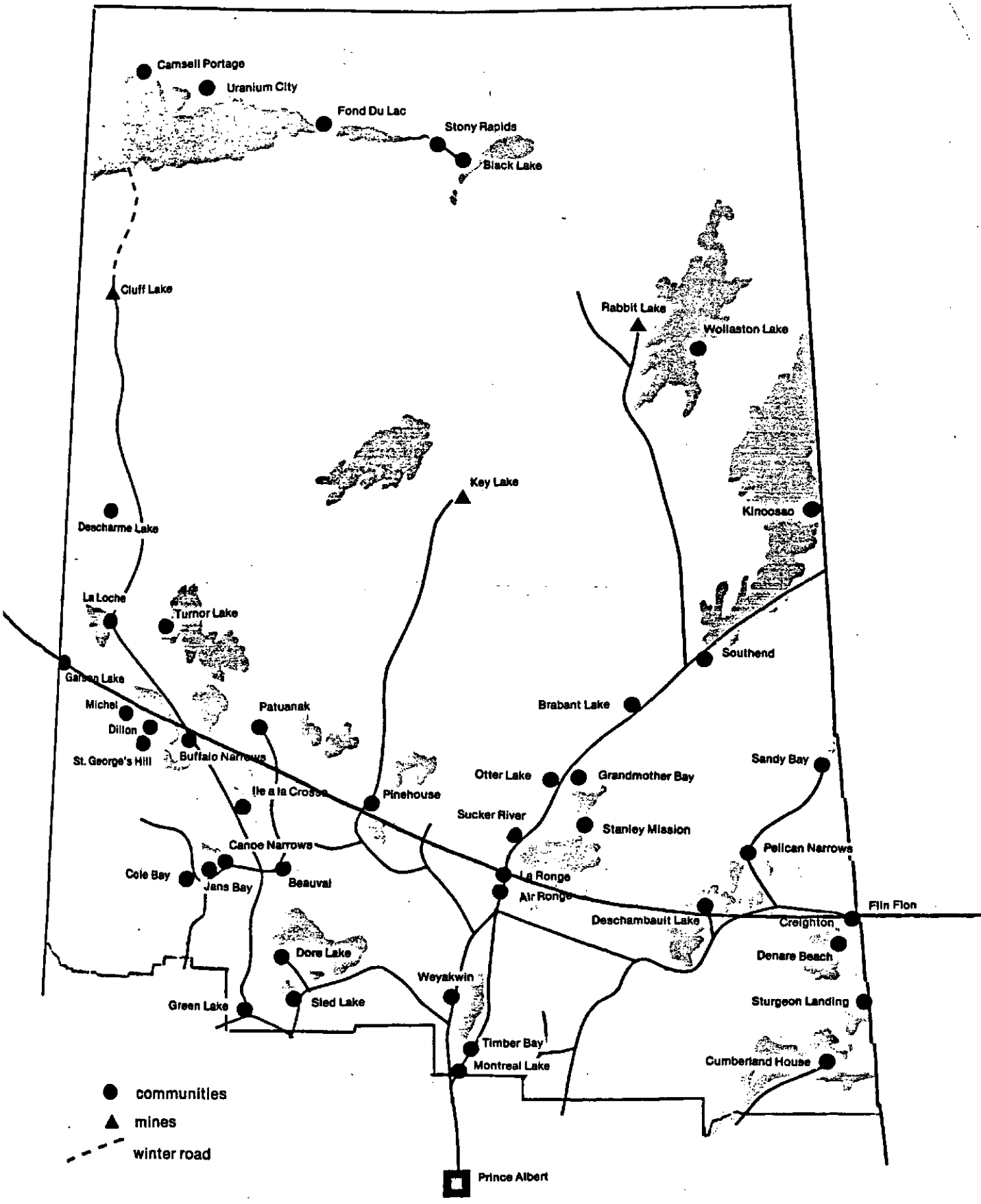
Respectfully,

Thomas G. Ryan,
Researcher.

APPENDIX B

MAP OF NORTHERN SASKATCHEWAN

NOTE: THE L FROM GARSON LAKE ON THE LEFT TO FLIN FLON ON THE RIGHT IS THE SEMI-DISCONTINUOUS PERMAFROST LINE DEFINING NORTHERN SASKATCHEWAN IN THIS RESEARCH



APPENDIX C

THE CANADIAN AEROBIC FITNESS

TEST LIMITATIONS(CAFT)

The Canadian Aerobic Fitness Test (CAFT): Limitations

The CAFT, as originally devised, was intended to be a motivational tool that could also provide a gross estimate of fitness: i.e., undesirable, minimum, recommended. Later, a regression equation, based on a sample of 59 participants was developed for the predication of VO2 max. Although this equation was validated against a maximal treadmill test, recent concerns about mode-specific validity; i.e., maximal step test, have been voiced. As a result, the validity and sensitivity of the CAFT, as a tool for the prediction of VO2 max., has been addressed by an Ad Hoc CSTF Advisory Committee, convened by Fitness Canada. This committee has subsequently made recommendations for necessary research to improve and extend the application of the CAFT. These research results and how they may affect the present form of the CAFT will be reported when they become available and appropriate changes will be incorporated into the fourth edition of the CSFT Operations Manual.

APPENDIX D

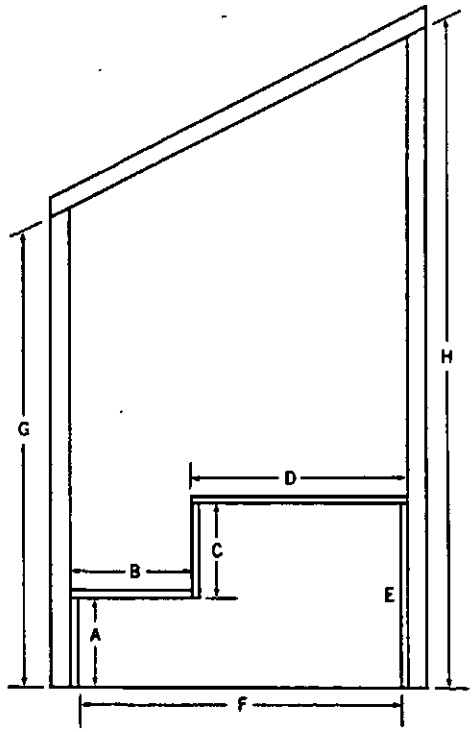
CONSTRUCTION PLANS FOR THE ERGOMETER STEPS AND FLEXOMETER

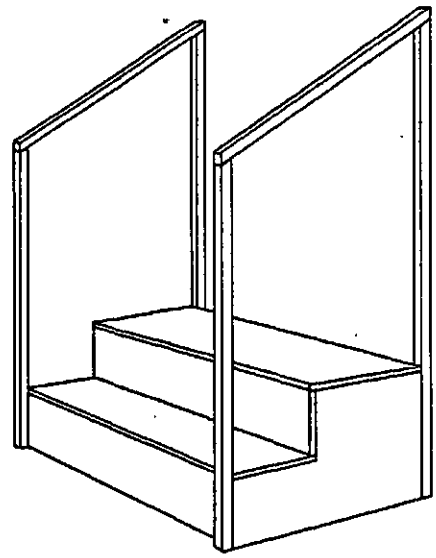
Construction Plans for the
Ergometer Steps
and Flexometer

Ergometer Steps

It is advised that steps be constructed in 1.2 meter (4 foot) lengths in order to store and transport easily.

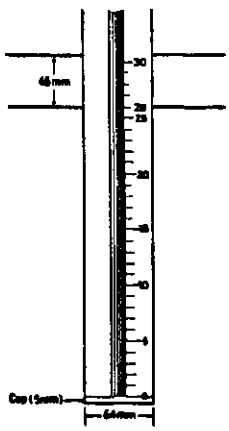
Details:
1. Double 20.3 cm. steps, cut to desired length.
2. Use 1.9 cm. (¾ inch) plywood.
3. Supporting panels (F) every 0.9 to 1.2 m.
4. Step Dimensions:
   A 18.4 cm.
   B 25 cm.
   C 18.4 cm. } by 1.2 m.
   D 45 cm.
   E 36.8 cm.
   F 70 cm.
5. Handrail Dimensions:
   G Approx. 100 cm.
   H Approx. 137.5 cm.

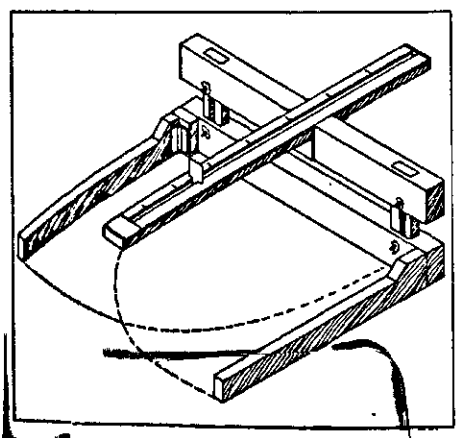


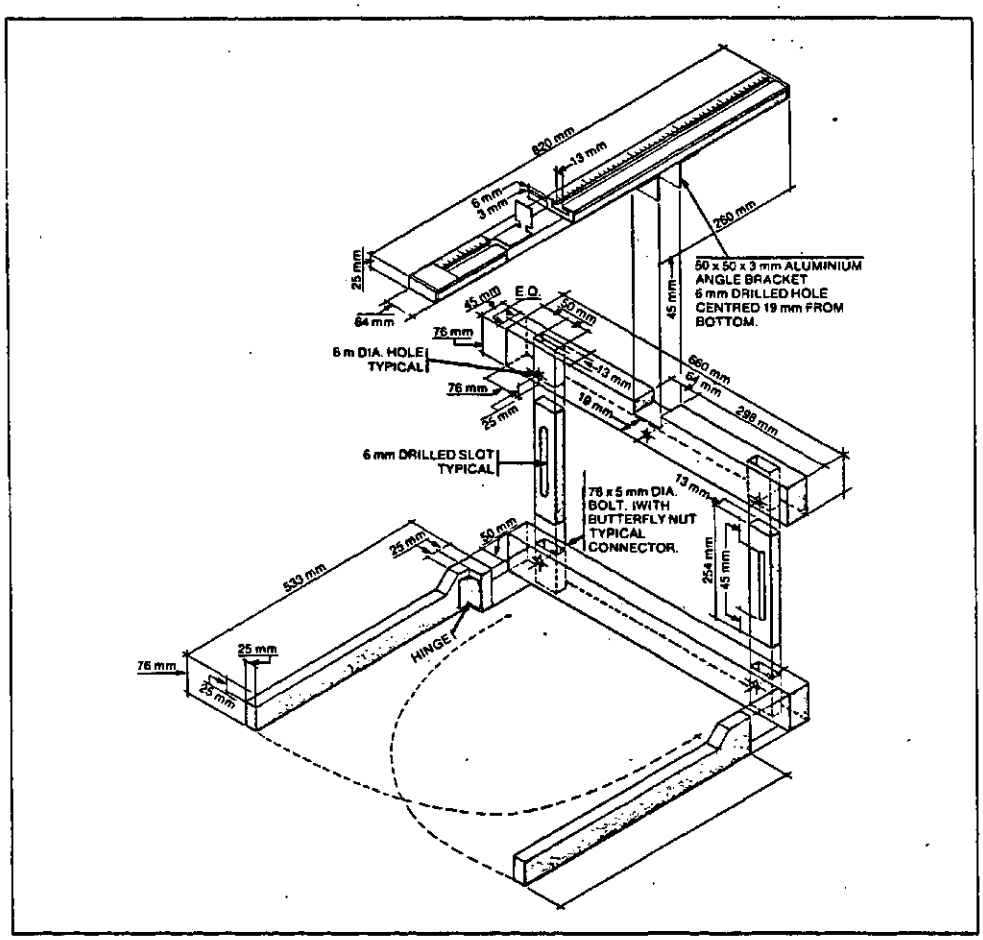


Flexometer

A modified Wells and Dillon flexometer may be constructed according to these directions. Please note that the "ruler" arm should be attached at the 26 cm. mark (See detailed insert – ruler arm is extended toward the participant with the "0" mark closest to the participant)







APPENDIX E

COMMUNICATIONS FOR RESEARCH PERMISSION

Indian and Northern
Affairs Canada

Your file Votre référence

Our file Notre référence

April 9, 1987

Mr. Tom Ryan
215 - 5th Ave. North
SASKATOON - Sask.
S7K 2P2

Re: Prince Albert District Band School Contacts

As per our telecom todays date, you may contact the following schools and Band officials:

Fond du Lac School

c/o Chief & Council
Fond du Lac Band
Fond du Lac - Sask.
S0J 0W0

Attn: Matthew Yooya, Education Co-ordinator - Telephone - 686-2022

Pelican Narrows School

c/o Chief & Council
Peter Ballantyne Band
Pelican Narrows - Sask.
S0P 0E0

Attn: Jeff Finell, Director of Education - Telephone - 632-2161

Keethanow School (Stanley Mission)

c/o Chief & Council
Lac La Ronge Band
P.O. Box 480
Lac La Ronge - Sask.
S0J 1L0

Attn: Robert Halkett, Director of Education - Telephone - 425-2183

I trust this information will help in your endeavours.

Cliff Samoleski
District Sup't of Education
INAC - Prince Albert District

Canada

CS:ak

NORTHERN LIGHTS
SCHOOL DIVISION No. 113

101 - 15th Street East Prince Albert, Saskatchewan S6V 1G1 Telephone: 922-1100

April 21, 1987

Thomas G. Ryan
215 5th Avenue North
SASKATOON, SASK.
S7K 2P2

Dear Mr. Ryan:

Thank you for your letter of April 9, requesting my permission to conduct research at certain NLSD schools. I am pleased to inform you that you can go ahead with the research in Southend, Sandy Bay, Pinehouse Lake, La Loche and Buffalo Narrows.

As you also requested, a list of NLSD principals and their addresses is enclosed.

Yours truly,

N. Davidson

for Garry Andrews
Director of Education

enclosure

/nd

215 5TH AVENUE N.

SASKATOON SASK.
S7K 2P2

APRIL 15, 1987

DEAR (BAND EDUCATION DIRECTOR OR PRINCIPALS NAME):

I am writing to you at this time to request your permission to conduct physical fitness appraisals of grade 10 students in your school. At present I am a graduate student in the Indian and Northern Education Program at the University of Saskatchewan. I am a physical education teacher, and registered fitness appraiser. The test I will use is commonly known as the Canadian Standardized Test of Fitness. I hope to test the majority of grade ten students in Northern Saskatchewan schools and I hope you will grant me the necessary permission so that I may next contact your school principal or grade 10 Physical Education teacher.

In sum, I believe that this will be a valuable experience for students, teachers, and possibly the community at large. Testing will require only one morning. If there are any questions I can be reached at the above address or this phone number { 244-8723 } any time before May 17th. I thank you for your time and prompt reply via the enclosed card.

Respectfully,

Thomas G. Ryan,
Researcher.

PERMISSION REPLY CARD

SCHOOL _____

PERMISSION IS GRANTED _____

PERMISSION IS NOT GRANTED _____

COMMENTS:

THANK-YOU

215 5th Avenue N.
Saskatoon, Sask.
S7K 2P2

May 11, 1987

Re: Fitness Research

Dear Principal:

Please find enclosed a number of consent forms. These forms are a formality I must observe and I hope that you can assist me with this task, so the end result is all grade 10's participate. I believe this to be a positive experience. Possibly, some information should now be passed along. The fitness testing does not require any running, only a step test will be given and I have portable steps. All students should be in proper gym attire. Other tasks, in the Canadian Standardized Test of Fitness(CSTF), include, trunk flexion, grip strength, sit-ups, push-ups, and the recording of body dimensions.i.e., height, weight, etc. The entire morning will be required to channel everyone through the process and the students are not to eat (a large meal) nor smoke two hours before testing as this may effect results. Testing will begin at 9:15 a.m. and the time before testing will be spent on a questionnaire and instructions, etc. I plan to arrive at your school at 8:30 a.m. the day of testing to set-up.

I would appreciate your efforts to make sure that the forms are returned to your school, by participating students, previous to the { date entered here } as this is your school's test date. I realize this is short notice but I am truly doing my best.

Kind Personal Regards,

Respectfully,

Thom Ryan,
Researcher.

P.S. "I will call before arriving".

ENC:CONSENT FORMS.

T.G.R.

APPENDIX F

PHYSICAL ACTIVITY READINESS QUESTIONNAIRE

THE PAR-Q

Physical Activity Readiness Questionnaire (PAR-Q)*

NAME OF PARTICIPANT _____

DATE _____

PAR Q & YOU

PAR-Q is designed to help you help yourself. Many health benefits are associated with regular exercise, and the completion of PAR-Q is a sensible first step to take if you are planning to increase the amount of physical activity in your life.

For most people physical activity should not pose any problem or hazard. PAR-Q has been designed to identify the small number of adults for whom physical activity might be inappropriate or those who should have medical advice concerning the type of activity most suitable for them.

Common sense is your best guide in answering these few questions. Please read them carefully and check (√) the ☐ YES or ☐ NO opposite the question if it applies to you.

YES	NO	
☐	☐	1. Has your doctor ever said you have heart trouble?
☐	☐	2. Do you frequently have pains in your heart and chest?
☐	☐	3. Do you often feel faint or have spells of severe dizziness?
☐	☐	4. Has a doctor ever said your blood pressure was too high?
☐	☐	5. Has your doctor ever told you that you have a bone or joint problem such as arthritis that has been aggravated by exercise, or might be made worse with exercise?
☐	☐	6. Is there a good physical reason not mentioned here why you should not follow an activity program even if you wanted to?
☐	☐	7. Are you over age 65 and not accustomed to vigorous exercise?

If You Answered

YES to one or more questions

If you have not recently done so, consult with your personal physician by telephone or in person BEFORE increasing your physical activity and/or taking a fitness appraisal. Tell your physician what questions you answered YES to on PAR-Q or present your PAR-Q copy.

programs

After medical evaluation, seek advice from your physician as to your suitability for:

- unrestricted physical activity starting off easily and progressing gradually;
- restricted or supervised activity to meet your specific needs, at least on an initial basis. Check in your community for special programs or services.

NO to all questions

If you answered PAR-Q accurately, you have reasonable assurance of your present suitability for:

- A GRADUATED EXERCISE PROGRAM – a gradual increase in proper exercise promotes good fitness development while minimizing or eliminating discomfort;
- A FITNESS APPRAISAL – the Canadian Standardized Test of Fitness (CSTF).

postpone

If you have a temporary minor illness, such as a common cold.

* Developed by the British Columbia Ministry of Health. Conceptualized and critiqued by the Multidisciplinary Advisory Board on Exercise (MABE).

APPENDIX G

PROCEDURES FOR THE 1986 CSTF

THE FOLLOWING APPENDICES (G1 - G13) HAVE BEEN REPRODUCED FROM THE CANADIAN STANDARDIZED TEST OF FITNESS, OPERATIONS MANUAL, 1986, 3RD EDITION. THE INFORMATION IN EACH APPENDIX WAS DEVELOPED AND PRODUCED BY THE GOVERNMENT OF CANADA FITNESS AND AMATEUR SPORT.

APPENDIX G1

RESTING HEART RATE MEASUREMENT PROCEDURES

The participant must sit in a comfortable chair with arm supports and rest with the feet flat on the floor for at least five minutes before resting heart rate is measured. The stethoscope should be positioned so the earpieces point forward. To monitor the heart rate, it is recommended that the diaphram of the stethoscope be place either on the sternum or over the second intercostal space on the left side. Determine the resting heart rate using a 15 second count and record in beats-per-minute in the space provided on the CSTF Data Sheet.

In the event that the resting heart rate is 100 beats/minute or more, wait an additional five minutes (have participant sit quietly) and take the readings again. A participant should not be permitted to take the aerobic and muscular endurance tests if the resting heart rate is 100 beats/minute after two readings.

If this is the case, explain briefly to the participant that the heart rate reading is not within the range for which the test was designed. The appraiser may suggest that the participant mention their elevated resting heart rate during their next visit with their physician. (Government of Canada Fitness and Amateur Sport, 1986, p.6)

APPENDIX G2

RESTING BLOOD PRESSURE MEASUREMENT PROCEDURE

Following the resting heart rate measurement, choose appropriate size of blood pressure cuff and apply the cuff to the participant's left arm. The cuff should be wrapped firmly and smoothly around the arm with the lower margin two to three centimetres above the antecubital space. The arm should be comfortably supported at an angle of 10 to 45 degrees from the trunk with the lower edge of the cuff at heart level. Locate and note the brancial artery at the antecubital space by palpation. The stethoscope should be positioned so that the earpieces point forward.

Rapidly inflate the cuff to a level 20 to 30 mmHg above the radial palpatory pressure. Quickly position the diaphram of the stethoscope over the bracial artery. Apply a minimum amount of pressure at a rate of approximately two mm-per-second. The systolic pressure is determined by the first perception of sound (first Korotkoff sound). The diastolic fourth-phase level (D4) is determined when the sounds cease to be tapping in quality and are fully muffled. Deflate the cuff to zero pressure.

Record the Resting Systolic and Diastolic fourth phase (D4) to the nearest two mmHg in the appropriate

space on the CSTF Data Sheet. In the event that the Resting Systolic Blood Pressure is 150 mmHg or more and/or the Resting Diastolic Blood Pressure is 100 mmHg or more, wait an additional five minutes, (have participant sit quietly) and take the readings again. A participant should not be permitted to take the aerobic and muscular strength and endurance tests if:

a) the resting systolic blood pressure measurement is 150 mmHg or more after two readings;

b) the resting diastolic blood pressure is 100 mmHg or more after two readings; or

c) the individual is receiving medication for high blood pressure.

If any of the above conditions exist, explain briefly that the blood pressure reading is not within the range for which the test was designed. (Government of Canada Fitness & Amateur Sport, 1986, p. 6-7)

APPENDIX G3

Anthropometric Measurements - Standing Height Procedures

Position the tape vertically against a wall. Ensure that it is perfectly straight and even with the floor. ....The participant, without footwear, stands erect, arms hanging by the sides, feet together, the heels and back in contact with the wall. The particpant is then instructed to look straight ahead, stand as tall as possible and take a deep breath while the measurement is taken.

The set square is placed on the head, depressing the hair to make firm contact and a mark is made at the level of the lower border of the square on the wall. Check to ensure that the participant's heels remain in contact with the floor. The distance from the floor to the pencil mark is recorded to the nearest 0.5 cm.;e.g. 176.5. (Government of Canada Fitness & Amateur Sport, 1986, p. 7)

Body Weight Measurement Procedure

Ensure the scale is on a flat surface....The participant must be without foot-wear and in light clothing (shorts and t-shirt or blouse for women). Record the weight in "kg" to the nearest 0.1 kg.; e.g. 067.2. (Government of Canada Fitness & Amateur Sport, 1986, p. 7)

APPENDIX G4

GIRTH MEASUREMENTS PROCEDURE

The participant stands erect in a relaxed manner, arms hanging loosely at the sides. The appraiser holds the tape between the thumbs and the index fingers with the second fingers stabilizing and leveling the tape. A cross handed technique is used to bring the zero line of the tape in line with the measuring aspect of the tape.

Ensure the tape is properly located in the horizontal plane in accordance with the instructions. Apply tension to the tape sufficient to maintain its position but not to cause indentation of the skin surface. All measurements are recorded to the nearest 0.1 cm.;e.g. 098.7 cm. (Government of Canada Fitness & Amateur Sport, 1986, p.7)

CHEST GIRTH PROCEDURE

Have the participant raise both arms and pass the tape around the chest postioned at the level of the mesosternale (approximately at the mid level of the sternum, midway between the axilla and the horizontal nipple line). Ensure the tape is perfectly horizontal. The participant lowers both arms so that they hang relaxed. The reading is taken at the end of a normal expiration. (Government of Canada Fitness & Amateur Sport, 1986, p.7)

APPENDIX G5

WAIST GIRTH MEASUREMENTS PROCEDURE

The participant stands erect. The appraiser uses a cross-handed technique to position the tape horizontally at the level of noticeable waist narrowing. The tape is then placed in the recording position and the measurement is made at the end of a normal expiration. In some participants, an indeterminate waist can be approximated by taking the girth at the estimated lateral level of the twelfth or lower floating rib. (Government of Canada Fitness & Amateur Sport, 1986, p.8)

HIP (GLUTEAL) GIRTH MEASUREMENTS PROCEDURE

The participant stands erect with feet together. The tape is positioned around the hips at the level of the symphysis pubis and the greatest gluteal protuberance. (Government of Canada Fitness & Amateur Sport, 1986, p.8)

RIGHT THIGH GIRTH PROCEDURE

The participant stands erect, feet slightly apart. The tape is positioned around the right thigh to a level one centimeter below the gluteal line. (Government of Canada Fitness & Amateur Sport, 1986, p.8)

APPENDIX G6

SKINFOLD MEASUREMENTS

General procedure:

During skinfold measurements, it is essential that the participant relax the underlying musculature as much as possible. When the site of the skinfold has been determined, a fold of skin plus the underlying fat is grasped between the thumb and forefinger with the back of the hand facing the appraiser. Keeping the jaws of the calipers always at right angles to the body surface, the contact faces of the calipers are placed one centimeter below the point where the skinfold is raised. While maintaining the pressure of the fingers on the skinfold, the trigger of the calipers is fully released and the measurement is taken. The measurement is noted when the indicator stabilizes which is approximately two seconds after the full pressure of the caliper jaws is applied to the skinfold. The reading is recorded to the nearest 0.2mm;e.g.16.8mm.

Complete the first set of skinfold measurements for all sites. Then, repeat the procedure to obtain a second set of measurements for each skinfold site. Record the mean of the two measures unless the difference between the first and second measure of that particular skinfold site is found to be greater than 0.4..mm. If so, take a

third measure of that skinfold site and choose from among the three values, the two measures which closely match each other in value. Determine the mean of those two measures. Should the three measures be equidistant, e.g., 18.6 19.2 19.8 determine the mean of all three values.

It should be noted that the accuracy of skinfold measurements depends on:

-precise identification of the site of the skinfold;

-forming the skinfold prior to the application of the caliper jaws;

-the standardization of the alignment of the skinfold crest;

-maintainance of the pressure by the fingers on the skinfold when the measurement is taken;

-complete release of the caliper jaws.
(Government of Canada Fitness & Amateur Sport, 1986, p.8)

APPENDIX G7

TRICEP SKINFOLD

Procedure:

The participant stands with the arms relaxed by the sides. The triceps skinfold is taken on the back of the right arm at the point midway between the tip of the acromion (right shoulder) and the tip of the olecranon (right elbow). The midpoint is determined by placing the fifth finger of the left hand on the tip of the acromion (right shoulder), the fifth finger of the right hand on the tip of the olecranon(right elbow) and then the thumbs are placed together to determine the midpoint.

The skinfold is then raised at the mid-arm point, so the fold runs vertically along the midline of the back of the arm. (Government of Canada Fitness & Amateur Sport, 1986, p.9)

BICEPS SKINFOLD

Procedure:

The biceps skinfold is measured on the right extended upper arm over the biceps at the same level as the mid-arm point for the triceps. The skinfold is then raised at the mid-arm point, so the fold runs vertically along the midline of the front of the arm. (Government of Canada Fitness & Amateur Sport, 1986, p.9).

APPENDIX G8

SUBSCAPULAR SKINFOLD

The participant stands with the shoulders relaxed and the arms by the sides. The skinfold is raised so it can be measured on a diagonal line coming from the vertical border of the scapula to a point 1 cm. beneath the inferior angle. The skinfold runs downward and outward at an angle of approximately 45 degrees to the spine.

ILIAC CREST SKINFOLD

The particapant stands in a normal erect position. Have the participant raise the right arm to the side so that it is horizontal and place the right hand on the right shoulder. If the participant is unable to place hand on shoulder, keep the horizontal arm extended. The skinfold is then measured three centimeters above the crest of the ilium at the midline of the body so that the fold runs forward and slightly downward.

MEDIAL CALF

Have the participant place the unweighted (relaxed)right foot flat on a step so that the knee is at 90o. The skinfold is raised on the inside of the right calf just above the level of the maximum calf girth so that the fold runs vertically along the midline. (Government of Canada Fitness & Amateur Sport, 1986, p.9)

APPENDIX G9

STEP TEST PROCEDURES

The CAFT (formerly known as the Canadian Home Fitness Test: Advanced Version) consists of a series of stepping sequences performed on double 20.3cm steps to a six-count musical rhythm set by a cassette tape with progressive increase in tempo.

The CAFT is structured such that a participant begins by performing a three minute "warm-up" exercise at a cadence intensity of 65 to 70 per cent of the average aerobic power expected of a person ten years older. Instructions and time signals are given by the cassette tape as to start and stop exercising and for the counting of the 10 second measurement of the post-exercise heart rate.

If a predetermined ceiling post-exercise heart rate is not attained or exceeded, the participant performs a further three minutes of exercise at 65 to 70 per cent of the average aerobic power expected for his/her age group. Again, if the participant does not attain or exceed the ceiling heart rate, a further three minutes of stepping is performed at an intensity equivalent to 65 to 70 per cent of the average aerobic power for a person ten years younger.

Apply the blood pressure cuff to the participant's left arm. The cuff should be wrapped firmly and smoothly around the arm with the lower margin two to three centimetres above the antecubital space. It is suggested that the participant wear the cuff throughout the step test. If it tends to slip, tape it to the upper arm or shoulder with masking tape....Have the participant practice the stepping sequence, first without the music and then with the music, but no more than twice each time. Ensure that the participant places both feet completely on the top step, that the legs are completely extended and the back upright during this phase of the movement. Also, ensure that the participant maintains the proper cadence. Count and/or step a few steps with any participant who is experiencing difficulty.

Inform the participant that the first stepping session lasts three minutes. When the music stops,the participant will cease to step and remain motionless. Indicate that you will then inform the participant whether or not to proceed to the second session of stepping depending on their heart rate response. If the participant is to proceed, explain that this procedure will be repeated at the end of the session. Indicate that the participant should feel free to stop stepping anytime if any discomfort is experienced....When the

music stops have the participant remain motionless, while standing. Determine the post-exercise heart rate....The determination of an accurate post-exercise heart rate is a critical measurement for deciding if the participant should continue to the next session....After the participant completes the last session of stepping, determined by the post-exercise heart rate response, have him/her sit down. Once seated, if the participant appears fatigued or light headed, elevate the legs to rest on the ergometer steps.

Record the post-exercise systolic and diastolic (D4) blood pressure readings:

-between 0:30 and 1:00 minute
-between 2:30 and 3:00 minutes

Measure and record the post-exercise heart rate again between 3:00 and 3:30(15 second count)...to ensure the heart rate and blood pressure drop below the resting ceiling levels before the participant leaves the site; i.e.,heart rate less than 100 beats/minute, systolic blood pressure less than 150mm/Hg, diastolic blood pressure less than 100 mmHg. (Government of Canada Fitness & Amateur Sport, 1986, p.10-11)

APPENDIX G10

GRIP STRENGTH PROCEDURES

Have the participant grasp the dynamometer in the appropriate hand. The grip is taken between the fingers and the palm at the base of the thumb. Adjust the grip of the dynamometer so the second joint of the fingers fits snugly under the handle and takes the weight of the instrument. Lock the grip in place. The participant holds the dynaometer in line with the forearm at the level of the thigh. The dynamometer is then squeezed so as to exert maximum force. Have the participant exhale while squeezing(to avoid the build-up of intra-thoracic pressure). During the test neither the hand nor the dynamometer should touch the body or any other object. Measure both hands alternatively allowing two trials per hand. Record the scores for each hand to the nearest kilogram. Combine the maximum score for each hand and record. (Government of Canada Fitness & Amateur Sport, 1986, p.12)

APPENDIX G11

PUSH-UPS PROCEDURES

Males - The participant lies on his stomach, legs together. His hands, pointing forward, are positioned under his shoulders. The participant pushes up from the mat by fully staightening the elbows and using the toes as the pivotal point. The upper body must be kept in a straight line. The participant returns to the starting position, chin to the mat. Neither the stomach nor thighs should touch the mat.

Females

The participant lies on her stomach, legs together. Her hands, pointing forward, are positioned under the shoulders. The participant pushes up from the mat by fully straightening the elbows and using the knees as the pivotal point. The upper body must be kept in a straight line. The participant returns to the starting position, chin to the mat. The stomach should not touch the mat. The lower legs remain in contact with the mat, ankles plantar-flexed. The push-ups are to be performed consecutively and without a time limit. (Government of Canada Fitness & Amateur Sport, 1986, p.12)

APPENDIX G12

TRUNK FORWARD FLEXION PROCEDURES

Have the participant warm-up for this test by performing slow stretching movements (modified hurdle stretch held for 20 seconds repeated twice on each leg) before taking actual measurements. The participant, barefoot, sits with legs fully extended with the soles of the feet placed flat against the two horizontal crossboards of the flexometer. The flexometer should be adjusted to a height at which the balls of the feet rest agianst the upper crossboard. The inner edge of the soles are placed two cm from the edge of the scale. Keeping knees fully extended, arms evenly stretched, palms down, the participant bends and reaches forward (without jerking), pushing the sliding marker along the scale with the fingertips as far forward as possible. The position of maximum flexion must be held for approximately two seconds. Advise the participant that lowering the head will maximize the distance reached. If the knees flex, the trial is not counted. Do not attempt to hold the knees down. In addition, do not allow jerking, bouncing action. The test is repeated twice. Record both readings and record the maximum reading to the nearest 0.5 cm. (Government of Canada Fitness & Amateur Sport, 1986, p.13)

APPENDIX G13

SIT-UP PROCEDURES

The participant lies in a supine position, knees bent at a right angle, and feet shoulder-width apart. The hands are placed at the side of the head with the fingers over the ears. The elbows are pointed towards the knees. The hands and elbows must be maintained in these positions for the entire duration of the test. Also, the ankles of the participant must be held throughout the test by the appraiser to ensure that the heels are in constant contact with the mat.

The participant is required to sit up, touch the knees with the elbows and return to the starting postion (shoulders touch floor). The participant performs as many sit-ups as possible within one minute. The participant may rest whenever necessary....A well-controlled "curl up" of the trunk to the point where the elbows touch the knees. The is followed by a "curling down" of the trunk with a particular emphasis on the lower back fully contacting the mat before the upper back and shoulders touch the mat.

A "rocking" or "bouncing" movement is not permitted. Also, the participant's buttocks must remain in contact with the mat and the fingers in contact with the side of the head at all times. (Government of Canada Fitness & Amateur Sport, 1986, p.13)

APPENDIX H

CSTF DATA SHEET

CSTF DATA SHEET

Gender M ☐ F ☐

NAME OF PARTICIPANT

Age

PRE-TEST SCREENING

PAR-Q	Screened No	Screened Yes
1. Has your doctor ever said you have heart trouble?	☐	☐
2. Do you frequently have pains in your heart and chest?	☐	☐
3. Do you often feel faint or have spells of severe dizziness	☐	☐
4. Has a doctor ever said your blood pressure was too high?	☐	☐
5. Has your doctor ever told you that you have a bone or joint problem such as *arthritis* that has been aggravated by exercise or might be made worse with exercise?	☐	☐
6. Is there a good physical reason not mentioned here why you should not follow an exercise program even if you wanted to?	☐	☐
7. Are you over age 65 and not accustomed to vigorous exercise?	☐	☐
Signed Consent and Release Form (No ☐ Yes ☐ →)	☐	☐

OBSERVATIONS

Pregnancy – ask all females	☐	☐
Difficulty breathing at rest	☐	☐
Persistent cough	☐	☐
Lower extremity swelling	☐	☐
Currently on medication	☐	☐
Followed preliminary instructions (No ☐ Yes ☐ →)	☐	☐
_____	☐	☐

RESTING HEART RATE AND BLOOD PRESSURE

Heart Rate: 15 sec. → b/min.

Systolic: mm Hg

Diastolic: mm Hg

If resting heart rate ≥ 100, or systolic ≥ 150, or diastolic ≥ 100 have participant rest 5 minutes and then repeat measurements

Heart Rate	15 sec.	b/min.	HR ≥ 100 ☐ ☐
Systolic		mm Hg	Systolic ≥ 150 ☐ ☐
Diastolic		mm Hg.	Diastolic ≥ 100 ☐ ☐

Physician: Phone:

Next of Kin: Phone:

ANTHROPOMETRIC MEASUREMENTS

Weight (kg)

Height (cm)

BMI (kg/m2)

Percentile

GIRTHS (cm)

Chest

Waist (Abdomen)

Hip (Gluteal)

Right Thigh

WHR (Waist ÷ Hip)

Percentile

SKINFOLDS (mm)

Triceps	1st, 2nd, 3rd	→ Mean Closest
Bicep	1st, 2nd, 3rd	→ Mean Closest
Subscapular	1st, 2nd, 3rd	→ Mean Closest
Iliac Crest	1st, 2nd, 3rd	→ Mean Closest
Medial Calf	1st, 2nd, 3rd	→ Mean Closest

SOS: Sum of (5) Skinfolds

Percentile

SOTS: Sum of (2) Trunk Skinfolds

Percentile

DATE	YEAR	MONTH	DAY	
NAME OF APPRAISER				

AEROBIC FITNESS

CANADIAN AEROBIC FITNESS TEST

Starting Stage

Heart Rate (10 sec.) 1st session, 2nd session, 3rd session

Heart Rate Final: 10 sec. → b/min.

Percentile

VO_2 Max. (ml·kg-1·min-1)

Percentile

POST-EXERCISE

Blood Pressure	0:30–1:00 min.	Systolic	mm Hg
		Diastolic	mm Hg
	2:30–3:00 min.	Systolic	mm Hg
		Diastolic	mm Hg
Heart Rate	3:00–3:30 min.	15 sec. →	b/min.

MUSCULAR STRENGTH – MUSCULAR ENDURANCE – FLEXIBILITY

GRIP STRENGTH (kg)

Right Hand, Left Hand — Max. — Max.

Combined Right and Left Max.

Percentile

PUSH-UPS

Percentile

TRUNK FORWARD FLEXION (cm)

Max.

Percentile

SIT-UPS (No. in 60 Seconds)

Percentile

CSTF DATA SHEET

APPENDIX I

ASSESSMENT REPORT BOOKLET PRECIS

Description of the Standardized Test of Fitness Assessment Report Booklet.

The booklet was prepared by the Fitness and Amateur Sport Branch of the Department of National Health and Welfare to provide you with the results of your Standardized Test of Fitness. It also contains some basic information related to fitness and the tests you performed. Besides being informative, this report will be useful in comparing your performance upon subsequent appraisals.

Furthermore, this booklet will act as a guide in helping you achieve a "state of well being" through regular physical activity and lifestyle modification. (The Minister of State Fitness and Amateur Sport, 1979, p.1) Moreover, the Assessment Report Booklet mentions briefly that Physical fitness is influenced by factors such as age, lifestyle, and the amount and type of physical activity one engages in. Total fitness involves the physical, emotional, and spiritual elements. Fitness components include anthropometry, flexibility, muscular strength and endurance, and cardio-respiratory fitness. Norms from the 1977 Canadian Public Health Association Project are included in the booklet.

APPENDIX J

FITNESS FEEDBACK FORM

NAME_____AGE_____SEX_____LOCALE_____

HEIGHT_____WEIGHT_____

% BODY FAT IS NOT CREDIBLE IN 1987 - THUS NO FIGURE OR RATING IS GIVEN - LEAN BODY WEIGHT AND IDEAL BODY WEIGHT HAS BEEN OMITTED.

GIRTHS(cm.)

CHEST_____ABDOMEN_____GLUTEAL_____THIGH_____

STRENGTH(Kg.)

R.HAND_____L.HAND_____TOTAL_____RATING_____

PUSH-UPS(total)_____Rating_____

SIT-UPS(total 60")_____Rating_____

TRUNK FLEXION(cm.)_____Rating_____

CANADIAN HOME FITNESS TEST(step-test results)VO2 Max.

Final Stage completed_____Post Exercise H.R.(b/min)____

PREDICTED VO2 MAX._____ RATING_____

RESTING SYSTOLIC B.P._____ DIASTOLIC_____

POST-EXERCISE(one-minute) SYSTOLIC_____DIASTOLIC_____

POST-EXERCISE(three minute)SYSTOLIC_____DIASTOLIC_____

RESTING H.R./MINUTE_____POST-EXERCISE H.R./MIN_____

NOTE: NORMS IN THE REAR OF YOUR BOOK ARE 1977 - I AM USING THE 1981 CANADIAN NORMS THESE ARE MORE RECENT AND CREDIBLE

BE FIT - FEEL BETTER - DO BETTER - EXERCISE A MINIMUM OF THREE TIMES PER WEEK - EAT GOOD FOOD - ASK YOUR TEACHER FOR ADVICE!